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THE INFLUENCE OF SPECIAL PHYSICAL TRAINING PROGRAM ON MORPHO-FUNCTIONAL INDICATORS AND HELTH LEVEL OF CADETS IN HIGHER MILITARY EDUCATIONAL INSTITUTIONS

The article is dedicated to solve an actual issue of physical health improving in higher military educational institutions (HMEI) by means of Special Physical Training (SPT). The events of the last years on east of Ukraine showed the importance of high physical health level of servicemen to conduct the battle actions in extreme terms and ability of military personal to resist successfully the influence of various stress factors, keeping a high capacity level. The purpose of the study is to investigate the influence of experimental SPT program on morpho-functional indicators and health level of cadets during its 20-month implementation. 119 cadets of Kharkiv National Air Force university named by Ivan Kozhedyb were involved in the research. The age of participants was from 19 to 27 years. They were divided into two groups: control (n=74) and experimental (n=45). Both groups of cadets were tested for the absence of a significant difference of morpho-functional indicators at the beginning of the experiment (p>0,05). The control group (CG) performed the current physical training program. An experimental group (EG) executed the new SPT program, based on military and sports all-round competition means. Traditional and experimental SPT programs had the same number (2 per week) of training sessions of 90 minutes each. Both groups were tested before and after the experiment. (Body Mass Index, Vital Capacity Index, Power Index, Robinson Index and Heart Rate Recovery Time) were used to determine the health level using the G. Apanasenko express-assessment method. The results of experiment demonstrated statistically reliable improvement of EG cadets' health level on 21,1 % (p<0.001). The CG participants' health level didn't improve statistically reliable (p>0.5). Conclusion: an experimental SPT program affects positively on cadets' health level in higher military educational institutions.

Keywords: *Special Physical Training, health level, morfo-functional indicators, higher military educational institutions.*

Корчагін М. В., Откидач В. С., Золочевський В. В., Гоманюк С.В. Вплив програми спеціальної фізичної підготовки на морфо-функціональні показники та рівень здоров'я курсантів вищих військових навчальних закладів. *Стаття присвячена актуальному питанню покращення рівня здоров'я курсантів вищих військових навчальних закладів. Мета дослідження – дослідити вплив експериментальної програми спеціальної фізичної підготовки на морфо-функціональні показники та рівень здоров'я курсантів. В ході педагогічного експерименту було створено експериментальну програму спеціальної фізичної підготовки та протягом 20 місяців впроваджено в освітній процес курсантів Харківського національного університету Повітряних сил імені Івана Кожедуба. До дослідження залучено 74 курсанта контрольної групи, які навчалися за чинною програмою фізичного виховання та спеціальної фізичної підготовки та 45 курсантів експериментальної групи, які займалися за експериментальною програмою, що базується на пріоритетному використанні вправ військово-спортивного багатоборства. Вік досліджуваних на початку експерименту від 19 до 27 років. У ході експерименту проведено вимірювання морфо-функціональних показників (індекс маси тіла, життєвий індекс, силовий індекс, індекс Робінсона та час відновлення ЧСС після 20 присідань) курсантів та визначено оцінку фізичного здоров'я за методикою Г. Апанасенка. Результати дослідження демонструють статистично достовірне покращення на 21,1 % (p<0,001) показника рівня фізичного здоров'я курсантів ЕГ. У представників КГ статистично достовірних змін не відмічено. Висновок: експериментальна програма спеціальної фізичної підготовки позитивно вплинула на рівень фізичного здоров'я курсантів ВВНЗ.*

Ключові слова: *спеціальна фізична підготовка, рівень здоров'я, морфо-функціональні показники, вищі військові навчальні заклади.*

Formulation of the problem. The events of the last years on east of Ukraine showed the importance of high physical health level of servicemen to conduct the battle actions in extreme terms and ability of military personal to resist successfully the influence of various stress factors, keeping a high capacity level [3, 14]. Modern military specialties require a higher level of psychical fitness of a soldier and also increase demands to its morpho-functional condition [10, 22, 23]. Physical fitness and functional condition of the body are the components of physical health level [2, 19].

Analysis of literature sources. According to domestic scientists, educational process in Ukrainian HMEI urgently needs reformation to be oriented on creation the military professional competence of future officers [4, 6]. The problem of qualitative training of cadets at the present stage of operational arts and military equipment development requires further development of their physical and psychological abilities [15, 17]. The main advantages of modern professional armies are the ability to select the best representatives of the nation for military service [16]. However, in Ukraine, given the low prestige of military service, it is impossible to ensure high quality professional selection. The authors of domestic scientific works [7, 8]

assert that in recent time the morpho-functional indicators of the Ukrainian young people have the clearly expressed tendency to worsening. The task of physical readiness providing for future professionals must be solved in the walls of higher educational establishment with the help of the professionally-oriented Physical Training [9, 18]. As for higher military educational institutes it is the Special Physical Training [5, 13].

The issues of cadets' health improvement by means of traditional sport training were examined in works of K. Prontenko, V. Prontenko, G. Griban, P. Tkachenko, R. Mikhalchuk, V. Suspo and other [20, 21, 24]. Our previous study proved the positive affect of professionally oriented physical training on the physical abilities level of military operators [11]. V. Klymovych, A. Oderov, S. Romanchyk, O. Olkhovyi, V. Andreychuk and other in their latest research also determined the effectiveness of the targeted impact of experimental technology for the acquisition of military-applied motor skills on anthropometric indicators and functional data of the cardiovascular system of cadets [12]. However, researchers have not fully characterized the dynamics of morpho-functional indicators that characterize the health improving processes occurring in the body of those who study in HMEI.

The purpose of the article is to determine the influence of experimental SPT program on morpho-functional indicators and health level of cadets in higher military educational institutions.

Presentation of the main study material. The research was conducted from January, 2020 till September, 2021 on the base of the Kharkiv national Air force university named after Ivan Kozhedyb and it was directed on the determination of morpho-functional indicators and health level dynamic of cadets.

119 cadets were involved in the research. The age of participants was from 19 to 27 years. They were divided into two groups: control (n=74) and experimental (n=45). All participants were informed about participating in an experiment and gave their consent. Both groups of cadets were tested for the absence of a significant difference of morpho-functional indicators at the beginning of the experiment ($p>0,05$). The control group (CG) performed the current physical training program. An experimental group (EG) executed the new SPT program, based on military and sports all-round competition means. Instead of outdated exercises of Soviet system of PT, the experimental SPT program included techniques and actions that are close to the specifics of military-professional activities: wrestling, combat with weapons; hand-to-hand combat without weapons; special actions of servicemen (shooting with air guns, running 3000 m with grenade throwing and shooting, running 6x100 m with a rifle), swimming in military uniform and diving. Traditional and experimental SPT programs had the same number (2 per week) of training sessions of 90 minutes each.

Pre-test – post-test design of pedagogical experiment was used. The determination of morpho-functional indicators and health level of cadets was held according to G. Apanasenko express-assessment method, based on the anthropometry characteristics (body height, body weight, vital capacity, handgrip test) and also state of cardiovascular system [1]. The methodology of express-assessment consisted in determining the amount of points for each of the 5 indicators: Body Mass Index (BMI), Vital Capacity Index (VCI), Power Index (PI), Robinson Index (RI) and Heart Rate Recovery Time (HRRT). Each index was evaluated in points. According to G. Apanasenko health level assessment is a sum of morpho-functional indicators (indexes). The low health level corresponded to sum of 3 and lesser points, below the average – 4-6 points, the average – 7-11 point, above the average – 12-15 points and the high health level is 16-18 points.

Statistical processing of the data was carried out on a computer using the standard STATISTICA 7.0 programs. 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 and Lilliefors test for normality. Therefore, a parametric test (i.e., the independent samples t-test) was used for analysis. The authenticity of difference between the indicators of cadets was determined by means of Student's criterion. The significance for all statistical tests was set at $p < 0.05$. The dynamics of indicators in each group was estimated. Percentage change was calculated using the equation 1:

$$\text{Pre-Post } \Delta\% = \text{ABS}\,[(\text{Meanpost}-\text{Meanpre})/\text{Meanpre}]\times 100; \quad (1).$$

The results of morpho-functional indicators determining are presented in table 1.

Table 1. Morpho-functional indicators of cadets during the experiment (n=119)

№	Test		Pre		Post		Pre-Post Δ%	The authenticity of difference
			X	SD	X	SD		
1	Body Mass Index, kg/m^2	CG (n=74)	403,18	2,41	407,33	2,13	10,3	p<0,05
		EG (n=45)	404,62	2,63	407,24	2,35	6,5	p>0,05
2	Vital Capacity Index, ml/kg	CG (n=74)	53,29	0,77	52,73	0,71	1,1	p<0,05
		EG (n=45)	53,29	0,88	53,28	0,89	0	p>0,05
3	Power Index, %	CG (n=74)	57,26	0,82	58,18	1,12	1,6	p>0,05
		EG (n=45)	56,97	1,29	60,61	1,44	6,4	p<0,01
4	Robinson Index, points	CG (n=74)	85,83	1,19	83,97	0,83	2,2	p>0,05
		EG (n=45)	85,51	1,40	81,97	1,42	4,1	p<0,001
5	Heart Rate Recovery Time after 20 squats per 30 seconds, s	CG (n=74)	88,86	0,83	88,03	0,78	0,9	p>0,05
		EG (n=45)	88,84	1,20	85,87	0,96	3,3	p<0,001
6	Health level assessment, points	CG (n=74)	7,39	0,30	7,91	0,27	7,0	p>0,05
		EG (n=45)	7,87	0,30	9,53	0,34	21,1	p<0,001

On the basis of the received data we carried out the analysis of morpho-functional indicators and physical health level dynamics of control and experimental groups. BMI of both group representatives increased by 10,3 % (CG) and 6,5 % (EG), but for CG this difference is statistically reliable ($p<0,05$), for EG it is not statistically reliable ($p>0,05$). In our opinion, a slight deterioration of cadets BMI is associated with weight gain related to major amount of intellectual work during the creation of master's degree theses.

We noted similar changes in the value of the VCI of CG representatives (1,1 %), and these changes are statistically significant. The VCI of EG cadets did not changed in general (tabl. 1).

Analysis of the PI and RI of CG cadets showed no statistically significant changes during the experiment. In contrast, the PI of EG improved by 6.4 % ($p<0.05$), and also the RI improved by 4.1% ($p<0.001$). In in our opinion, the indicators have increased due to EG cadets muscle strength rising and heart function enhancement. The last conclusion was confirmed by a statistically significant improvement of EG respondents HRRT index by 3.7% at $p <0.001$. The CG cadets HRRT index did not changed statistically reliable ($p>0,05$).

These changes of morpho-functional indicators allowed to determine the influence of the SPT program on the health level of cadets. Health level assessment of CG representatives before and after the experiment did not showed statistically significant difference at $p> 0.05$ (tabl. 1). However, according to the results of the study, the health level of EG cadets changed by 21.1% ($p<0,001$).

The experiment confirmed the data of scientists [17] about the positive influence of SPT on the health level of cadets in HMEI. Generally, SFP program application for 20 months provided the improving of health level assessment of EG cadets from 7.87 to 9.53 points.

Conclusions. The results of experiment demonstrated statistically reliable improvement of EG cadets' health level by 21,1 % ($p<0.001$). The CG participants' health level didn't improve statistically reliable ($p>0.5$). The experimental SPT program application for 20 months affects positively on cadets' health level in higher military educational institutions.

The prospects of further researches will be focused on the determination of SPT program influence on psycho-physiological abilities of cadets in HMEI.

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THE CONCEPT OF CENTER IN AIKIDO STUDY

The article analyzes the concept of "center" in the context of aikido and other oriental martial arts. It is determined that the category of center in aikido completely coincides with the definition of the general center of gravity in general physiology. That once again proves the practical effectiveness of techniques used in aikido, as well as the important positive impact of aikido practice on harmonizing the interaction of right and left-brain hemispheres, balance of psycho-emotional state and improvement of general health and well-being.

The state of physical culture and sports activities of Aikido athletes is revealed, which is seen as a syncretism of external (physical, social) and internal (emotional, mental, volitional, independent) multifaceted work, which, although not a competitive and stimulating system, but aimed at long term of study and comprehension, without age requirements.

It was found that a deeper understanding by aikido practitioners of the basic and key concepts of the presented martial art contributes to a better understanding of the biophysical basis of techniques, ukemi and tai sabaki movements, which increases the level of preparation for the certification. In addition, it was found that understanding and using the work of the center has a significant positive impact in the study of other martial arts, including judo, iaido, jodo, hand-to-hand combat, and even in teaching acrobatics elements.