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General physical fitness of servicemen as the main element of increasing military-special training

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Ogólna sprawność fizyczna żołnierzy jako główny element zwiększenia wyszkolenia wojskowo-specjalnego

Streszczenie

Wraz z początkiem rosyjskiej agresji na Ukrainę Siły Zbrojne Ukrainy potrzebują znaczących reform i usprawnień zarówno w zakresie uzbrojenia technicznego, jak i reorganizacji struktury ad-

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ministracyjnej zgodnie z wymogami profesjonalizacji i przejścia Sił Zbrojnych na dobrowolną służbę [2, 3, 6].

Szkolenie jakiegokolwiek żołnierza nie może być kompletne, jeśli jest ograniczone jedynie wiedzą na temat posługiwania się sprzętem wojskowym i bronią, oraz umiejętnością posługiwania się nimi. Nieodłącznym warunkiem pomyślnej realizacji zadań zawodowych jest zdolność każdego żołnierza do pełnego wykorzystania mocy sprzętu wojskowego w możliwie najkrótszym czasie [1, 10].

Pilną kwestią jest doskonalenie programów treningu fizycznego wojskowych, które w przyszłości zapewnią jakość zadań zgodną z przeznaczeniem i wykonaniem zadań.

Analiza i poprawa poziomu dynamiki ogólnej sprawności fizycznej żołnierzy z uwzględnieniem celowego wykonywania zadań.

Badania wykazały, że na wszystkich etapach eksperymentu poziom ogólnej sprawności fizycznej żołnierzy kontraktowych jest gorszy niż młodych kadetów cywilnych ($t = 2, 25-2,66$; $p < 0,05$). Stwierdzono, że w obu grupach dynamika wskaźników ogólnej sprawności fizycznej jest dodatnia, nie ma natomiast istotnej różnicy, co wskazuje na brak skuteczności dotychczasowego programu rozwoju sprawności fizycznej, niezależnie od kategorii podchorążych, aktualnego programu sprawności fizycznej, kategorii kadetów.

Słowa kluczowe: trening fizyczny, wojskowi, Siły Zbrojne Ukrainy, ogólna sprawność fizyczna.

Abstract

With the beginning of Russia's armed aggression against Ukraine, the Armed Forces of Ukraine need significant reforms and improvements both in technical rearmament and reorganization of the administrative structure in accordance with the requirements of professionalization and the transition of the Armed Forces to staffing on a voluntary basis [2, 3, 6].

The training of any serviceman cannot be complete if it is limited only to knowledge of the use of military equipment and weapons and the ability to use them. An integral condition for the successful completion of professional tasks is the ability of each serviceman to make the most of all the power of military equipment in the shortest possible time [1, 10].

An urgent issue is the improvement of programs for physical training of servicemen, which in the future will ensure the quality of tasks in accordance with the purpose and performance of tasks.

Analysis and improvement of the level of dynamics of the general physical fitness of servicemen taking into account purposeful performance of tasks.

The research has shown that, at all stages of the experiment, the level of general physical fitness of contract servicemen is worse than that of civilian youth cadets ($t=2,25-2,66$; $p<0,05$). It was revealed that in both groups the dynamics of indicators of general physical fitness is positive, but there is no significant difference, which indicates the lack of effectiveness of the current program of physical fitness, regardless of the category of cadets, effectiveness of the current program of physical fitness, or the category of cadets.

Keywords: physical training, servicemen, Armed Forces of Ukraine, general physical fitness.

Introduction

Maintaining the appropriate level of physical and combat readiness of servicemen of the Armed Forces of Ukraine is one important, necessary and sufficient condition for quality and successful implementation of tasks to protect the

state in accordance with the purpose. The professional activity of military servicemen is characterized by constantly increasing physical and mental stress, the impact on the functional state and efficiency of servicemen, their performance of tasks in special conditions associated with risk to life and health [7, 11]. Physical training plays an important role and is not only an important factor which the professional realization of professional tasks by servicemen depends on, but also affects the performance of combat missions [1, 10].

Given the peculiarities of the participation of units and servicemen of the Armed Forces of Ukraine in the conduct of hostilities on the territory of our state, the psychological stability of servicemen and professional competence of defenders is becoming increasingly important [4].

General physical training of servicemen in the process of training in higher military educational institutions contributes to improving military special training, leading a healthy lifestyle, disease prevention and physical rehabilitation, accelerating the adaptation of servicemen to the conditions of military service, the organization of meaningful leisure. The tasks of general physical training follow from its objective function and mainly reflect the general requirements of training and combat activities for the physical condition of all categories of servicemen.

Classes in general physical training are aimed at developing, improving and maintaining physical qualities, formation of motor skills on gymnastic shells, skiing, coordination and spatial orientation in collective action during sports games, coordinated movements in swimming, education of willpower (determination, initiative, ingenuity, endurance and self-control), military training and fitness, improving posture, hardening the body and relieving emotional stress.

Scholars [8, 9] note that progressive changes in the use of units and an increase in the number of servicemen of the Armed Forces of Ukraine have created an urgent problem of a comprehensive reform of training and education of cadets - future commanders of the Armed Forces of Ukraine from the function of sergeant to officer. One of the main components of this task is the creation of a professional sergeant in the Armed Forces of Ukraine, which should be the basis of the future Armed Forces of Ukraine [4, 5].

Thus, the analysis and improvement of the level of dynamics of the general physical fitness of servicemen-defenders of the Armed Forces of Ukraine remains an urgent issue.

Materials and Methods

The study was conducted on the basis of the Military College of Sergeants of the National Academy of Land Forces (Lviv). The study involved 94 cadets of the

Military College of Sergeants of the National Academy of Land Forces named after Hetman Petro Sagaidachny (17.6 ± 0.2 years old; range: 17–21 years old), of which 48 cadets were chosen from civilian youth (KG1) and 46 cadets were contract servicemen (KG2).

Testing (1 – beginning of the first semester, 2 – end of the first semester) was conducted with the use of well-known exercises, following the conditions of their implementation, which are provided by the Provisional Guidelines for Physical Training in the Armed Forces of Ukraine (TNFP-2014), namely: 100 m run, shuttle running 10×10 m, pull-ups on the crossbar, bending and unbending the arms while lying down, shuttle running 4×100 m, 1000 m and 3000 m runs.

During the study, pedagogical methods were used (observation, testing) to determine the dynamics of the level of physical fitness of cadets, whereas methods of mathematical statistics were implemented to process experimental data and determine reliability. The results of the study were calculated using Microsoft Office Excel. Significance of differences between sample values was checked using Student's t-test and considered statistically significant at $p < 0.05$ – 0.001 .

The results of the study were evaluated by mathematical statistics methods, using the package of applied computer programs "Statistica 5.5", license number AX908A290603AL. After the pedagogical experiments, we carried out calculations of the main univariate statistics:

- arithmetic mean – \bar{X} , standard deviation of the mean – m , dispersion – σ ;
- Student's t-criterion - to establish differences between two samples for the average results, assuming normal distribution of individual values in each sample. At the same time, a 5-integer correlation level – p (correlation not less than 0.95) was accepted as a base; during the analysis of the results in the middle of each sample, the t value was used to compare the results of different samples - for non-compatible samples.

The methods of mathematical statistics allowed the authors to fully study the research question and conduct an experimental test pursuant to the provisions of protection.

Results

The study of the cadets' performance in the 100 m run showed that the average results at the beginning of the experiment were 14.3 s for KG1 and 14.4 s for KG2, and at the end of the experiment 14.0s and 14.2 s respectively (Table 1). A comparative analysis of the cadets' performance during the first and second control tests showed that the results of the cadets of the first control group deteriorated by 0.3 s at the end of the experiment ($t = 1.77$; $p > 0.05$) and for KG2

they deteriorated by 0.2 s ($t = 1.75$; $p > 0.05$). A comparative analysis of the indicators between KG1 and KG2 allowed us to determine that at the beginning and the end of the study there was no significant difference between the group indicators ($t = 1.13-1.16$; $p > 0.05$).

Table 1. Dynamics of the indicators of the military college cadets during the experiment

	KG 1 (n = 48)			KG 2 (n = 46)			P KG1 – KG2 Beg.	P KG 1 – KG 2 End
	Beg.	P Beg. End.	End.	Beg.	P Beg. End.	End		
<i>The 100 meter run, s</i>								
\bar{X}	14.3	t = 1.77	14.0	14.4	t = 1.75	14.2	t = 1.13	t = 1.16
σ	0.74		0.64	0.80		0.68		
m	0.11		0.09	0.12		0.10		
<i>Shuttle running 10 × 10 meters, s</i>								
\bar{X}	29.2	t = 1.41	29.1	29.0	t = 2.08	29.2	t = 2.25	t = 1.24
σ	0.38		0.37	0.39		0.37		
m	0.05		0.05	0.06		0.06		

\bar{X} – arithmetic mean, σ – dispersion, m – standard deviation of the mean

Source: own research by O. Nebozhuk.

The analysis of the indicators in the cadets' shuttle run of 10 × 10 m showed that the average results at the beginning of the experiment were 29.2 s for KG1 and 29.0 s for KG2, whereas at the end of the experiment it was 29.1 s for KG1 and 29.2 s for KG2 (Table 1). A comparative analysis of the cadets' performance during the first and second control tests showed that the cadets of the first control group did not significantly improve the results at the end of the experiment by 0.1 s ($t = 1.41$; $p > 0.05$) and KG2 group improved them by 0.2 s ($t = 2.08$ $p < 0.05$). A comparative analysis of the indicators between KG1 and KG2 allowed us to determine that at the beginning of the study the results of the exercise for KG1 were significantly better by 0.2 s than those for KG2 ($t = 2.25$; $p < 0.05$). At the end of the study, the results of the exercise for KG2 were worse by 0.1 s than those for KG1, but unreliable ($t = 1.24$; $p > 0.05$).

Studies of the cadets' pull-ups on the crossbar showed that positive changes occurred in both groups, but no significant improvement was found (Table 2). Thus, the results of the exercise for KG1 during the experiment improved by 0.8 times ($t = 1.43$; $p > 0.05$). The analysis of the performance indicators for KG2 cadets showed an improvement of the result by 0.9 times ($t = 1.46$; $p > 0.05$).

The comparative analysis of KG1 and KG2 showed that KG1 cadets' (civilian youth) results at the beginning of the experiment were significantly better compared to KG2 by 1.2 times ($t = 2.50$; $p < 0.05$).

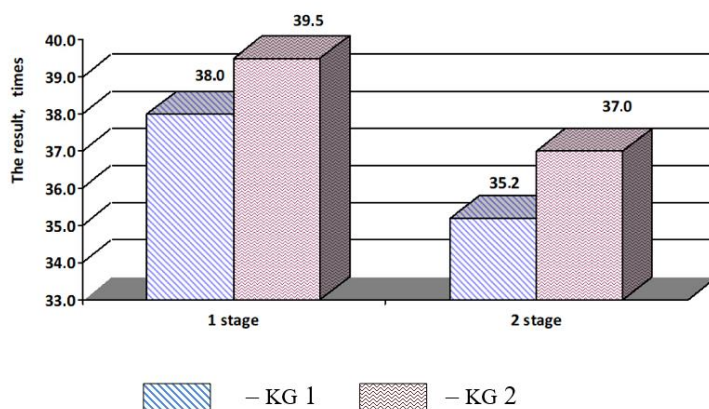
Table 2. Dynamics of the cadets' performance in pull-ups on the crossbar during the experiment, times

	KG 1 (n = 48)			KG 2 (n = 46)			P KG1 – KG2 Beg.	P KG 1 – KG 2 End
	Beg.	P Beg. End.	End.	Beg.	P Beg. End.	End		
\bar{X}	13.8	t = 1.43	14.6	12.6	t = 1.46	13.5	t = 2.50	t = 1.56
σ	2.41		3.00	2.10		3.55		
m	0.35		0.43	0.31		0.52		

Source: the data obtained from the dissertation research by O. Nebozhuk.

The analysis of cadets' arms flexion and extension in the supine position during the experiment showed that the arithmetic mean at the beginning of the study were 38.0 times for KG1 and 35.2 times for KG2, and at the end of the experiment 39.5 times for KG1 and 37.0 times for KG2 (Fig. 1). The comparative analysis of cadets' performance during the first and second control tests showed that the cadets of the first control group improved 1.5 times at the end of the experiment compared to the beginning ($t = 1.38$; $p > 0.05$). It was also found out that for KG2 the results of the exercise improved 1.8 times ($t = 1.69$; $p > 0.05$), but no significant improvement was found in both groups.

The comparative analysis of the indicators between KG1 and KG2 allowed us to determine that at the beginning of the study the results for KG1 were significantly better than for KG2, i.e. by 2.8 times ($t = 2.66$; $p < 0.05$). The analysis of the results for KG1 and KG2 at the end of the experiment showed that in the first control group the indicators were also significantly higher than in KG2, i.e. by 2.5 times ($t = 2.27$; $p < 0.05$).

**Fig. 1.** Dynamics of the cadets' arm flexion and extension in the supine position during the experiment, times

Source: own research.

The analysis of the cadets participating in the shuttle run 4 × 100 m during the experiment showed that the average results at the beginning of the study were 92.6 s for KG1 and 94.3 s for KG2, and at the end of the experiment they equalled 92.0 s for KG1 and 93.2 s for KG2 (Table 3).

Table 3. Dynamics of the indicators for the cadets taking part in the shuttle running 4 × 100 m during the experiment, s

	KG 1 (n = 48)			KG 2 (n = 46)			P KG1 – KG2 Beg.	P KG 1 – KG2 End
	Beg.	P Beg. End.	End.	Beg.	P Beg. End.	End		
\bar{X}	92.6	t = 0.72	92.0	94.3	t = 1.29	93.2	t = 1.88	t = 1.41
σ	4.26		3.90	4.51		4.02		
m	0.62		0.56	0.67		0.59		

Source: own research.

The analysis of the performance of shuttle running 4 × 100 meters by the cadets during the first and second control testing showed that the results of the cadets from the first control group at the end of the experiment significantly improved by 0.6 s ($t = 0.72$; $p > 0.05$), compared to the beginning. In addition, it was found out that in the second control group the results of the exercise improved by 1.1 s ($t = 1.29$; $p > 0.05$), but no significant difference in the results during the experiment was found. It was also determined that the results of the second control group at the beginning and end of the experiment were insignificantly worse than KG1 ($t = 1.41$ – 1.88 ; $p > 0.05$).

The analysis of the cadets' performance in the 1000-meter run during the experiment showed the following arithmetic mean at the beginning of the study: KG1 – 274.1 s, KG2 – 276.3 s, and at the end of the experiment KG1 – 273.2 s, KG2 – 274.9 s (Fig. 2). A comparative analysis of the cadets' performance during the first and second control tests showed that the results of the cadets from the first control group at the end of the experiment improved by 0.7 s compared to the beginning ($t = 0.78$; $p > 0.05$). It was also revealed that for KG2 the results of the exercise improved by 1.4 s ($t = 1.69$; $p > 0.05$), but no significant improvement in the results was found in any of the groups.

The comparative analysis of the indicators between KG1 and KG2 allowed us to determine that at the beginning of the study the results for KG1 were significantly better than for KG2 at 2.2 s ($t = 2.28$; $p < 0.05$). The analysis of the results for KG1 and KG2 at the end of the experiment showed that in the first control group the indicators were also better than for KG2 by 1.7 s ($t = 1.79$; $p > 0.05$), but without a significant difference.

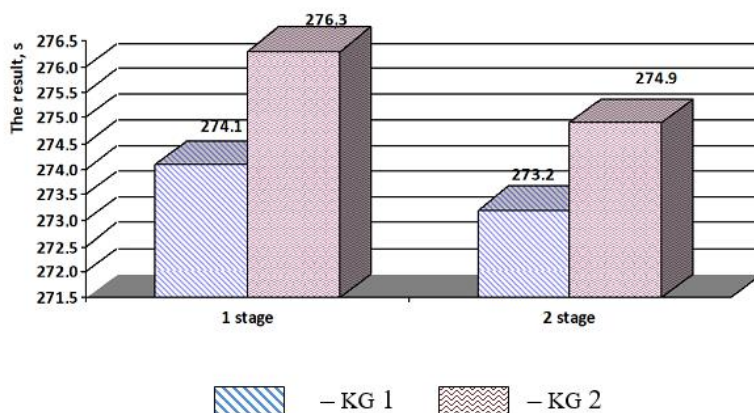


Fig. 2. Dynamics of the cadets in the 1000-meter run during the experiment, s

Source: own research.

The study of the cadets' results of their 3000-meter run during the experiment showed that the arithmetic mean at the beginning of the study were 852.5 s for KG1 and 875.5 s for KG2, and at the end of the experiment 837.6 s for KG1 and 864.3 s for KG2 (Table 4). The analysis of the cadets' performance in the 3000-meter run during the first and second control tests showed that the cadets of the first control group had slightly improved results at the end of the experiment by 14.9 s ($t = 1.47$; $p > 0.05$). In addition, it was found out that in the second control group the results of the exercise improved by 11.2 s ($t = 1.39$; $p > 0.05$), but no significant difference in results during the experiment was found.

Table 4. Dynamics of the cadets in the 3000-meter run during the experiment, s

	KG 1 (n = 48)			KG 2 (n = 46)			P KG1 – KG2 Beg.	P KG 1 – KG 2 End
	Beg.	P Beg. End.	End.	Beg.	P Beg. End.	End		
\bar{X}	852.5	t = 1.47	837.6	875.5	t = 1.39	864.3	t = 2.56	t = 2.87
σ	48.26		50.80	38.73		38.90		
m	6.97		7.33	5.71		5.74		

Source: used the data obtained in the dissertation research O. Nebozhuk.

A comparative analysis of exercise performance between KG1 and KG2 allowed us to determine that at the beginning of the study the results in the first control group were significantly better than for KG2 by 23.0 s ($t = 2.56$; $p < 0.05$). The analysis of the results of KG1 and KG2 at the end of the experiment showed that in the first control group the indicators were also significantly higher than in KG2 by 26.7 s ($t = 2.87$; $p < 0.01$).

Discussion

General physical training of servicemen in the process of training in higher military educational institutions contributes to improving military special training, leading a healthy lifestyle, disease prevention and physical rehabilitation, accelerating the adaptation of servicemen to the conditions of military service, the organization of meaningful leisure. The tasks of general physical training follow from its objective function and mainly reflect the general requirements of training and combat activities for the physical condition of all categories of servicemen.

The previous research has shown that the level of training of servicemen at the initial stage of training is insufficient to perform the assigned tasks. Our main task was to analyze the results of the experiment, whose purpose was to study the level of general physical fitness of servicemen of the military college of sergeants, to determine the dynamics of the general physical fitness of cadets, taking into account the categories of servicemen.

Our research showed that at all stages of the experiment the level of general physical fitness of the cadets, i.e. military servicemen under contract is worse than the cadets chosen from among civilian youth ($t = 2,25-2,66$; $p < 0,05$). In addition, it was found out that in both groups the dynamics of the indicators of general physical fitness is positive, but there is no significant difference, which indicates the lack of effectiveness of the current program of physical training, regardless of the category of cadets.

In the future, the results of our study shall be useful to determine the effectiveness and implementation of the author's program to improve the overall physical fitness of cadets, which in turn will provide an opportunity to significantly improve their overall physical qualities.

Conclusion

The results of the experiment to determine the dynamics of the level of general physical fitness of cadets of the military college of sergeants, taking into account the categories of servicemen, showed that at the beginning of the experiment the results of the 10 × 10 meter run in the first control group (civilian youth) was significantly better than for KG2 ($t = 2.25-2.66$; $p < 0.05$). In addition, it was determined that at the end of the experiment the results of exercises in bending and unbending the arms in the supine position and the 3000-meter run in the second control group were significantly worse than KG1 ($t = 2.27-2.87$; $p < 0.05-0.01$).

STATEMENT OF ETHICS

All participants in our study gave their informed consent to participate in the experiment. Research was conducted and performed in accordance with the ethical standards of the Declaration of Helsinki. According to protocol of the sitting of a committee of ethics and bioethics № 5 dated 20.06.2022 of Lesya Ukrainka Volyn National University as part of the Head of committee: Doctor of Science in Physical Education and Sports, Professor O. Andriychuk; Members of committee: PhD in Biology, Associate Professor O. Usova; PhD in Medical Sciences, Associate Professor O. Yakobson (Lutsk, Ukraine) the conclusion as for release of the article «General physical fitness of servicemen – as the main element of increasing military-special training» was formed: to recommend suggested investigation to the printing in Journal “Sport and Tourism. Central European Journal”.

DECLARATION OF CONFLICTING INTERESTS

The authors declared no potential conflicts of interests with respect to the research, authorship, and/or publication of the article *General physical fitness of servicemen as the main element of increasing military-special training*.

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