

The role of psychophysiological readiness in enhancing physical training of tank cadets

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Published online: January 31, 2026

Accepted for publication: January 15, 2026

DOI:10.7752/jpes.2026.01006

Abstract:

Modern conditions require high-quality training of future military specialists. In this regard, the issues of revising the existing educational process in higher military educational institutions and revising all its professional components are becoming acute. An important component of training tank cadets, which improves the skills of organizing and performing combat missions, is the process of physical training. In addition, the profession of a tank platoon commander requires performing duties in extreme conditions and is a special and complex type of activity that requires a set of professionally important qualities. Therefore, the process of physical training, as a set of measures for the physical improvement of military personnel, is constantly in the field of view of scientists and is mainly aimed at developing general and special physical qualities, forming military-applied skills, and cultivating moral-volitional and psychological qualities. Physical training of tank cadets as a key aspect of the educational process of future military specialists requires constant improvement and implementation of the latest technologies and teaching methods. One of the reserves for optimizing the physical training process is psychophysiological diagnostics based on the properties of nervous processes and functional states. Determining the psychophysiological state of cadets and their readiness for classes allows for the full formation of an individual trajectory of physical development. The conducted study optimized the physical training program, which, based on the psychophysiological readiness of cadets for classes, provided for different content of means and dosage of loads and took into account negative factors affecting the training process. Using the methods of mathematical statistics, the effectiveness of the developed program for physical training of tank cadets was substantiated and positive aspects were identified: improvement of the state of physical fitness of cadets, their motivation and interest in classes. *Purpose:* to investigate the dynamics of the level of physical fitness of cadets of armored troops after the application of a special training program based on the determination of their psychophysiological readiness for classes. *Material and methods.* Objects: The study involved 50 cadets studying at the Military Institute of Tank Troops of the National Technical University "Kharkiv Polytechnic Institute". Participation in the study was carried out in accordance with the ethical principles of the "Helsinki Declaration" and was voluntary. Optimization of the educational process in the academic discipline "Physical Education and Special Physical Training" consisted of conducting psychophysiological diagnostics of cadets at the beginning of classes to determine readiness for future work and the use of the appropriate version of a specially developed physical training program.

Key Words: educational process, cadets, physical training program, innovative approaches, psychophysiological state, strength of the nervous system, physical fitness.

Introduction

The armed conflict in Ukraine has sharply raised the issue of high-quality training of future military specialists. In this regard, a pressing issue is the revision of the existing educational process in higher military educational institutions. This urgently requires the reformation of all its components to a practical professional

and applied focus, a new regime of training, rest, physical and psychological stress (Klymovych V., Oderov A., Romanchuk S. et al., 2022).

Modern military professional training of tank troops specialists is very dynamic. Its constant improvement is the most important direction of development of the military activity system. To form the necessary professional skills and abilities that meet the requirements of the modern concept of combat operations, appropriate physical training is necessary (Pervachuk O., Oderov A., Hunchenko V. et al., 2024).

As experts note, the process of physical training is a set of measures for the physical improvement of military personnel, aimed at developing general and special physical qualities, forming military-applied skills, cultivating moral-volitional and psychological qualities and is the main component of combat training (Romanchuk S., Svysch Y., Shchur T. et al., 2024).

At the same time, in today's conditions, the process of physical training of tank cadets requires not only the development of effective methods and means, but also taking into account the individual characteristics of military personnel (Yuriev S., Zonov O., Tsepelyaev Yu. et al., 2022; Babaiev Yu., 2024).

In addition, for more effective construction of the educational process in the academic discipline "Physical Education and Special Physical Training" and for the purpose of selecting the appropriate training programs, it is necessary to determine the readiness of cadets for classes, which should be carried out on the basis of diagnostics of their psychophysiological state. This is due to the fact that the choice of methods and means of the training process and its success depends both on the level of physical performance and on the stability of the higher nervous activity of military personnel (Misyura V., Ruban L., & Mishyn M., 2022; Petrachkov O., Yarmak O., Shostak R. et al., 2023; Kozina Z., Berezhna Y., Boychuk Y. et al., 2024).

Material & methods

In order to optimize the physical training of future specialists in the system of professional activity, an experiment was conducted on the basis of the Military Institute of Tank Troops of the National Technical University "Kharkiv Polytechnic Institute". The study, which lasted for one semester of study, involved cadets, in the amount of 50 people, who were divided into control (n = 25) and experimental (n = 25) groups, between which differences were determined during the experiment.

Participation in the experiment was carried out in accordance with the ethical principles of the Helsinki Declaration and was voluntary, for which the military personnel signed a consent form.

Optimization of the educational process in the discipline "Physical education and special physical training" consisted in conducting psychophysiological diagnostics of tank cadets at the beginning of classes to determine readiness for future work. Using the tapping test adapted to the android platform using PhpStorm 2024.3.2.1 software, the strength of the cadets' nervous system was determined: strong, medium and weak (Fig. 1). Processing and collection of data to determine the strength of the nervous system were carried out by a mathematical algorithm embedded in the online test. Based on this, the cadets were divided into 3 groups. Each group was offered a corresponding version of a specially developed physical training program with the appropriate content on physical activity.

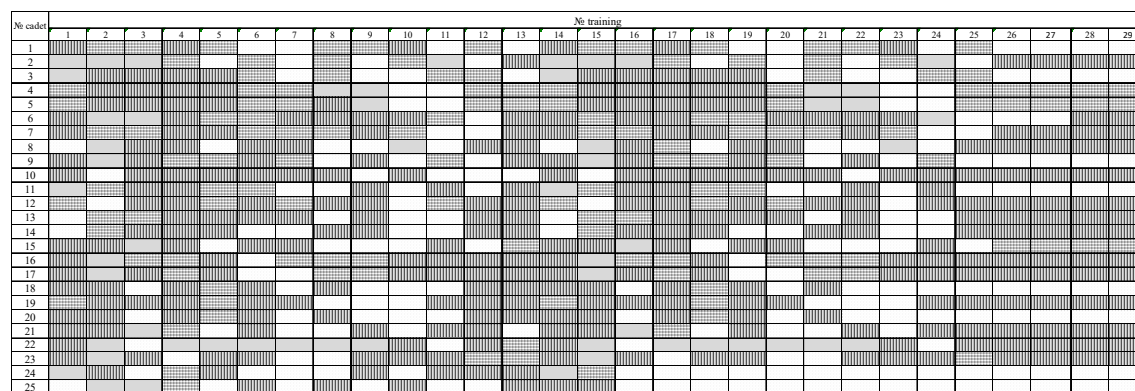


Figure 1. The strength of the nervous system of cadets at the beginning of classes

Notes: – weak type of nervous system;
 – middle type of nervous system;
 – strong type of nervous system;
 – absence of a cadet from class.

The dynamics of the level of physical fitness of the cadets was determined using control exercises: 100 m run; pull-ups on a horizontal bar; 3 km run; shuttle run 6x100 m with a machine gun and a bag loaded with two magazines.

The results of the experiment conducted throughout all stages of the study were processed by methods of mathematical statistics using the computer program "Statistica 6.0" and calculations of the main one-dimensional statistics were carried out: arithmetic mean, standard error of the mean – m, dispersion. In order to determine the reliability of differences between the indicators of control exercises in representatives of the control and experimental groups, Student's t-test was used.

Results

Testing conducted before the start of the experiment did not reveal statistically significant differences in the level of physical fitness of the cadets of the CG and EG ($p>0,05$) (Table 1).

Table 1. Physical fitness indicators of cadets in the control and experimental groups before and after the experiment, (n=50)

№	Control exercises	Group	$\bar{X} \pm m$		t	p
			before the experiment	after the experiment		
1	100 m run, s	CG	14,01±0,54	13,83±0,65	4,32	<0,001
		EG	14,04±0,52	13,72±0,55	5,72	<0,001
		t	0,20	0,89		
		p	>0,05	>0,05		
2	Pull-ups on the bar, times	CG	16,16±3,08	16,20±3,33	-0,17	>0,05
		EG	16,36±3,89	18,92±4,29	-7,49	<0,001
		t	0,21	2,59		
		p	>0,05	<0,05		
3	3 km run, s	CG	808,60±58,42	789,76±34,46	2,14	>0,01
		EG	805,08±59,43	767,40±49,71	4,68	<0,001
		t	0,23	2,13		
		p	>0,05	<0,05		
4	Shuttle run 6x100 m with a machine gun + 2 stores, s	CG	128,48±7,27	127,68±4,60	0,96	>0,05
		EG	129,60±4,57	124,96±3,80	7,60	<0,001
		t	0,70	2,43		
		p	>0,05	<0,05		

Notes: $t_{cr} = 2,06$ at $p=0,05$; $t_{cr} = 2,79$ at $p=0,01$; $t_{cr} = 3,72$ at $p=0,001$.

Analyzing the average performance of cadets in performing 100 m sprint at the end of the experiment, it was found that the results in the CG (13,83±0,65) and EG (13,72±0,55) improved, but there were no reliable differences between them ($t=0,89$; $p>0,05$) (Table 1). At the same time, the analysis of the results in the CG at the end of the study compared to the beginning significantly improved by 0,18 s ($t=4,32$; $p<0,001$), and the difference between the indicators in the EG in performing this exercise significantly improved by 0.36 s ($t=5,72$; $p<0,001$) (Table 1, Fig. 2).

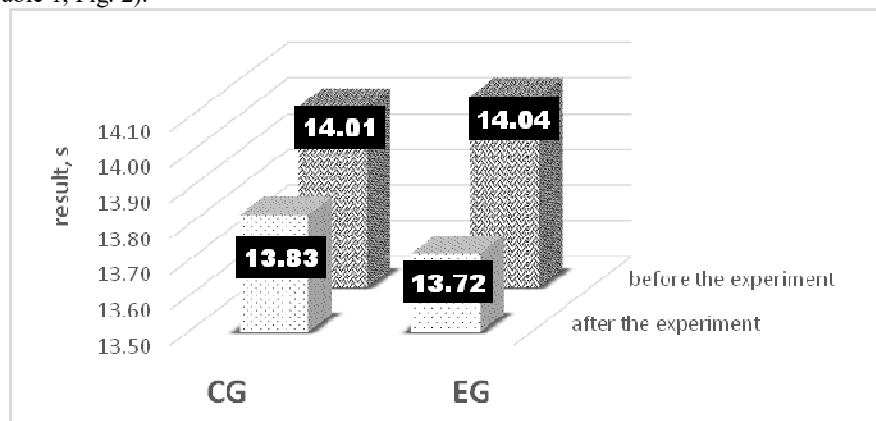


Figure 2. Dynamics of the results of the 100 m run by the cadets of the CG and EG during the experiment, s

Considering the results of the control exercise "pull-ups on the horizontal bar" it was found that at the beginning of the study the average indicator for cadets was: CG – $16,16 \pm 3,08$ times, EG – $16,36 \pm 3,89$ times ($t=0,89$; $p>0,05$) and at the second stage of the experiment in the CG – $16,20 \pm 4,29$ times ($t=2,59$; $p<0,05$) (Table 1). Based on the analysis of the indicators of cadets in the CG during the study, it was found that the results did not significantly improve – 0.04 times ($t=0,17$; $p>0,05$), while the difference between the indicators of this exercise by cadets in the EG showed that a reliable improvement of 2,56 times ($t=7,49$; $p<0,001$) (Table 1, Fig. 3).

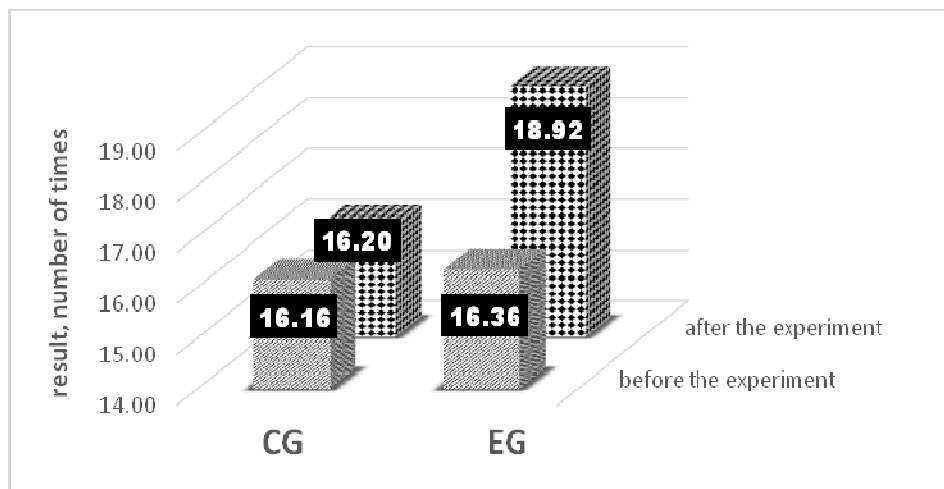


Figure 3. Dynamics of the results of performing pull-ups on the horizontal bar by cadets of the CG and EG during the experiment, times

The obtained results in the 3000 m run revealed positive dynamics both in the CG from $808,60 \pm 58,42$ s to $789,76 \pm 34,46$ s (18,84 s, $t=2,4$; $p<0,01$) and in the EG from $805,07 \pm 4$ (37,68 s, $t=4,68$; $p<0,001$). However, a comparative analysis of the average results at the end of the experiment determined a statistically significant difference between the CG and EG ($t=2,13$; $p<0,05$) (Table 1, Fig. 4).

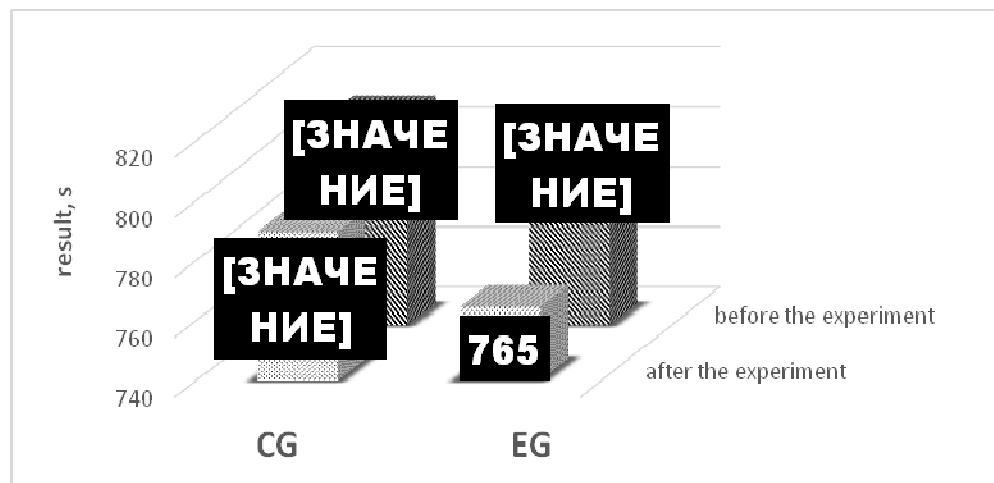


Figure 4. Dynamics of the results of running 3000 m by cadets of the CG and EG during the experiment, s

An analysis of the indicators characterizing the military-applied skills and abilities of the cadets, namely the performance of the control exercise: shuttle run 6x100 m with a machine gun and a bag with two magazines, established that the average result before the start of the experiment in the CG was $128,48 \pm 7,27$ s, EG – $129,60 \pm 4,57$ ($t=0,70$; $p>0,05$) (Table 1).

At the end of the study, a reliable improvement in the average results between the groups was revealed ($t=2,43$; $p<0,05$), namely, the CG – $127,68 \pm 4,60$ s and the EG – $124,96 \pm 3,80$ s. Despite this, in the CG, the improvement in the result by 0,8 s was not statistically significant ($t=0,96$; $p>0,05$), while in the EG, a significant improvement was noted ($t=7,60$; $p<0,001$), which on average amounted to 4,64 s (Table 1, Fig. 5).

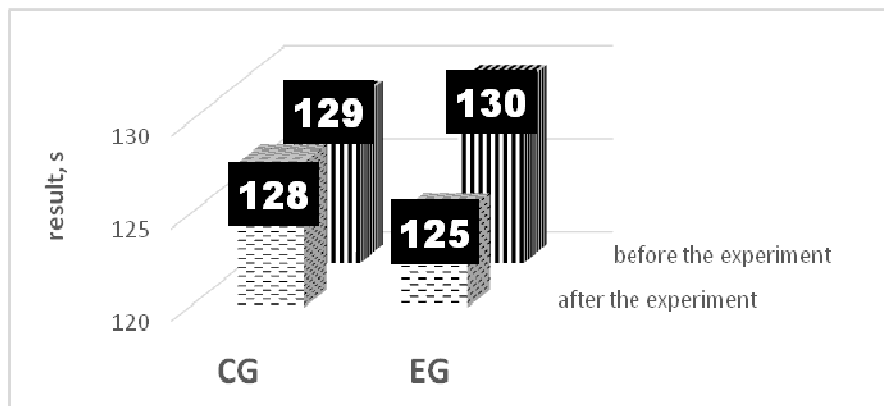


Figure 5. Dynamics of the results of performing a 6x100 m shuttle run with a machine gun and a bag with two magazines by cadets of the CG and EG during the experiment, s

Discussion

In modern conditions, when military science is rapidly developing, the need to improve the educational process of future officers is growing. A particularly important task is to improve the quality of training of tank cadets in military disciplines that instill the skills of organizing and performing combat missions by military units, according to their purpose (Babaiev Yu., 2024). The analysis of literary sources showed that one of the critical educational disciplines of the educational process of tank troops cadets is "Physical education and special physical training". This is due to the fact that the profession of a tank platoon commander requires the performance of duties in extreme conditions and is a special and complex type of activity that requires the presence of a set of professionally important qualities. In this regard, the process of physical training, as a complex of measures for the physical improvement of military personnel, is primarily aimed at the development of general and special physical qualities, the formation of military-applied skills, the training of moral-willed and psychological qualities, which is constantly in the field of view of scientists (Krutsevych T., Pangelova N., Pidleteichuk R., 2021; Svystun V. & Verbyn N., 2023; Blaus O., Bula-Biteniece I., Lubinska I. et al., 2023; Romanchuk S., Svysch Y., Shchur T. et al., 2024; Romanchuk S., Hunchenko V., Ishchenko Ye. et al., 2024; Babaiev Yu., 2024).

Our preliminary studies have proven that a properly constructed process of special physical training of military personnel, taking into account all important aspects, contributes to the better formation of the state of performance of the assigned tasks (Gomanyuk S., Gradusov V., Gunchenko V. et al., 2014; Kamaev O., Hunchenko V., Hradusov V. et al., 2018; Hunchenko V., Yuriev S., Romanchuk S. et al., 2023). At the same time, the introduction of technology for optimizing special physical training using automated systems, the content of which is formed taking into account the level of training and professional orientation, contributes not only to improving the physical condition and fulfillment of combat training standards, but also to improving the indicators of psychological preparedness of military personnel, which form high professional qualities in the future specialist, characterizing the moral and psychological portrait of the specialist, ensure the body's resistance to stress, materializing knowledge, skills and abilities in the parameters of reliability (Hunchenko V., Mishyn M., Yuriev S. et al., 2025). It should be noted that the introduction of the latest technologies and training methods is a key aspect of the physical training process. Thus, modern research proves that changes in the psychophysiological state of a person affect the level of mental and physical performance (Cooke A. & Ring C., 2019; Petrachkov O., Yarmak O., Shostak R. et al., 2023; Navabinejad S. & Rostami M., 2023; Degtyarenko-Melnyk T.V., & Brynza I.V., 2024; Kozina Z., Berezhna Y., Boychuk Y. et al., 2024; Ramos-Alvarez O., Rodriguez-Fernandez P. & Arufe-Giraldez V., 2024). The authors in their works determine that psychophysiological diagnostics is based on the position that the properties of nervous processes and functional states of a person are closely interconnected with his somatic psychophysiological characteristics, therefore, in the event of any deviations from the normative individual trajectories of psychophysiological development, the indicators of strength, balance, and mobility of nervous processes, as well as the psychofunctional state of the body, change accordingly.

Currently, specialists recommend using psychophysiological diagnostic methods to assess the degree of psychophysiological and physical stress on the body of a serviceman associated with nervous and physical exhaustion.

In this regard, for more effective construction of the educational process in the academic discipline "Physical education and special physical training" we conducted an experiment based on psychophysiological diagnostics of military personnel regarding their readiness for classes. Based on the testing results, the servicemen were offered an appropriate training program, specially designed to take into account the strength of their nervous system.

The results of our study have proven that determining the readiness of military personnel for training based on their psychophysiological state and selecting the appropriate content and dosage of the load has a positive effect on the level of physical fitness.

Conclusions

An analysis of scientific and methodological literature made it possible to identify a problem area in organizing the process of physical training of tank cadets, which does not fully take into account the motivation for learning and the constantly changing environment.

To improve the educational process, a physical training program was optimized, which, based on the psychophysiological readiness of cadets for classes, provided for different content of means and dosage of loads and took into account negative factors affecting the training process.

The reliability between the results of the performance of control exercises by cadets, which was carried out using mathematical statistics methods, made it possible to determine the effectiveness of the developed program

At the same time, the conducted research, in addition to the positive aspects: improvement of the physical fitness of tank cadets, their motivation and interest in training, revealed a number of negative aspects, which include: additional workload for scientific and pedagogical staff to develop and formulate a training program for cadets and the need to involve 3 teachers to ensure high-quality organization of classes.

Declaration of generative AI and AI-assisted technologies in the writing process: The authors declare that artificial intelligence tools or AI-assisted technologies were not used during the preparation of this work.

Conflicts of interest: The authors declare that they have no conflicts of interest related to this study.

References:

- Babaiev, Yu.G. (2024). Characteristics of morpho-functional and somatic health indicators of tank-cadets during field trainings of different durations. *Scientific journal National Pedagogical Dragomanov University*, 7(180), 26-31. doi: [https://doi.org/10.31392/UDU-nc.series15.2024.7\(180\).05](https://doi.org/10.31392/UDU-nc.series15.2024.7(180).05).
- Blaus, Oskars, Bula-Biteniece, Inta, Lubinska, Inese, Bernāns, Edgars, Pīlups, Andris, Tomašs, Ainars, & Līcis, Renārs. (2023). Correlations between control exercises of combat fitness test and control exercises of physical conditioning. *Journal of Physical Education and Sport*, 23(9):284, 2469-2479. doi:10.7752/jpes.2023.09284
- Cooke, A., & Ring, C. (2019). Psychophysiology of sport, exercise, and performance: Past, present, and future [Editorial]. *Sport, Exercise, and Performance Psychology*, 8(1), 1-6. <https://doi.org/10.1037/spy0000156>.
- Degtyarenko-Melnyk, T.V., & Brynza, I.V. (2024). Psychophysiology of motor activity. A textbook for students of higher education institutions. Odesa, 379. ISBN 978-617-7389-18-6.
- Gomanyuk, S., Gradusov, V., Gunchenko, V., Zonov, A.V., & Makogon, Y. (2014). Application of automated control system in the system of physical training of military personnel. *Slobozhanskyi Herald of Science and Sport*, 5(43), 20-24. doi:dx.doi.org/10.15391/sns.v.2014-5.004.
- Hunchenko, Vyacheslav, Mishyn, Maksym, Yuriev, Stanislav, Babaiev, Yurii, Ishchenko, Yevhen, Khachatryan, Artur, Zonov, Oleksandr, Ivakin, Taras, Zimnikov, Oleh, Komar, Ivan, & Borzilo, Oleksandr. (2025). A study on the psychological qualities of military personnel in technical support units based on the implementation of an automated control system program for the process of special physical training. *Journal of Physical Education and Sport*, 25(1):4, 30-37. doi:10.7752/jpes.2025.01004.
- Hunchenko, V., Yuriev, S., Romanchuk, S., Tseplyaev, U., Ivakin, T., Abramenko, O., Khachatryan, A., Melnykov, A., & Pervachuk, O.I. (2023). Dynamics of special physical training of military officers of the technical supply of the armies. *Scientific journal National Pedagogical Dragomanov University*, 4(163), 74-82. doi:10.31392/NPU-nc.series15.2023.04(163).14.
- Kamaev, O., Hunchenko, V., Hradusov, V., Homanyuk, S., Martynenko, O., Mishyn, M., & Mulyk, K. (2018). Optimization of special physical training of cadets in the specialty «Arms and Military Equipment» on performing professional military-technical standards. *Journal of Physical Education and Sport*, 18(264), 1808-1813. doi:10.7752/jpes.2018.s4264.
- Klymovych, V., Oderov, A., Romanchuk, S., Olkhovyi, O., Andreychuk, V., Muzyka, N., Ishchenko, Ye., Hurman, L., Ladyniak, A., & Honshovskyi, V. (2022). The influence of the experimental program of physical training of students on anthropometric indicators and functional data of the cardiovascular system. *Bulletin of the Kamianets-Podilskyi Ivan Ohienko National University. Physical education, Sport and Human Health*, (24), 5-8. doi: 10.32626/2309-8082.2022-24.5-8.
- Kozina, Z., Berezhna, Y., Boychuk, Y., Kozin, O., Golenkova, Y., Polishchuk, S., & Sanjaykumar, S. (2024). Assessment of reaction speed and nervous system characteristics: implications for physical exercise

- selection in humanities students' physical education. *Journal of Physical Education and Sport*, 24(3):62, 513-520. doi:10.7752/jpes.2024.03062.
- Krutsevych, T., Pangelova, N., & Pidleteichuk, R. (2021). Conceptual approaches to the organization of the system of physical training of military servicemen in leading NATO countries. *Theory and Methods of Physical education and sports*, 2, 76-80. doi: 10.32652/tmfvs.2021.2.76–80.
- Misyura, V., Ruban, L., & Mishyn, M. (2022). Vestibular rehabilitation of amateur athletes after brain concussion injury. *Rehabilitation & Recreation*, 12, 198-203. doi:https://doi.org/10.32782/2522-1795.2022.12.26.
- Navabinejad, S. & Rostami, M. (2023). Mind and Body in Sync: The Fascinating Field of Psychophysiology in Sports. *Health Nexus*, 1(3), 38-40. <https://doi.org/10.61838/kman.hn.1.3.5>.
- Pervachuk, Oleh, Oderov, Artur, Hunchenko, Vyacheslav, Ponomarov, Viktor, Nebozhuk, Oleh, Melnykov, Andrii, Lashta, Viktor, Andreychuk, Volodymyr, & Romaniv, Ihor. (2024). Interrelation of Military Professional Training and Physical Fitness of Servicemen. *Physical Education, Sport and Health Culture in Modern Society*, 1(65), 10-17. <https://doi.org/10.29038/2220-7481-2024-01-10-17>.
- Petrachkov, O., Yarmak, O., Shostak, R., Andrieieva, O., Yahupov, V., Chepurnyi, V., & Drozdovska, S. (2023). The effect of stress factors on cognitive and management functions of cadets of higher military educational institutions. *Journal of Physical Education and Sport*, 23(1), 162-169. doi:10.7752/jpes.2023.01020.
- Ramos-Alvarez, O., Rodriguez-Fernandez, P., & Arufe-Giraldez, V. (2024). Impact of competitive games in physical education classes on emotional and psychological well-being. *Journal of Physical Education and Sport*, 24(4):105, 924-933. doi:10.7752/jpes.2024.04105.
- Romanchuk, S., Hunchenko, V., Ishchenko, Ye., Iarovy, M., Shevchenko, O., Poplavets, V., & Lashta, V. (2024). Application of crossfit in physical training of law enforcement officers. *Scientific journal National Pedagogical Dragomanov University*, 1(173), 121-127. [https://doi.org/10.31392/UDU-nc.series15.2024.1\(173\).27](https://doi.org/10.31392/UDU-nc.series15.2024.1(173).27).
- Romanchuk, S., Svysch, Y., Shchur, T., Arabskyi, A., Borzilo, O., Bilyk, V., & Oderov, A. (2024). Physical training as the main criterion for assessing the combat capability of cadets in the process of military professional activity. *Scientific journal National Pedagogical Dragomanov University*, 12(185), 166-169. [https://doi.org/10.31392/UDU-nc.series15.2024.12\(185\).35](https://doi.org/10.31392/UDU-nc.series15.2024.12(185).35).
- Svystun, V., & Verbyn, N. (2023). Problems of crossfit implementing into the physical training of military personnel. *Military Education*, 1(47), 263-279. doi: 10.33099/2617-1775/2023-01/263-279.
- Yuriev, S., Zonov, O., Tseplyaev, Yu., Bolshakov, O., Hunchenko, V., Babaiev, Yu., & Zimnikov, O. (2022). Dynamics of cadets' physical fitness during field training. *Scientific journal National Pedagogical Dragomanov University*, 9(154), 127-131. doi:10.31392/NPU-nc.series15.2022.9(154).28.