ORIGINAL ARTICLE

CONTENTS

Prognostic role of age and body weight in enhancing the physical component of quality of life for participants of combat actions through physical and sports rehabilitation

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ABSTRACT

Aim: To assess the influence of age and body weight on the improvement of the physical component of quality of life in combatants participating in the course of physical and sports rehabilitation. This will be evaluated using analysis based on the SF-36 questionnaire.

Materials and Methods: The study involved 40 participants of combat actions (males with an average age of 42,35 ± 8,98 years). During the period from 2020 to 2021, these participants were involved in physical and sports rehabilitation, and training for both national and international competitions in running disciplines within athletics.

Results: The study developed models that describe how age and body weight influence on the dynamics in the quality of life components for combatants. Analysis of the data indicated that the model illustrating the impact of age and body weight on the absolute increase in the PHC was statistically significant (F=3,899; p=0,0286). The model that aimed to predict the increase in indicators of the mental health component as a result of the implementation of physical and sports rehabilitation measures turned out to be statistically insignificant (F=0,036; p=0,9642).

Conclusions: The obtained results hold practical value for planning and implementing physical and sports rehabilitation programs for combatants.

KEY WORDS: physical and sports rehabilitation; quality of life; SF-36; combatants; age; body weight; physical component of health; prediction

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INTRODUCTION

Physical and sports rehabilitation (PSR) is an essential element in the system of reintegration of combatants (DDR) into active social and professional life. In the conditions of a full-scale war in Ukraine, when the number of veterans and injured servicemen is constantly growing, the issue of the effectiveness of PSR measures has become exceptionally relevant. According to the Ministry of Defense of Ukraine, as of 2023, approximately one million individuals hold the status of combatant [1-14], and this requires the expansion of scientifically based approaches to their physical and psychological support.

An analysis of the current scientific literature indicates a growing interest in integrating FSR into the healthcare system and rehabilitation services [3, 12]. The impact of physical exercise on the quality of life of individuals with combat experience is being studied in particular, using the SF-36 questionnaire, which is considered as a valid tool in clinical psychology and rehabilitation [4, 7]. Foreign studies have established the positive impact of structured physical activity programs on the physical functioning and vital activity of veterans [6, 8].

At the same time, Ukrainian scientific discourse has not yet sufficiently studied which biological factors (in particular, age and body weight) influence the effectiveness of FSR, and whether rehabilitation outcomes are consistent across different subgroups of veterans. The preliminary results of the author's study [9] confirmed FSR's overall effectiveness in improving the quality of life of DDR, but the question of the dependence of this effect on the individual characteristics of the contingent remains open.

In this context, it is relevant to study the prognostic role of age and body weight for the dynamics of the physical component of quality of life as one of the

main outcomes of rehabilitation intervention. Such analysis allows a shift from a universal to a personalized approach in PSR program planning, which is crucial under limited resources and the need for priority-based assistance. Therefore, the conducted study has both scientific and applied value for the practice of war veterans rehabilitation in Ukraine.

AIM

To assess the influence of age and body weight on the improvement of the physical component of quality of life in combatants participating in the course of physical and sports rehabilitation. This will be evaluated using analysis based on the SF-36 questionnaire.

MATERIALS AND METHODS

PARTICIPANTS

The study involved 40 DDRs who participated in FSR events during 2020–2021, in particular as part of preparation for all-Ukrainian and international competitions in running disciplines of track and field athletics. All participants were informed about the specifics of the research and provided their consent to participate in them.

RESEARCH METHODS

The study was conducted on a sample of 40 combatants who completed a PSR course. Inclusion criteria included age between 18 and 60 years, absence of serious chronic diseases, and informed consent to participate. Data were collected via questionnaires that evaluated the participants' quality of life, as well as their age and body mass.

PROCEDURE (ORGANIZATION OF THE STUDY)

The survey was conducted at the National Sports Complex "Olympic" during training sessions in preparation for international and all-Ukrainian competitions in running disciplines of track and field athletics. The study involved 40 combatants who had completed military service. The survey was conducted by the trainer at the first training session and a year after regular training. All participants were informed about the use of testing materials and gave consent to their processing.

The SF-36 Online Instrument was used to assess the quality of life of the combatants, administered at the start of the study and again after one year of observation. The 36 items of the questionnaire are grouped into eight scales: physical functioning, role limitations due to physical health, bodily pain, general health, vitality, social functioning, role activity, bodily pain, general health, life activities, social functioning, emotional state and mental health. Each scale score ranged from 1 to 6, where higher values indicated better results. The 8 scales were grouped into two indicators: physical and psychological components of health.

The physical component of health (PCH) included: Physical Functioning (PF), Role Functioning due to Physical Condition (RF), Pain Intensity (PI), General Health (GH).

The mental component (MC) of health included: Life activities (LA), Social functioning (SF), Role functioning due to emotional state (RF), Mental health (MH).

STATISTICAL ANALYSIS

During the study, we formulated the following hypotheses:

- H_1 – physical and sports rehabilitation measures have a positive effect on the quality of life of combatants;
- H_2 – the effectiveness of physical and sports rehabilitation measures aimed at improving the quality of life depends on the age and body weight of the military.

To verify the hypotheses, statistical analysis methods were employed. Normal distribution of the data was tested using the Shapiro–Wilk W-test, recommended for samples up to 50 observations. As the indicators did not correspond to the normal distribution law, the median (Me) and 25th and 75th quartiles were used to represent the central tendency and dispersion of empirical data, the Kruskal-Wallis H-test was used to compare the estimates of the components of the quality of life of the DDR, and the Wilcoxon T-test was used for comparative analysis before and after the study.

When testing H_2, we used regression analysis, choosing the generalized linear model GLM, which allows modeling categorical variables of various types, including binary ones. In addition, they can be applied to data that are not normally distributed and model nonlinear relationships between dependent and independent variables. All this makes GLM a powerful tool for analysis in various fields of knowledge. So, the predictors in the model were binary variables: age and BMI of the contingent. Previously, the variables were coded: 1 – age up to and including 45 years and normal body weight and length ratio; 0 – over 45 years old and overweight. The dependent variables were the absolute increases in the PHC and MHC of the DDR quality of life during the period of implementation of the FSR measures. It is important to note that we considered the absolute increases in the quality of life components

as the criteria for evaluating intervention effectiveness.

Homogeneity of variances for PHC and MHC increases, adjusted for age and body weight, was confirmed using Levene's test ($p > 0,05$). For the PHC age groups, the F-statistic and p-value were 1,048 and 0,3122 in accordance; for the MHC – 1,795 and 0,1879; for the PHC of the body weight groups – $F=0,048$ at $p=0,8267$; for the MHC – $F=0,715$ at $p=0,4029$.

The hypotheses were tested at a significance level of 0,05.

MS Excel and STATISTICA 16.0 software were used for calculations.

LIMITATIONS

It is important to note that our study has certain limitations. Firstly, it was conducted on a sample of combatants who were preparing for running events in track and field athletics competitions. This group may possess a higher level of physical fitness and motivation compared to those combatants who do not engage in such competitions. Consequently, the findings of the study cannot be directly generalized to less physically active combatants. In addition, the study had a relatively small sample size, which may limit its statistical power and make the results less reliable. Lastly, the research was based on self-reported data from the participants, which may introduce certain biases into the findings.

COMPLIANCE WITH ETHICAL REQUIREMENTS

The study was conducted in accordance with the principles of the Helsinki Declaration of the World Medical Association «Ethical principles of medical research involving a person as an object of research». All study participants provided informed consent in writing to participate in the study.

RESULTS

In the current context of full-scale Russian military aggression, both individual and collective traumatization can be observed among the population of Ukraine [5, 11]. Wars are one of the most destructive traumatic events of our time [13]. War in Ukraine is considered as a distress that negatively affects the personality and its functioning, psyche and mental health of the individual [15, 16]. Among the primary causes of distress during war, O. R. Tkachyshyna identifies factors such as the prolonged inability to meet physiological needs; unsuitable, unusual living conditions (such as extended stays in shelters or other non-residential facilities etc.); physical injuries, exacerbated illnesses, persistent pain; sustained negative emotions (experiences of fear, anxiety, anger, rage).

To assess health-related quality of life, a survey was conducted among combatants (n=40) who regularly participated in PSR programs.

The study showed that after the implemented measures of physical and sports rehabilitation – specifically, participation in running disciplines of athletics – the most significant improvements were observed in the mental health component, role functioning due to the emotional state, social functioning, general health, pain intensity, role functioning, and physical functioning of the participants. The results obtained are evidence of the positive impact of PSR measures on the state of combatants at the stage of restoring mental and physical health and their return to civilian life. After the study, the maximum absolute median increases were 100 points for PR and RE, that is, for the lowest components of quality of life [9].

PSR measures are an important component of military recovery after combat actions. Its impact on the quality of life of combatants requires thorough study. In this study, we not only studied whether physical and sports rehabilitation activities affect the quality of life of combatants, but also whether the effectiveness of these activities depends on the age and body weight of the military.

To evaluate hypothesis H_1, a visual analysis was conducted, which demonstrates the presence of a relationship between the dynamics of quality of life components under the influence of PSR measures with age and body weight of the combatants. Using the figures, it can be seen that the implemented measures had a different effect on the PHC and MHC depending on the age and body weight of the combatants (Fig. 1, Fig. 2).

During the study, models were developed to describe the effect of age and body weight on the dynamics of quality of life components in combatants. The parameters of the models are presented in Table 1.

Analysis of the data showed that the model describing the impact of age and body mass on the absolute increase in the PHC was statistically significant ($F = 3,899$; $p = 0,0286$). Furthermore, the coefficients within this model were also statistically significant, with p-values ranging from 0,0003 to 0,0445. Its analytical form is expressed as:

$$\Delta PHC=2,51+1,24*age(0)+1,31*body\ weight(0) \quad (1),$$

Where ΔPHC – on absolute increase of PHC;

Age – age up to 45 years;

Body weight – normal body weight.

On the other hand, the model for predicting the increase in MHC resulting from physical and sports rehabilitation interventions was not statistically significant ($F = 0,036$; $p = 0,9642$). The lack of the statistical

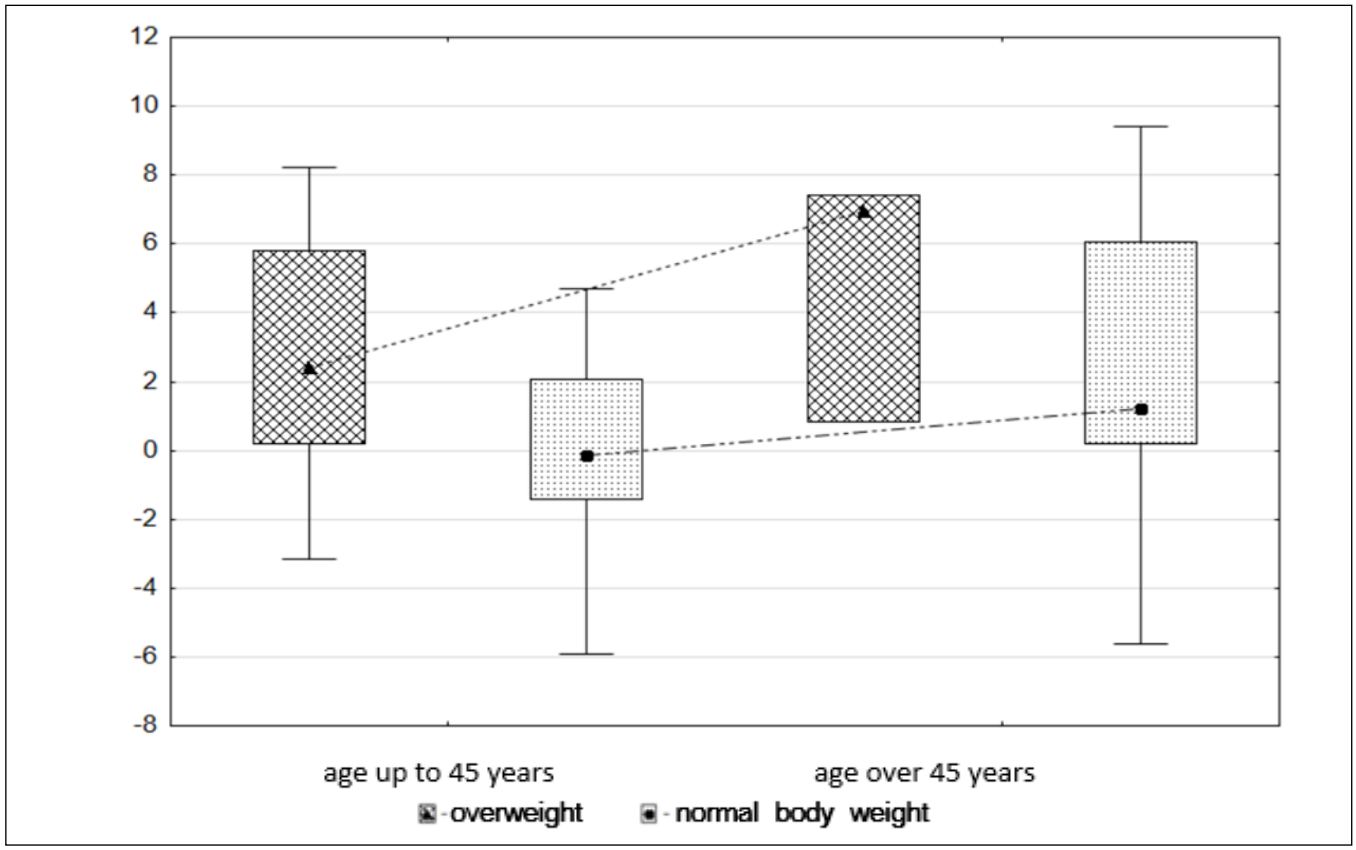

Fig. 1. The relationship between the dynamics of the PHC under the influence of physical and sports rehabilitation measures with the age and body weight of the combatants (n=42)
Picture taken by the authors

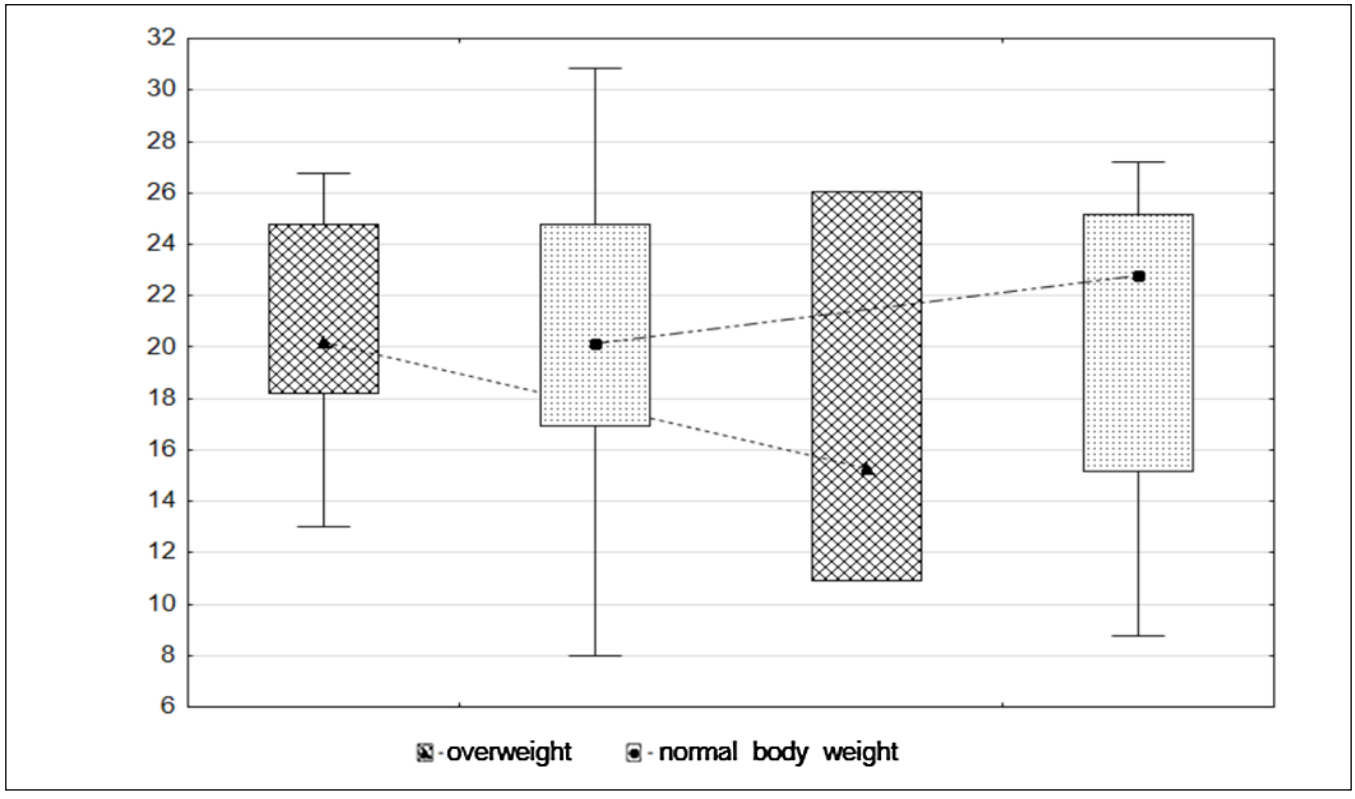

Fig. 2. Relationship between the dynamics of the MHC under the influence of physical and sports rehabilitation interventions with age and body weight of combatants (n=42)
Picture taken by the authors

Table 1. Evaluation of the parameters of the model of the influence of stress-associated states on the overall assessment of psychophysiological indicators of students

Dependent variables	Regression components	Regression coefficients and their estimates					
		α	S(α)	t	p	CI	
						-95%	+95%
PHC Increase	**Constant term**	2,51	0,63	3,987	0,0003	2,51	0,63
	Age ≤ 45 years	1,24	0,60	2,076	0,0445	1,24	0,60
	Normal body weight	1,31	0,60	2,208	0,0332	1,31	0,60
MHC Increase	**Constant term**	20,14	1,02	19,787	<0,05	18,08	22,20
	Age ≤ 45 years	-0,21	0,96	-0,215	0,8311	-2,15	1,74
	Normal body weight	-0,19	0,96	-0,199	0,8429	-2,14	1,75

Note: S(α) – standard error of the regression coefficient; t – Student›s t-test to assess the significance of the regression coefficient α; p – achieved significance level; CI – confidence interval

Source: compiled by the authors of this study

significance does not permit to make a definitive conclusions about the influence of age and body weight on the MHC of combatants' quality of life.

Thus, we can say that hypothesis H2 was partially proven and related exclusively to the physical component of quality of life.

DISCUSSION

Due to the systematic nature of training and high-quality execution of exercises, combatants had the opportunity to improve their quality of life and reduce the negative effects of experienced stress. Our study demonstrated a statistically significant dynamic in the Physical Health Component (PHC) among military personnel who underwent PSR. The most pronounced changes were recorded in groups of respondents over 45 years of age with excess body weight, what allows us to speak about the effectiveness of the PSR in the context of the specific biological characteristics of veterans.

The model we constructed confirms that BMI and age make a prognostically significant influence on the increase in PHC. The average increase across the entire sample was 2,51 points, however, among participants over 45 years of age with excess body weight, the expected increase was more than 5 points. These results are consistent with scientific views on the reactivity of veterans' adaptive systems to physical activity in later life. In particular, Martz E. [12] emphasizes that systematic fitness programs can compensate for age-related and somatic limitations of veterans, if they are implemented for a long time, as well as if the classes have a rehabilitation-oriented focus.

Furthermore, research by Dekel et al. [6] indicates that group-based physical activity not only serves as a means of functional recovery but also contributes to post-traumatic growth. Training participants who share combat experience may form supportive networks, enhancing the rehabilitative effect even in the absence of specialized psychological care. Nevertheless, contrary to expectations, our study did not demonstrate a statistically significant influence of biological variables on the increase in the Mental Health Component (MHC) of quality of life. This finding contrasts with the conclusions of Joseph and Linley [8], who describe a universal psychological benefit from regular physical activity.

A potential explanation for this discrepant result may be the specificity of the sample: the study was conducted among individuals who voluntarily joined the training process in running disciplines and already had a sufficient level of physical activity and self-regulation. The reduction in emotional stress may have occurred earlier or may not have been sensitive enough to be registered using the SF-36.

Additional support for the significance of psychosocial factors is found in the works of Kravchenko O. [2] and Kohut I. et al. [1, 10]. Their works emphasize that the psychological adaptation of veterans depends on the depth of the trauma experienced, the level of social support, motivation to participate in the program, and even the type of previous combat experience. Therefore, assessing PSR effectiveness in improving the MHC requires not only a physiological but also an interdisciplinary approach—incorporating psychodiagnostics, life event analysis, and motivational component.

It is worth noting that the results we obtained complement the existing empirical base and enable the development of more personalized PSR program planning. Specifically, target beneficiaries of such programs may include individuals over 45 years of age with excess body weight, for whom the expected effectiveness is highest. At the same time, unified approaches should

be avoided, and systems for stratifying combatants according to their functional and psycho-emotional resources should be developed.

Future research should focus on creating more complex models that combine physiological, psychosocial, and behavioral parameters. Longitudinal studies may be particularly valuable to assess the sustainability of rehabilitation interventions over time. It is also worth considering the possibilities of multicomponent programs that include not only physical but also cognitive, motivational, and emotional-reflective modules.

CONCLUSIONS

Based on the conducted research, the prognostic role of age and body mass in improving the physical component of quality of life among combatants participating in physical and sports rehabilitation programs was confirmed. The generalized linear model demonstrated a statistically significant effect of these factors on the increase in the Physical Health Component (PHC) as measured by the SF-36 questionnaire. The greatest effect was observed in veterans over 45 years of age with excess body weight. This allows us to recommend a personalized approach to planning rehabilitation activities, focusing on the biological characteristics of the target group. At the same time, the influence of age and body weight on the dynamics of the mental component of quality of life was not statistically significant, what requires further interdisciplinary study taking into account psychosocial factors. The results obtained can be used to improve the effectiveness of state programs for the physical and social reintegration of military personnel.

PROSPECTS FOR FURTHER RESEARCH

In further research, it is advisable to study the influence of psychosocial factors on the dynamics of the mental component of veterans' quality of life and to develop personalized rehabilitation models.

REFERENCES

1. Kohut I, Krushynska N, Pryma I. Hotovnist' uchasnykiv boyovykh diy do systematychnoho adaptyvnoho fizychnoho vykhovannya. [Readiness of combatants for systematic adaptive physical education]. Teoriya ta metodyka fizychnoho vykhovannya ta sportu. 2022;1:97–100. doi:10.32652/tmfvs.2022.1.97–100. (Ukrainian) DOI
2. Kravchenko O. Zminy struktury osobystosti viys'kovosluzhbovtsiv za kontraktom, yaki mayut' status uchasnyka boyovykh diy. [Personality structure changes in contract military personnel with combatant status]. Visnyk Natsional'noho universytetu oborony Ukrayiny. 2022;65-1:53 – 63. doi:10.33099/2617-6858-2022-65-1-53-63. (Ukrainian) DOI
3. Li M, Wang T, Li Y-Z, Zhang L et al. Personality characteristics of officers and soldiers of different army years in combat troops. https://www.researchgate.net/publication/291744902_Personality_characteristics_of_officers_and_soldiers_of_different_army_years_in_combat_troops [Accessed 12 May 2025]
4. Tokhtamysh O. Posttravmatychne zrostannya v protsesi reabilitatsiyi. [Post-traumatic growth in the rehabilitation process]. Visnyk Kyyivs'koho natsional'noho universytetu imeni Tarasa Shevchenka. 2018;1(3):57–62. doi:10.17721/2616-7786.2018/3-1/13. (Ukrainian) DOI
5. Feshchenko Yu, Mostovyi, Yu, Babiychuk, Yu. Protsedura adaptatsiyi mizhnarodnoyi ankety otsinky yakosti zhyttya v Ukrayini. [Adaptation procedure for the international quality of life assessment questionnaire in Ukraine]. Ukrayins'kyy pul'monolohichnyy zhurnal. 2002;3: 9–11. (Ukrainian)
6. Chaban O, Khaustova O. Antystresova povedinka v umovakh viiny. Osnovy farmakoterapii tryvohy. [Anti-stress behavior in wartime. Fundamentals of pharmacotherapy of anxiety]. Praktychnyy likar. 2022;2-3:5-13. (Ukrainian)
7. Dekel S, Hankin IT, Pratt JA et al. Posttraumatic growth in trauma recollections of 9/11 survivors: A narrative approach. J Loss Trauma. 2016;21(4):315–24. doi:10.1080/15325024.2015.1098009. DOI
8. Jenkinson C, Coulter A, Wright L. Short form 36 (SF-36) health survey questionnaire: normative data for adults of working age. BMJ. 1993;306:1437–40. doi:10.1136/bmj.306.6890.1437. DOI
9. Joseph S, Linley PA. Trauma, recovery, and growth: Positive psychological perspectives on posttraumatic stress. Hoboken (NJ): John Wiley & Sons. 2008, p. 387.
10. Krushynska N, Kohut I, Fedorchuk S et al. Vplyv zakhodiv fizychnoyi ta sportyvnoyi reabilitatsiyi na pokaznyky yakosti zhyttya uchasnykiv boyovykh diy. [Impact of physical and sports rehabilitation measures on quality of life indicators in combatants]. Klinichna ta profilaktychna medytsyna. 2025;1(39):86–91. doi:10.31612/2616-4868.1.2025.11. (Ukrainian) DOI
11. Krushynska N, Kohut I. Vplyv zaniat bihom na riven stresu v uchasnykiv boiovykh dii [The impact of running on the stress level of combatants]. Teoriya ta metodyka fizychnoho vykhovannya ta sportu. 2023;4:37–41. doi:10.32652/tmfvs.2022.4.37-41. (Ukrainian) DOI
12. Krushynska N, Kohut, I, Matvieiev S. Sotsialni naslidky viiny v Ukraini ta rol adaptyvnoi fizychnoi kultury v yikh podolanni. Teoriia i metodyka fizychnoho vykhovannia i sportu. [Social consequences of the war in Ukraine and the role of adaptive physical culture in overcoming them]. Teoriya ta metodyka fizychnoho vykhovannya ta sportu. 2022;3:89–94. doi:10.32652/tmfvs.2022.3.89-94. (Ukrainian) DOI

13. Martz E. Trauma rehabilitation after war and conflict. New York: Springer. 2010, p.436.
14. Simsir Z, Dilmac B. Predictive relationship between war posttraumatic growth, values, and perceived social support. Illness, Crisis, & Loss. 2021;29(2):95–111. doi:10.1177/1054137318788655. DOI
15. Reznikov: v Ukraini nyni blyzko miliona liudei ye uchasnykamy boiovykh dii [Reznikov: about a million people in Ukraine are currently combatants]. Radio Svoboda. 2023. https://www.radiosvoboda.org/a/news-reznikov-viyna-ubd/32558693.html. [Acssesed 10 May 2025] (Ukrainian)
16. Tkachyshyna O. Problema mentalnoho zdorovia v Ukraini: psykholohichnyi analiz [The problem of mental health in Ukraine: a psychological analysis]. Habitus. 2023;53:207-211. http://habitus.od.ua/53-2023. [Acssesed 10 May 2025] (Ukrainian)
17. Ziadi AA, Heshmati R, Nemati F, Hashemi T. The relationship of resilience and social support with post-traumatic growth: The mediating role of emotion regulation strategies. Int. J. of Health Sci. 2023;7(S1):749-60.

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CONFLICT OF INTEREST
The Authors declare no conflict of interest

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