










ORIGINAL PAPER

Manifestations of post-traumatic stress in military personnel after participating in hostilities in the Russian-Ukrainian war

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ABSTRACT

Introduction and aim. Since the beginning of the Russian-Ukrainian war, many Ukrainian military personnel began to show post-traumatic stress (PTS). The purpose of the article is to identify the features of PTS exhibited in different age groups in trauma-exposed military personnel during their participation in the psychological recovery program (“Invincibility Program”).
Material and methods. Ukrainian Defense Forces military personnel (n=546 males, between 20 and 60 years of age) participated in this study. All participants were divided into three age groups. Determination of the features of PTS in military personnel was carried out using psychodiagnostic tests.

Results. In each age group, more than half of the participants in the “Invincibility Program” had PTS characteristics such as the sub-threshold or clinical manifestations of PTSD, adjustment disorders, low resilience to combat mental trauma, and various sleep disorders combined with somatic complaints. The data showed higher features of PTS in the younger participants and they decreased in both the 2 older sets of participants.

Conclusion. The age-related features of the manifestation of PTS in military personnel must be taken into account when developing psychological recovery programs: for younger participants, such events should be carried out longer and more intensively.

Keywords. hostilities, military personnel, post-traumatic stress

Introduction

On February 24, 2022, the armed forces of the Russian Federation invaded Ukraine and large-scale hostilities began, in which hundreds of thousands of military personnel from both sides took part. Combat injuries received by Ukrainian military personnel were accompanied by particular severity, multiplicity, and combined defeat.¹ They were caused by the use of many types of modern weapons by Russian military personnel: ballistic missiles, unmanned aerial vehicles, artillery shells, mines, multiple-launch rocket systems, and firearms.

Also, almost all military personnel participated in hostilities combat stress manifested in the form of acute stress reactions, affective and anxiety disorders, addictive and delinquent behavior, adjustment disorders, and suicidal manifestations.²⁻⁵ These negative consequences of post-traumatic stress (PTS) in combat conditions were combat stress reactions (CSRs), requiring the provision of psychological first aid to military personnel and recovery of mental resources.^{6,7}

PTS consisted of immediate, long-term, and delayed mental consequences. At first, the PTS symptoms

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were not subjectively felt as a disease, without disturbing the adaptation and resilience of military personnel to combat conditions.⁸ While most soldiers were able to adequately cope with these stressors, others become so overwhelmed that their psychological defenses become exhausted, causing a psychological breakdown.⁹ They struggled with loneliness, isolation, forced separation from their loved ones, and lack of their physical needs being met regarding food, drink, and sleep. Combatants during the war faced constant danger, not only in the line of duty. They also witnessed the injury and death of their fellow soldiers, commanders, and enemies as well as innocent civilians. Added to the enormous stress was the unpredictability of modern warfare, including the risk of weapons of mass destruction and asymmetric combat operations, making it difficult to predict where and when the next attack might occur.¹⁰ Subsequently, these changes in some military personnel were transformed into a delayed response to a stressful event of a threatening or catastrophic nature, which could later cause more pronounced stress or distress.¹¹⁻¹⁴

Data reporting the prevalence of PTS in military personnel vary considerably. This was due to many factors: the intensity and duration of hostilities, the experience of the combatants, their level of professional and psychological readiness, motivation, as well as on gender, marital status, age, personal participation in combat, and other factors. For example, at the beginning of the Russian-Ukrainian war (March 2022), PTS in Ukrainian combatants reached threshold levels of clinical symptoms of anxiety (44.4%), depression (43.3%), and insomnia (12.4%).¹⁵ The researchers found that although protective and mediating factors were in place, 11% to 17% of combat veterans were at risk for mental disorders in 3 to 4 months after return from combat duty.¹⁶ It was revealed that out of 103,788 US veterans, 25,658 (25%) received mental health diagnosis(es); 56% of whom had two or more distinct mental health diagnoses.¹⁷

The long-term pathogenic effects of PTS may be reflected not only in higher rates of PTSD but also in its severity. During 20 years of follow-up, it was found that Israeli veterans who had PTS in the form of CSRs also suffered from more severe PTSD than combat veterans without CSRs.⁹ Thus, for many PTS victims, the initial mental breakdown at the line of contact marked the beginning of a lifelong struggle with the psychopathological consequences of the war.

Post-conflict studies have shown that combat participation was associated with a significant risk of mental health problems, including post-traumatic stress disorder (PTSD), major depression, suicides, substance abuse, impairment in social functioning and in the ability to work, and the increased use of health-care services.¹⁸⁻²⁰ Therefore, mental health issues must be addressed before and during deployment to ensure

optimum individual and unit functioning, as well as to prevent chronic mental illness and disability in the future.^{16,17,21} The US Department of Defence guidelines on PTSD recommend outpatient trauma-focused psychological therapies (TFPT) before pharmacological interventions or other forms of therapy due to the benefits of TFPT being longer-lived.²²

We did not find scientific papers that studied the features of the manifestation of PTS in military personnel of different age groups after participating in long-term hostilities. In this regard, we suggested that PTS in military personnel of different age groups may manifest itself in different ways. It was found that no generally accepted international definition of human age groups. Therefore, we used the classification age groups with the recommendations of the UN and WHO, in which the crown of youth age is from 18 to 24; the young age is 25 to 44; the middle age is 45–60; the elderly age is 60–75; the senile age is 75–90, and the long-livers are after 90.²³ In this regard, the age groups used in this study are uneven. Age-related periodization of mental development was based on determining a person's ability to interact with society, taking into account bodily changes due to the laws of the biological development of the human body. This classification also considered the social situation of human development, leading professional activities, critical and sensitive periods of development (age crises), and other factors. It should be noted that in Ukraine, citizens who are 20 years old are called up for military service (therefore, in Group 1, the age of the study participants was 20–24 years old).

Aim

The purpose of the article was to identify the features of PTS exhibited in different age groups in trauma-exposed military personnel during their participation in the psychological recovery program.

Material and methods

Study design and participants

All participants gave their informed consent for inclusion before they participated in the study. The approval of the ethics committee was obtained before the initiation of the study (meeting date; 11/01/2023, decision number; 2023/14). All procedures performed in this study involving human participants were in accordance with the ethical standards specified by the institutional and national research committee and with the Helsinki Declaration and its later amendments or comparable ethical standards.

This study was a cross-sectional, descriptive study. After the start of the war and three months of intense hostilities, Ukrainian military personnel began to experience acute stress reactions, more often showing signs of distress and adjustment disorders, depression, demoral-

ization, PTS, and suicidal behavior. Therefore, the Command of the Operational Group of Troops “Kharkiv” created the rehabilitation center. The rehabilitation center was located 30–40 km from the combat zone. The psychological recovery project for military personnel after being in combat conditions began in June 2022 and continues to this day based on the clinical sanatorium in the Kharkiv region. The psychological recovery program for military personnel was specially developed for its practical implementation: we named it the “Invincibility Program.” The purpose of this program was to reduce the impact of PTS on combatants, strengthen mental health and mobilize their psychological resources, improve adaptation and resilience, and promptly return to combat activities. The duration of stay of the program participants in the rehabilitation center was seven days. In this program eight military psychologists were involved, working with 60–80 military personnel. All participants were divided into 4–5 groups for group psychotherapy and psycho-correction (10–15 people in a group with 1–2 psychologists). Group activities were held in the morning, and individual consultations were held in the afternoon. Psychologists were constantly with their participants for the entire duration of the program. Participants of the “Invincibility Program” were allowed to live with their families and family members (wives, children) could participate in all activities of the program. Only about 30% of participants took advantage of this option: most of the families became forced refugees and left Ukraine or lived far from the rehabilitation center. The total number of military personnel involved since the beginning of the “Invincibility Program” has amounted to more than 3 500 people.

Table 1. Distribution of study participants by age groups

Age groups	Participants	
	n	%
Group 1 (20–24 years old)	73	13.37
Group 2 (25–44 years old)	278	50.92
Group 3 (45–60 years old)	195	35.71
Total (20–60 years old)	546	100.00

Ukrainian Defense Forces military personnel (n=546 males, between 20 and 60 years of age, 35.84 ± 6.49 years) participated in this study. All combatants took part in the Russian-Ukrainian war and had combat experience after February 24, 2022 (6–10 months), (8.75 ± 2.58 months). Combatants were sent to the rehabilitation center from combat positions based on a list of indications for psychological recovery. According to military specialties, there were infantrymen, attack aircraft, scouts, snipers, tankers, artillerymen, and other military specialists. Female military personnel were not included in this study because, over the entire period of the program, less than 0.5% of female combatants participated. Participants were randomly

selected for the study. All participants were divided into three age groups (Table 1).

Instruments

Determination of the PTS manifestations in military personnel was carried out after arrival at the rehabilitation center using psychological tests.

The “Mississippi Scale for Combat-Related Post-traumatic Stress Disorder” (MSCRPTSD) was used to diagnose PTSD in military personnel on missions in the war zone, translated into Ukrainian.^{24,25} The scale consists of 35 statements (4 subsets), the answers to which were given on a 5-point Likert scale (Cronbach’s $\alpha=0.887$). Subset 1 (11 statements) describes the symptoms of the “intrusion” group when the traumatic event is constantly repeated in the experience in one (or more) ways. Subset 2 (11 statements) relates the symptoms of the “avoidance” group when there is a constant avoidance of stimuli associated with trauma, blocking of emotional reactions, and numbness, which was not observed before the trauma. Subset 3 (8 statements) describes the symptoms of “excitability” when persistent symptoms of arousal increase that were not observed before the injury. Subset 4 (5 statements) describe symptoms associated with guilt and suicidal tendencies. Despite the grouping of statements into four subsets, one general indicator was calculated taking into account the conversion of the answer into a score for direct and inverse statements, reflecting the severity of PTSD symptoms (range from 35 to 175 points, where 35–80 points is a variant of the norm; 81–114 points – separate symptoms of PTSD; 115–175 points – clinical manifestations of PTSD, a psychiatric examination and inpatient examination were recommended).

The “Disadaptation Express Questionnaire” (DEQ) is an abbreviated modified version of the Multilevel Personality Questionnaire “Adaptation”.²⁵ The DEQ made it possible to identify signs of a violation of the adaptability of the soldier’s personality: violation of the regulatory function of the emotional-volitional sphere and self-esteem; lack of prospects for continuing life and the ability to overcome life’s difficulties (probability of committing suicidal attempts); loss of moral convictions, the likelihood of committing addictive and delinquent acts; loss of communicative potential (comradely support, reduced ability to accept the help of one’s team). The DEQ consists of 45 statements included in 5 subscales (Cronbach’s $\alpha=0.848$): “Sincerity of answers,” “Violation of behavioral regulation,” “Probability of committing suicide attempts,” “Violation of moral normativity,” and “Loss of communicative potential.” Each positive response was worth 1 point, and negative 0 points. The overall DEQ scale was calculated as the sum of scores on 4 scales (values on the “Sincerity of answers” scale were not included). The results of the overall DEQ scale were

evaluated as follows: 1–10 points – high adaptation to combat operations, sufficient tolerance to adverse mental and physical stress, including under conditions of severe combat stress; 11–14 points – average adaptation, unstable level of performance, especially in combat conditions; 15 points or more – low adaptation (distress and adjustment disorders) that does not meet the requirements for soldiers in combat conditions.

The “Resilience to Combat Mental Trauma Questionnaire” (RCMTQ) was used for psychodiagnostic participants upon completion of the program. RCMTQ is the modified Combat Experiences Scale (CES).^{25,26} CES is a 33-item measure that assesses deployment-related experiences. RCMTQ is a 45-item measure combined into 3 scales, answered on a 6-point Likert scale that assesses resilience to combat mental trauma based on combat experience gained (Cronbach’s $\alpha=0.887$). “The expectation from participating in hostilities scale” made it possible to assess the professional potential of military personnel in possible combat situations: their assessment as potentially (non)removable; expected mental (feeling of safety), psycho-physiological (somatic well-being) and social consequences of participation in hostilities; the ability to use the experience of their professional group and own experience. “The overcoming a stressful situation scale” made it possible to assess the mechanisms for overcoming stressful (combat) situations: to assess the role of anxiety, search activity, defense mechanisms (definition of the priority of problem-oriented and emotionally-oriented coping), behavior (hierarchies of the relations system, purposefulness and awareness of professional actions, responsibility), the role and importance of supporting the military team. The scale “Realization of the acquired combat experience” made it possible to assess the ability to process the acquired combat experience: to realize, accept, and determine its place in one’s life path and the ability to apply it in the future adequately. The overall indicator of resilience to combat mental trauma (RCMT) was calculated as the sum of points on 3 scales, taking into account the conversion of the answer into a score for direct and inverse statements. The obtained results of the RCMT indicator were evaluated as follows: 193–225 points – a high level of RCMT, even with a significant complication of the combat situation, such military personnel are able to cooperate and provide assistance to colleagues; to process, assimilate one’s own experience and adopt the experience of comrades; will be able to maintain focus, efficiency, and control over their mental state; 144–192 points – the average level of RCMT reflected a reduced ability to provide support to colleagues; do not always maintain the effectiveness of their activities and control over their mental state; 0–143 points – low level of RCMT reflected psychological unpreparedness to participate

in hostilities; rapid exhaustion, irritability, inability to interact, and to assist colleagues.

For the data presented basic descriptive statistics were used (arithmetical mean *M*, standard deviation *SD*). The reliability of differences in the results of the mean values in three interrelated samples was determined using Student’s *t*-test and Fisher’s ϕ -test. For the assessment of the statistical significance of differences, we used the level of significance from $p<0.1$ to $p<0.001$. The statistical analysis of the study results was carried out using the program SPSS 20.0 (IBM, Armonk, NY, USA).

Results

The results of the study showed that in each of the 3 groups, approximately half of the participants had PTS characteristics such as the sub-threshold or clinical manifestations of PTSD according to the MSCRPTSD (Table 2).

Table 2. PTS manifestations in participants of different age groups^a

PTS indicators	Groups of participants (%)			Differences between groups		
	Group 1	Group 2	Group 3	ϕ_{1-2}	ϕ_{1-3}	ϕ_{2-3}
Norm	46.58	47.12	51.28	0.08	0.69	0.90
Sub-threshold PTSD	20.55	31.65	34.87	1.93*	2.35**	0.73
Clinical manifestations of PTSD	32.88	21.22	13.85	2.02*	3.34***	2.07*

^a * $p<0.05$; ** $p<0.01$; *** $p<0.001$

Participants with normal PTS scores (<80 points) were not included in further analysis of the results. Further, of all the participants whose PTS indicators (sub-threshold and clinical manifestations of formed PTSD) exceeded the normative ones (>80 points), three age groups were made according to the above criteria ($n=281$): Group 1 consisted of 39 participants (13.88%); Group 2 consisted of 147 participants (52.31%); Group 3 consisted of 95 participants (33.81%). In Group 1, the intensity of PTS manifestations was the highest and decreases with age; the differences between groups of participants in these PTS indicators reach the level of statistical significance (Table 3).

Table 3. PTS manifestations in participants of different age groups (MSCRPTSD points)^a

PTS indicators	Groups of participants			Differences between groups		
	Group 1 ($n_1=39$)	Group 2 ($n_2=147$)	Group 3 ($n_3=95$)	t_{1-2}	t_{1-3}	t_{2-3}
Sub-threshold and clinical manifestations of formed PTSD	102.15 ± 14.41	96.94 ± 14.85	92.77 ± 11.84	2.00*	3.60**	2.42*

^a * $p<0.05$, ** $p<0.001$

Table 4 presents the results of the adjustment disorders in participants of different age groups.

Table 4. Adjustment disorders in participants of different age groups (DEQ points)^a

Adjustment disorder indicators	Groups of participants			Differences between groups		
	Group 1 (n ₁ =39)	Group 2 (n ₂ =147)	Group 3 (n ₃ =95)	t ₁₋₂	t ₁₋₃	t ₂₋₃
Sincerity of answers	3.87 ±1.13	3.42 ±1.24	3.28 ±1.23	2.17*	2.67**	0.85
Violation of behavioral regulation	5.90 ±2.40	4.64 ±2.36	4.22 ±2.06	2.92**	3.82***	1.46
Probability of committing suicide attempts	3.36 ±2.36	3.12 ±2.46	2.80 ±2.43	0.57	1.24	0.98
Violation of moral normativity	4.49 ±1.97	4.07 ±2.18	3.28 ±1.74	1.15	3.32**	3.09**
Loss of communicative potential	4.85 ±1.80	3.99 ±2.35	3.94 ±2.19	2.46*	2.49*	0.19
Total indicator of adjustment disorders	18.59 ±6.19	15.82 ±7.45	14.24 ±6.10	2.38*	3.71***	1.80 ⁰

^a ⁰p<0.1; *p<0.05, **p<0.01; ***p<0.001

Table 5 presents the results of resilience to combat mental trauma in participants of different age groups.

Table 5. Resilience to combat mental trauma in participants of different age groups (RCMTQ points)^a

Resilience to combat mental trauma indicators	Groups of participants			Differences between groups		
	Group 1 (n ₁ =39)	Group 2 (n ₂ =147)	Group 3 (n ₃ =95)	t ₁₋₂	t ₁₋₃	t ₂₋₃
Expectation from participating in hostilities	40.91 ±11.62	42.74 ±10.73	46.29 ±11.01	0.89	2.47*	2.47*
Overcoming a stressful situation	47.44 ±11.30	49.40 ±10.29	51.03 ±10.76	0.98	1.69 ⁰	1.17
Realization of the acquired combat experience	40.82 ±11.63	41.79 ±10.05	43.90 ±9.95	0.48	1.45	1.60
Total indicator of resilience to combat mental trauma	129.18 ±31.43	133.93 ±26.49	141.22 ±27.73	0.87	2.08*	2.03*

^a ⁰p<0.1; *p<0.05

Table 6 shows data on participants with various sleep disorders and somatic complaints requiring consultations and treatment of doctors (therapist, cardiologist, traumatologist, neuropathologist, otorhinolaryngologist).

Table 6. The presence of various sleep problems and somatic complaints in participants of different age groups with PTS manifestations^a

Sleep and health problems	Groups of participants (%)			Differences between groups		
	Group 1 (n ₁ =39)	Group 2 (n ₂ =147)	Group 3 (n ₃ =95)	φ ₁₋₂	φ ₁₋₃	φ ₂₋₃
Sleep problems	61.54	54.42	55.79	0.80	0.61	0.21
Somatic complaints	56.41	85.03	84.21	3.59***	3.29***	0.17

^a ***p<0.001

Discussion

There are no studies that have examined the relationship between age and post-traumatic stress after the partic-

ipation of military personnel in prolonged combat operations. As a result of the study, it was revealed that PTS in military personnel of different age groups manifested itself in different ways. It was found that in each age group, about half of the participants in the “Invincibility Program” had PTS characteristics such as the sub-threshold or clinical manifestations of PTSD. However, the intensity of symptoms in different groups is not the same. In Group 1, the largest number of participants were identified who had clinical manifestations of PTSD – 32.88%, in Group 3 this percentage is the lowest – 13.85%. According to the intensity gradation of PTS manifestations, the discrepancies between the age groups reach the level of statistical significance. In Group 1, the intensity of PTS manifestations was the highest and decreased with age.

A similar trend was also found in participants with adjustment disorders: in the direction from Group 1 (adjustment disorders are most pronounced) to Group 3, in which the indicators slightly exceed the norm. Differences between groups of participants in almost all indicators of adjustment disorders reach the level of statistical significance. The exception is the indicator “Probability of committing suicide attempts”, which in all groups was approximately the same and relatively low.

In all groups with PTS manifestations, an unsatisfactory indicator of resilience to combat mental trauma was revealed (<143 points). However, Group 3 participants had the most realistic expectations about taking part in combat operations, which allows them to better tune in to the action of combat stress factors; according to this indicator, they significantly differ from Group 1 and Group 2. The revealed differences in resilience to combat mental trauma were not very pronounced in order to conclude that the personal life experience of Group 3 participants helps them in overcoming combat stress factors. Perhaps the challenges of war were such stress factors that even with good professional and psychological training it is impossible to be fully prepared for real combat activities, which predetermines the development of PTS in military personnel. However, it is easier for Group 3 participants to compare their own experiences of overcoming life’s problems with the techniques that they were taught in preparation for participating in hostilities. This was a more reliable way to develop skills for coping with stressful situations.

More than half of the participants with PTS symptoms in each group had some type of sleep disorder. For Groups 2 and 3, 85% had somatic complaints: sleep problems superimposed on existing health problems and the consequences of injuries and concussions, worsened physical well-being, or, due to the mechanisms of reflection, the hypochondriacal component increased. Group 1 participants had more than 56% somatic complaints; according to this indicator, partici-

pants in Group 1 differ from the other two groups at a statistically significant level.

Thus, it can be argued that the impact of combat stress on mental and somatic health manifests itself differently in different age groups of military personnel. Perhaps this was due to life experience of coping with stress, and productive coping strategies developed by more mature military personnel. This trend can be explained by two paradoxes of stress and aging.²⁷ Although older adults are thought to experience more stress and to be more vulnerable to its adverse effects, they report less stress.²⁸ Older adults learn to appraise and cope with stress differently and that protects them despite the increased physiological vulnerability. The second paradox is related to the positive aspects of stress in that under certain conditions stress can have positive or 'toughening' effects that can be construed as building resilience.²⁷

We found that in all three groups of participants, at the beginning of the "Invincibility Program", there is still no reflection and integration of the experience of participating in hostilities into their "lifeline". This can be explained by the fact that all participants had not yet completed the combat mission (after the program, all military personnel returned to the combat zone). Also, they had not yet realized the latent period (a month after the trauma event), the results of which may be post-traumatic growth or clinical manifestations of formed PTSD. It should be noted that the study participants had not yet gone through a full cycle of combat readiness recovery and combat stress resilience formation, which includes professional and psychological training, development of productive coping strategies, and awareness of the acquired experience to counter combat stress factors. However, at this stage of its formation, more mature military personnel had higher resilience to combat stress factors. It can also be assumed that this group included the most experienced military personnel. However, the data obtained show that their experience was not related to coping with the combat stressors that were characteristic of large-scale hostilities (in this indicator they do not differ from other age groups).

Combat-induced mental disorders were known to be often recognized either at the beginning or immediately after the end of the war, often in the absence of continuous systematic long-term follow-up of the victims.^{20,29} It was found that military personnel who experienced PTS during combat in the form of CSRs had a higher likelihood of developing PTSD.³⁰ The results of our study may indicate that in the future many veterans may develop mental health problems after the end of hostilities. It can be assumed that intense and prolonged exposure to post-traumatic stress in adolescence, which, due to the maturation of brain structures and changes in social status, is sensitive to the formation of self-regula-

tion, will not only be a temporary mental disorder, but a significant and lifelong vulnerability. This process can become the basis for the formation of lifelong PTSD.

PTS may not be the only negative outcome identified in military personnel after participating in hostilities. Israeli veterans experienced significantly more psychiatric disorders, distress, social functioning difficulties, health problems, accelerated aging, and earlier all-cause mortality than those who survived PTS.³¹ The PTS experience is a typical moment when the combatant begins to feel vulnerable and helpless as he loses his sense of safety.^{9,32} The results of previous studies and the new data we obtained confirm that combatants who experienced PTS may be at greater pre-combat risk and intensity than those who were not found PTS.

The presence of sleep disorders and somatic complaints in the participants significantly complicated the overcoming of PTS and reduced the effectiveness of the "Invincibility Program". The large difference between 20-24-year-olds and the other two groups for somatization (~50 vs. 85%) shown in Table 6 can be explained by some subjective and objective factors. Firstly, military personnel stayed in the combat zone for more than 6-8 months without rotation. Secondly, in addition to a direct threat to life, physical and mental health, a negative impact was exerted by: the lack of satisfaction of elementary physiological needs (safety, accommodation in trenches and dugouts, insufficient sleep, food, prolonged separation from the family, etc.), climatic effects of heat, cold, rain, snow, frost, etc. Thirdly, as the results of this study showed, mental traumatization by participation in combat actions was perceived more acutely in youth than in other age categories. This triggered the mechanisms of reflection, which were characterized by special attention to internal sensations, as a result of which somatic complaints of the hypochondriacal type could arise. Fourthly, young military personnel had less experience in taking care of their health. This was especially true for young people who had a "protracted childhood" and until recently their parents took care of them. Left alone with the onset of the disease, these young people were more likely to engage in more impulsive behavior, ranging from significant exaggeration to ignoring obvious problems, as well as greater dramatization of attitudes towards a possible disease. This could also be related to the purpose of a certain "manipulation": drawing attention to oneself and one's problems, obtaining help from outsiders, and reducing responsibility for erroneous actions.

Sleep problems were a core presenting symptom of many mental health disorders, including PTSD, depression, and anxiety.³³ Sleep disturbances, pain, and somatic problems were debilitating, significantly reducing the basis for recovery and opportunities for post-traumatic growth.

That is why it was advisable to carry out recovery programs at the sanatorium clinical base which has the necessary equipment and specialists to work with various sleep disturbances and diseases which has a psychosomatic, neurological component. In addition, sanatorium treatment should be aimed at general strengthening of the body, reducing anxiety, and tension, relieving muscle spasms by means of massage and exercise therapy, restoring the respiratory system, and anti-stress nutrition.

The results of the study allow us to offer practical recommendations for the formation of military units. It is expedient to limit (even if there is consent and motivation) the entry of youth military personnel who have not undergone purposeful military training into units participating in intense and prolonged combat clashes. Consider the possibility of expanding the involvement of military personnel of mature age in combat operations while maintaining sufficient physical health, motivation to participate in hostilities, and experience in professional military activity. Mature military personnel, while maintaining good physical shape and having motivation were more resistant to the action of combat stress factors, less than other age groups are prone to the formation of PTSD. If they had an adequate attitude to the peculiarities of their physical status (awareness of the consequences of aging and the presence of diseases), they would be able to quite effectively compensate for a number of physical shortcomings due to experience, a high-quality choice of military equipment, etc.

Study limitations

This study certainly had limitations. First, female military personnel were not included in this study because, over the entire period of the “Invincibility Program”, less than 0.5% of female combatants participated. Secondly, it was impossible to study the further fate of program participants with symptoms of PTS, a high level of adjustment disorders, and low rates of resilience to combat mental trauma, which needed longer psychological recovery programs or additional examinations. Finally, the current study was limited by not having an active comparison condition and by not having a longitudinal follow-up.

Conclusion

As a result of the study, it was found that half of the military personnel after participating in hostilities had PTS characteristics such as the sub-threshold or clinical manifestations of PTSD, adjustment disorders, and low resilience to combat mental trauma. However, the manifestation of PTS in each age group of participants has its own characteristics. The data showed higher features of PTS in the younger participants and they decreased in both the 2 older sets of participants. Group 3 partic-

ipants (age 45–60 years old) had higher rates of adaptation and resilience to combat mental trauma. They were aware of their age characteristics and did not expect significant changes in their mental state. Group 2 participants (age 25–44 years old) occupied an intermediate position in terms of PTS manifestations. Therefore, for this group, it was necessary to carry out additional activities to implement positive changes in their mental state. Group 1 participants (age 20–24 years old) showed the greatest manifestations of PTS. However, they also had the greatest mental and physical resources to overcome stressful events. But this required more time to move into a more harmonious mental state and consolidate the results achieved. The age-related features of the manifestation of PTS in military personnel must be taken into account when developing psychological recovery programs: for younger people, such events should be carried out longer and more intensively. The obtained results of the PTS manifestation made it possible to develop individual psycho-correctional and psychotherapeutic measures for the recovery of military personnel after participating in hostilities.

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Declarations

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Author contributions

Conceptualization, I.P. and Y.M.; Methodology, I.P.; Software, K.H.; Validation, Y.M., I.P. and N.K.; Formal Analysis, L.F.; Investigation, O.K.; Resources, N.A.; Data Curation, Y.M. and I.P.; Writing – Original Draft Preparation, Y.M.; Writing – Review & Editing, I.P.; Visualization, K.H.; Supervision, N.K.; Project Administration, I.P.; Funding Acquisition, I.P.

Conflicts of interest

The authors declare no competing interests.

Data availability

All data generated or analyzed during this study are included in this published article.

Ethical approval

The approval of the ethics committee was obtained before the initiation of the study (meeting date; 11/01/2023, decision number; 2023/14).

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