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PSYCHOLOGICAL FEATURES OF EMOTIONAL DISORDERS IN MILITARY PERSONNEL AFTER MINE-EXPLOSION INJURY DURING THEIR MEDICAL-PSYCHOLOGICAL REHABILITATION

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Abstract

Research in the field of psychology of emotional disorders in military personnel with mine-explosion injuries intersects various disciplines such as psychology, medicine, military science, sociology, rehabilitation, etc. Unfortunately, there is currently no unified system, technology, and methodology for comprehensive medical-psychological rehabilitation of

combatants, as preference is given to individual types – social, psychological, medical, physical, pedagogical, and the rehabilitation measures themselves have a fragmented nature. Therefore, the question arises about the justification of the effectiveness and measures of medical-psychological rehabilitation for military personnel who have participated in combat operations. The study involved 99 individuals – male military personnel aged 18 to 61 years, undergoing treatment and recovery in a medical institution.

For the statistical analysis of the research results, factor, cluster analysis, and analysis of variance (ANOVA) were conducted.

Based on the research results, three clusters were identified, differing in the average level of intelligence and characteristic diagnoses. It was found that individuals with higher intelligence more often experience adaptation disorders (33%), those with average intelligence – PTSD (27%), and those with low intelligence – organic emotional disorders (66%).

The strongest correlation between verbal intelligence and the following personality profile scales was found: schizoid (-0.445, $p \leq 0.01$), psychasthenia (-0.436, $p \leq 0.01$), paranoia (-0.379, $p \leq 0.01$), depression (-0.371, $p \leq 0.01$), hysteria (-0.350, $p \leq 0.01$), psychopathy (-0.322, $p \leq 0.01$), hypomania (-0.251*), and hypochondria (-0.200, $p \leq 0.05$).

The research results allow for the development of specific recommendations regarding psychological support and medical-psychological rehabilitation for military personnel who have experienced Mine-Explosion Trauma (MET). The obtained data can be utilized to enhance psychological training programs for military personnel in the event of possible traumatic situations, helping them better cope with emotional difficulties.

Keywords: mine-explosion trauma; emotional disorders; verbal intelligence; medical-psychological rehabilitation

The war in Ukraine has given rise to a special category of military personnel who have experienced the negative impact of a complex of intense and prolonged acting stressors, leading to emotional disorders, post-traumatic stress disorders (PTSD), adaptation disorders, and other mental health issues. A significant number of military personnel who participated in combat operations require comprehensive medical-psychological rehabilitation. Unfortunately, there is currently no unified system, technology, and methodology for the comprehensive medical-psychological rehabilitation of combatants, as preference is given to individual types – social, psychological, medical, physical, pedagogical, and the rehabilitation measures themselves have a fragmented nature. Therefore, the question arises about the

justification of the effectiveness and measures of medical-psychological rehabilitation for military personnel who have participated in combat operations.

The scientific study of the psychological aspects of emotional disorders that arise after experiencing mine-explosion events becomes fundamentally important and relevant. The concept of "Mine-Explosion Trauma" (MET) has become an integral and perhaps central component of modern armed conflicts and military events. MET is a multifactorial combat injury that occurs as a result of the cumulative damaging effect on the human body of shock waves, hot gas streams, fire, toxic products of explosion and burning, fragments of ammunition casings, secondary projectiles [1], and is often accompanied by deep and extensive tissue damage, contusion, and emotional disorders. In the presented statistical data on combat injuries and injuries to military personnel of the U.S. Army (Table 1) over the last 160 years, there is a rapid increase in MET from 9% to 81% [2, 3, 4, 5].

Table 1

Comparison of rates of gunshot wounds and mine-explosive injuries

Wars	Year	Gunshot wounds, %	MVT injury, %
Civic	1861-1865	91	9
First World War	1914-1918	65	35
World War II	1939-1945	27	73
In Korea	1950-1953	31	69
In Vietnam	1959-1975	35	65
Iraq, Afghanistan	2003-2011; 2001-2021	19	81

As of now, specific data related to the war in Ukraine is not available in open sources.

The aim of the study is to investigate the psychological characteristics of emotional disorders in military personnel after mine-explosion trauma. The main task is to uncover the factors influencing the emotional state of military personnel who have experienced explosive trauma and identify possibilities for psychological support and medical-psychological rehabilitation.

The object of our research is emotional disorders of personality after mine-explosion trauma.

The subject of the study is the relationship between the personality traits of military personnel and the depth of emotional disorders after mine-explosion trauma.

The research was conducted at the "Odesa Regional Psychiatric Hospital No. 2 of the Odesa Regional Council." The study involved 99 individuals – male military personnel aged 18 to 61 years, undergoing treatment and recovery at the institution.

Research Methods. In the study of psychological features of emotional disorders in military personnel after mine-explosion trauma, a comprehensive approach was employed. To ensure the reliability and objectivity of the obtained results, the following methodologies were used:

1. Battery of tests "Wechsler Adult Intelligence Scale" (WAIS). This test, developed by David Wechsler and adapted for the Ukrainian version by Yu.I. Filimonenko, allows for the assessment of the overall intelligence level of an individual and identifies potential cognitive consequences of mine-explosion trauma.

2. Minnesota Multiphasic Personality Inventory (MMPI) in a shortened version (Mini-Mult). Developed by Stark Hathaway and adapted for Ukrainian realities by V.P. Zaytsev. This questionnaire helps explore the deep structures of personality and identify potential psychological problems that may arise as a result of trauma.

3. Benton Visual Retention Test assesses visual memory and attention, which is important for determining possible cognitive disorders after trauma.

The application of the above methodologies allowed us to obtain a comprehensive picture of the psychological features of emotional disorders in military personnel after mine-explosion trauma. These methodologies are part of a comprehensive psychological study of basic mental functions and personality profiles commonly used in clinical practice and outlined in regulatory documents, including those related to psychological expertise. All methodologies were used in accordance with their standard instructions, ensuring the reproducibility of procedures and obtained results, and adhering to the ethical code of psychologists. The analysis of the obtained data was conducted using SPSS (Statistical Package for the Social Sciences) version 22.

Research Results. In our work, we rely on the theory of Joseph LeDoux, whose ideas are based on the James-Lange and Cannon-Bard theories regarding the physiological aspects of emotions. According to these theories, physiological changes in the body occur before the onset of the emotion itself. LeDoux extended these concepts by investigating how the brain processes sensory information related to emotional stimuli and responds with corresponding emotional reactions. Therefore, LeDoux integrated the physiological aspects of emotions with

the brain mechanisms initiating them. Joseph LeDoux's theory pertains to the transmission of sensory information about emotional stimuli in the brain. He believes that information about threatening or emotionally charged stimuli reaches the brain through two pathways: the fast short route and the slow long route [6]. In this context, researching the issue of emotional disorders in military personnel is an important task for both science and practice. Studying this aspect can contribute to the development of more effective strategies for psychological support and help preserve the physical and mental health of military personnel.

At the initial stage of the research, two preliminary methods of statistical data analysis were employed: factor analysis using the principal component method and cluster analysis using Ward's method. The subsequent stage involved analysis of variance (ANOVA), a method for comparing mean values, to compare the identified clusters, and Spearman's correlation analysis for non-parametric criteria. In accordance with the presented approach, a factor analysis of the data was conducted using the principal component method, allowing the identification of three factors among all the specified indicators (Table 2).

Table 2

Components with a weight of their constituents greater than 0.7.

Components	**Component Constituents (Scales) with Strength Greater Than 0.7**					
1	Awareness	Similarity	Verbal Indicator	Non-Verbal Indicator	General Indicator	
2	Hypochondriasis	Depression	Hysteria	Paranoia	Psychasthenia	Schizoid
3	Benton Errors	Wechsler Errors				

The result of the factor analysis was the identification of three strongest factors, incorporating intelligence indicators defining the first component, personality profile indicators constituting the second component, and the third component containing indicators of errors in Wechsler's and Benton's tests, representing inaccuracies in perception, memory, and thinking. In our case, the use of Principal Component Analysis (PCA) helped determine the number of components (Table 2) that could best explain the variation in our data and identify the most influential ones that are crucial for the study. We assume that these components are key factors explaining the major part of variability in the dataset.

To obtain more structurally transparent information, we will conduct cluster analysis.

According to the results of the dendrogram analysis (Figure 1), the presence of two distinct large clusters was identified, with one of them dividing into two smaller subclusters. Considering the research goal and practical tasks at hand, in the subsequent analysis and interpretation of data, three clusters were adopted (Table 3).

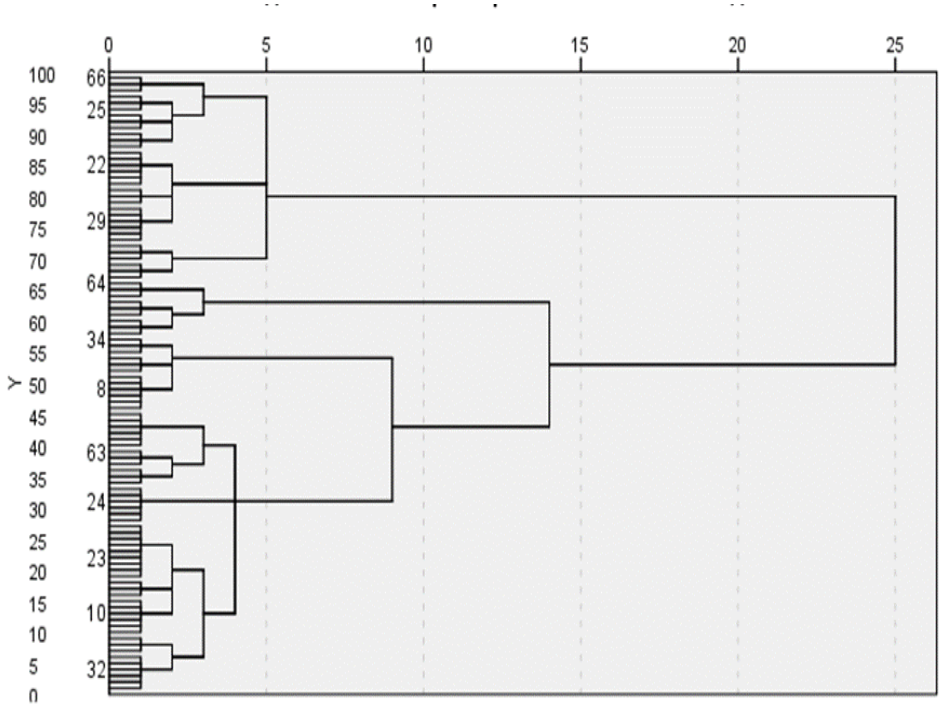


Figure 1. Dendrogram of clustering indicators using the applied methodologies.

The first, second, and third clusters consist of military personnel of various ages and educational backgrounds, characterized by the presence of emotional disorders that may be caused by wartime events, Mine-Blast Trauma (MBT), and the stress accompanying military service (Table 3).

Table 3

General data of cluster analysis.

Cluster	**Number of investigated%**	**Average age, years**	**Education, %**					**Diagnosis, in general /cluster, %**					
			HS / NF	**HS**	**SSS**	**HE/NF**	**HE**	**F41.2**	**F43.1**	**F43.2**	**F06.3**	**UD**	**Others**
1	45	32 ±13	-	20	**67**	-	13	-	3/7	**15/33**	9/20	12/27	6/13
2	45	34 ±10	13	27	**33**	-	**33**	6/13	**12/27**	6/13	3/7	6/13	12/27
3	10	43 ±10	-	**33**	**33**	33	-	3/30	-	-	**7/70**	-	-

The first cluster includes 45% of military personnel aged 18 to 61 with an average age of 32. Regarding education, these individuals have various levels, including secondary school (SS - 9%), secondary specialized school (SSU - 30%), and higher education (HE - 6%). As for diagnosed conditions, they were diagnosed with adjustment disorder (F43.2 - 15%), unspecified diagnosis (UD - 12%), organic emotionally labile disorders (F06.3 - 9%), and PTSD (F43.1 - 3%), among others (6%). In the first cluster, adjustment disorder predominates at 33%, indicating that military personnel after Mine-Blast Trauma (MBT) may have difficulties adapting to certain life circumstances and challenges in socialization. Adjustment disorder is a mental disorder arising from negative life events or stressors, involving mood changes beyond normal stress reactions and may be associated with significant distress or functional impairment.

The second cluster includes 45% of military personnel aged 18 to 60 with an average age of 34. These individuals have varying levels of education, including secondary school (SS - 12%), incomplete secondary school (SS/NS - 6%), secondary specialized school (SSU - 15%), and higher education (HE - 15%). Regarding diagnoses, they were diagnosed with adjustment disorder (F43.2 - 6%), unspecified diagnosis (UD - 6%), organic emotionally labile disorders (F06.3 - 3%), PTSD (F43.1 - 12%), anxiety-depressive disorder (F41.2 - 6%), and others (12%). PTSD dominates in 27% of cases in the second cluster, indicating that the traumatic events experienced by these military personnel elicit a range of neurotic symptoms and emotional reactions.

The third cluster includes 10% of military personnel with an average age of 43. Regarding education, these individuals have various levels, including secondary school (SS - 3%), secondary specialized school (SSU - 3%), and incomplete higher education (HE/NS - 3%), but no cases of higher education. They were diagnosed with organic emotionally labile disorders (F06.3 - 6%) and anxiety-depressive disorder (F41.2 - 3%). Notably, the third cluster lacks diagnoses characteristic of the first cluster, such as adjustment disorder, and PTSD, which predominates in the second cluster. Instead, organic emotionally labile disorders dominate in 70% of cases in the third cluster. This may indicate that their emotional reactions are associated with biological aspects or organic factors causing emotional lability or instability. MBT can affect neurochemistry and brain structure, leading to unpredictable and unstable reactions to stimuli or events.

Analyzing the data, we observe that the three clusters differ in the level of intelligence (Wechsler 's test battery) and personality profile indicators (Minnesota Multiphasic Personality Inventory - MMPI). The data are presented in Tab. 4 and 5.

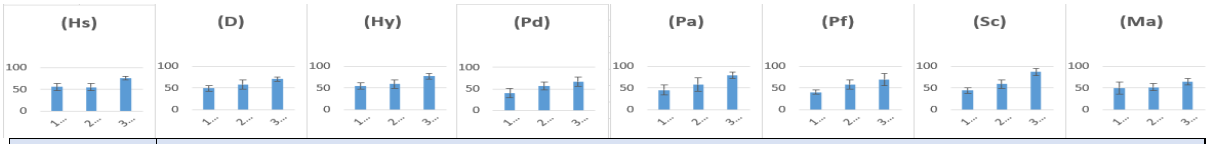
Table 4

Average scale values μ, for the Wechsler test, ± σ standard deviation by clusters.

Cluster	Intelligence (μ ± σ)		
	Verbal	Non-Verbal	General
1	102±10	96±12	99±9
2	86±8	83±10	84±7
3	71±8	64±8	66±8

Table 5

Average scale values μ, for the Minnesota Multiphasic Personality Inventory (MMPI), ± σ standard deviation by clusters.



Cluster	Mini-Mult							
	(Hs)	(D)	(Hy)	(Pd)	(Pa)	(Pf)	(Sc)	(Ma)
1	56	49	54	40	45	40	44	50
2	55	58	59	56	58	58	59	52
3	76	71	77	67	80	70	87	64

For ease of perception of the integrity of the personality profile and analysis of the obtained information, we will present tabular data graphically, as shown in Figure 2.

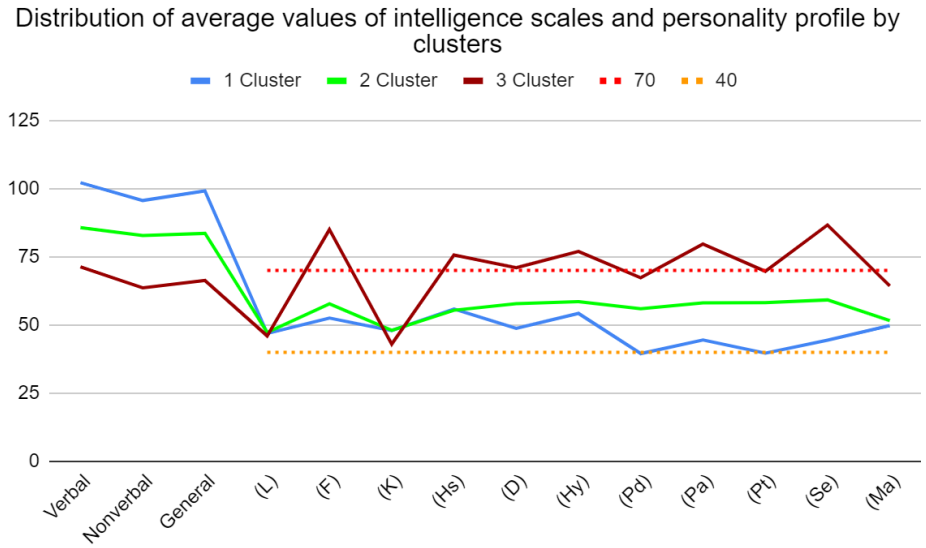


Figure 2. Distribution of average values of intelligence scales and personality profile by clusters.

The personality profile of the third cluster is characterized by high scores on the aggression scale, indicating a tendency of the subjects to excessively demonstrate symptoms. The profile curve has an elevated nature with a peak in the pronounced schizoid scale. The correction scale has the lowest indicators, which may suggest a tendency to respond without prior analysis or thoughtful consideration of questions, characteristic of individuals with low intelligence. Decreased criticality does not allow for adequate corrections.

Moderate correction of their answers is characteristic of individuals with high and moderate intelligence, as seen in the second and first clusters.

Let's conduct a analysis of variance of the average scale values and find out if there are significant differences between the clusters. Next, we determine if there is a correlation between intelligence scales and the level of deviations in the personality profile and how significant it is. The obtained results are presented in Table 6.

Table 6

Correlation coefficients between Mini-Mult scales and intelligence indicators according to Wechsler

Intelligence	**(Hs)**	**(D)**	**(Hy)**	**(Pd)**	**(Pa)**	**(Pf)**	**(Sc)**	**(Ma)**
Verbal	-,200*	-,371**	-,350**	-,322**	-,379**	-,436**	-,445**	-,251*
Non-Verbal	-0,055	-0,151	0,027	-,344**	-0,14	-0,189	-0,187	-0,028
General	-0,095	-,293**	-0,17	-,388**	-,306**	-,381**	-,396**	-0,153

* Correlation is significant only at the 0.05 level (two-tailed).

** Correlation is significant only at the 0.01 level (two-tailed).

From Table 6, it can be seen that there is a significant correlation between verbal intelligence and 6 Mini-Mult scales at the $p \leq 0.01$ level and 2 scales at the $p \leq 0.05$ level. Correlation with non-verbal intelligence exists but only with one of the paranoia scales (Pd), reflecting rigidity in thinking. From this, we can make initial conclusions that the relationship between intelligence and the mental state of military personnel after TBI is mainly determined in the area of verbal intelligence.

The strongest connection between verbal intelligence and the schizoid scale is (-0.445**), followed by decreasing strength of connection: psychasthenia (-0.436**), paranoia (-0.379**), depression (-0.371**), hysteria (-0.350**), psychopathy (-0.322**), hypomania (-0.251*), hypochondria (-0.200*). Individuals with high scores on the schizoid scale are able to subtly feel and perceive abstract images, but in everyday life, their emotionality is somewhat subdued, and most events do not evoke an emotional response. Thus, the general

feature of the schizoid type is a combination of increased sensitivity with emotional coldness and alienation in interpersonal relationships. The psychasthenia scale diagnoses individuals with an anxious and distrustful character, characterized by anxiety, fearfulness, indecision, and constant doubts.

According to the results of the correlation analysis, we found a negative correlation between intelligence and personality profile indicators. This means that as the level of intelligence increases, the level of tension in military personnel decreases across all scales of the Mini-Mult test. Thus, we assert that the level of intelligence influences the relationship between TBI and the "depth" of emotional response according to changes in the personality profile.

Let's conduct additional correlation analysis between the components of verbal intelligence scales and Mini-Mult scales. The results of the analysis are presented in Table 7.

Table 7

Correlation coefficients between scales and indicators of verbal intelligence according to Wexler.

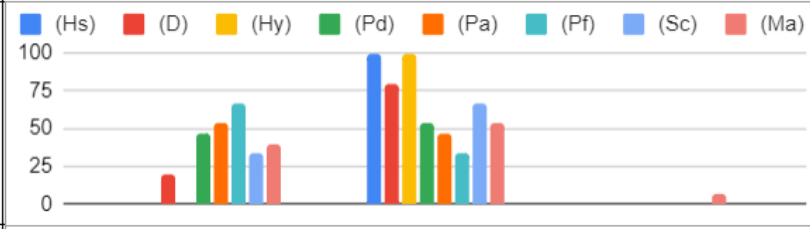
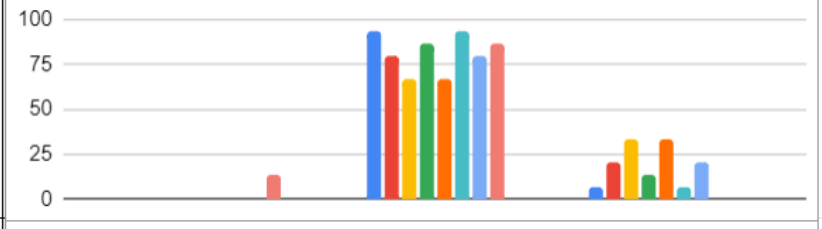
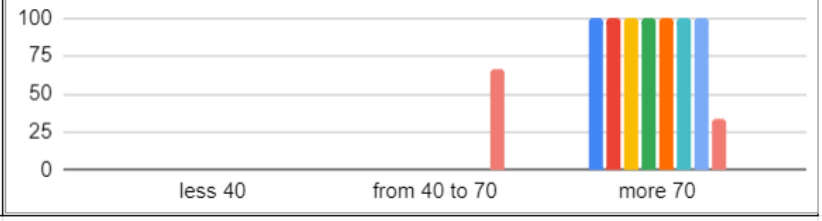
Verbal Intelligence	(Hs)	(D)	(Hy)	(Pd)	(Pa)	(Pf)	(Sc)	(Ma)
Awareness	-0,112	-,**320****	-0,193	-,203*	-,**422****	-,**372****	-,**411****	-,256*
Comprehension	-0,107	-,259**	-0,181	-,251*	-0,175	-,**326****	-,**335****	-,264**
Arithmetic	-0,038	-,212*	-0,158	-,**322****	-,**382****	-,273**	-,307**	-0,087
Similarity	-0,193	-,269**	-,285**	-,265**	-,282**	-,**309****	-,**358****	-0,066
Repetition	0,009	-0,116	-0,176	-,**250***	-,201*	-,**244***	-0,176	-0,152
Lexical	-,336**	-,**365****	-,**477****	-,**344****	-,366**	-,**392****	-,**435****	-0,165

As a result of the correlation analysis, we observed a negative correlation between verbal intelligence and personality profile indicators. This implies that as the level of verbal intelligence decreases, the impact of combat trauma on the intensity of emotional disorders increases. The achieved results allow us to conclude that verbal intelligence influences the relationship between combat trauma and the "depth" of emotional disorders.

For convenience and clarity of the analysis, all relevant information is summarized in a single table, Table 8. In the context of this analysis, two components obtained during factor

analysis are compared: intelligence and the level of mental reactions. It's important to note that during further research using cluster analysis, it was established that intelligence is divided into three clusters depending on its level. The first cluster corresponds to the average norm according to Wexler (90-109 points), the second cluster corresponds to the lower norm according to Wexler (80-89 points), and the third cluster corresponds to the borderline zone according to Wexler (70-79 points). Thus, the clusters are compared as components of the first factor (verbal intelligence) with the components of the second factor represented in the form of scales of the Mini-Mult test (the mental state of the military).

Table 8

	Cluster analysis		Factor analysis (component 3)
	Cluster	IQ Wechsler	number of military personnel, %
Factor analysis (component 1)	1	102	
	2	86	
	3	71	

Consolidated table of data (factors, clusters, and scales)

Taking into account the fact that high scores on all scales of the Mini-Mult questionnaire are scores exceeding the level of 70 points, and low scores are considered to be below 40 points, let's analyze the clusters based on the first and third components.

From Table 8, it can be observed that the first cluster consists of military personnel with an average and low level of mental components of the personality profile. Peak values on the psychasthenia scale, corresponding to the data in Table 3 where the prevalence of adaptation disorder is observed in the first cluster. The word "psychasthenia" comes from the Greek "psyche" (soul) and "astheneia" (weakness), meaning "weakness of the soul." People suffering from psychasthenia may experience fluctuations in emotional state, a tendency to

reflections and doubts, as well as neurotic disorders. Psychasthenia can be accompanied by various symptoms such as perfectionism, obsessive thoughts, anxiety, and phobias.

The second cluster includes military personnel with high and medium levels of mental components of the personality profile. Peak values on the hysteria and paranoia scales, which may correspond to the dominant symptoms of PTSD. Paranoia reflects a condition where there is a pathological belief in the existence of a threat or persecution by others, although these beliefs may be unfounded or exaggerated. Hysteria is a term historically used to denote a wide range of various mental and physical symptoms, such as conversion disorders (transforming mental states into physical symptoms), pronounced emotional lability, and others.

The third cluster includes military personnel with exclusively high levels on the scales of the personality profile. The diagnosis characteristic of this cluster is organic emotional labile disorders, high values on the aggression scale, explaining the elevated indicators on all scales of the personality profile.

By the frequency of significant correlations, let's rank the scales of verbal intelligence. The results of ranking are presented in Table 9.

Table 9.

Ranking of verbal intelligence scales by the frequency of correlations with Mini-Mult scales

Scales of verbal intelligence (Wechsler)	**Power, Component 1**	**Number of correlations by level of reliability**		**Sum of significant correlations**	**%**
		p<=0,01	**p<=0,05**		
Vocabulary	,646	7	0	7	87,5
Knowledge	**,771**	4	2	6	75
Similarity	**,856**	6	0	6	75
Comprehension	,623	4	1	5	62,5
Arithmetic	,678	4	0	4	50
Repetition of numbers	,426	0	3	3	37,5

The obtained data can serve as a basis for developing corrective measures regarding the training and rehabilitation of military personnel [7, 8]. Considering the data obtained during the analysis of the returned component matrix, we make an additional conclusion by adjusting and reducing the number of components of verbal intelligence to two (informativeness and similarity). Let's consider the significance of these scales.

The results of the "Informativeness" scale provide us with an idea of the level and scope of knowledge, the ability to retain them in long-term memory, selective direction of interests, and the overall education of the subject. This scale reflects how informed the researched person is, what knowledge they possess, and how well they can use it in practical activities. It also reflects the overall level of education and the amount of information that the subject possesses.

The "Similarity" scale gives an idea of the level of development of conceptual thinking, logical thinking, the ability to generalize and abstract. It reflects how the subject can understand analogies, establish connections between different phenomena, generalize information, and work with abstract concepts. The "Similarity" scale may indicate the subject's general ability to analyze, generalize, and logically understand complex situations.

Based on the theory and our research results, we can conclude regarding the interpretation of the obtained data. Note that the level of intelligence has a reverse correlation with the depth of mental reactions to events such as military trauma. This means that individuals with a higher level of intelligence are more likely to use the "long pathway" of information transmission, which passes through the cortex of the brain. In individuals with higher intelligence, greater attention and analysis of information occur at the level of the brain cortex, leading to more careful processing of stimuli and, consequently, less depth of mental reactions.

Therefore, this conclusion emphasizes the importance of intellectual development and intellectual preparedness in overcoming the consequences of traumatic events and emotional disorders. The development of cognitive functions and the ability to analyze and process information can contribute to reducing the intensity of mental reactions, especially in situations related to traumatic events.

The recommended medical and psychological rehabilitation program [9, 10, 11, 12] consists of the following stages:

1. Preparatory stage:

Assessment of the condition of the affected individuals.

Evaluation of physical and mental states.

Involvement of specialists, including doctors, psychologists (CPT, EMDR), and rehabilitation experts.

Organization of informational materials, such as booklets, videos, and web resources about the consequences of psychotrauma.

2. Educational stage:

Information sessions and psychoeducation.

Seminars and lectures on the impact and consequences of military trauma.

Legal information about the rights and opportunities for social support for the affected individuals.

3. Psychological support:

Individual counseling for providing psychological assistance and support (Cluster 3). Group sessions for organizing therapeutic groups for the exchange of experiences and mutual support (Clusters 1 and 2).

Stress management: Training in stress and emotional state management techniques.

4. Rehabilitation Stage:

Physical Rehabilitation: Collaboration with physiotherapists to restore functions.

Social Adaptation: Assistance in social integration and restoration of daily activities.

Professional Orientation: Counseling regarding professional retraining or changing the field of activity.

5. Feedback and Evaluation:

Collection of Feedback: Gathering feedback from participants.

Program Evaluation: Assessing the program's effectiveness based on participant feedback.

Program Correction: Making changes and improvements to the program based on received feedback.

6. Long-term Support:

Monitoring and Support: Maintaining constant contact with the affected individuals to provide ongoing support.

Community Organization: Establishing support groups for long-term communication and experience sharing.

This MPR program plan can be adapted based on the specific needs of the affected individuals and the resources available to institutions conducting MPR.

Conclusions:

1. Based on the research results, three clusters were identified, differing in the average level of intelligence and characteristic diagnoses. It was found that individuals with higher intelligence more often experience adaptation disorders (33%), those with average intelligence - PTSD (27%), and those with low intelligence - organic emotional disorders (66%).

2. The strongest correlation between verbal intelligence and the following personality profile scales was found: schizoid (-0.445, $p \leq 0.01$), psychasthenia (-0.436, $p \leq 0.01$), paranoia (-0.379, $p \leq 0.01$), depression (-0.371, $p \leq 0.01$), hysteria (-0.350, $p \leq 0.01$), psychopathy (-0.322, $p \leq 0.01$), hypomania (-0.251, $p \leq 0.05$), and hypochondria (-0.200, $p \leq 0.05$). This means that with a decrease in the level of verbal intelligence, the influence of mine-blast trauma on the intensity of emotional disorders increases. The results allow us to conclude that verbal intelligence influences the relationship between mine-blast trauma and the "depth" of emotional disorders. In particular, with the growth of verbal intelligence, the impact of the consequences of mine-blast trauma becomes less pronounced.

3. The research contributes to a deeper understanding of the psychological aspects of emotional disorders, especially in the context of military activities and traumatic events. The results can complement existing stress, adaptation, and psychological response theories, as well as reveal new aspects that were previously overlooked. The research findings will enable the development of specific recommendations for psychological support and medical-psychological rehabilitation of military personnel who have experienced mine-blast trauma. The obtained data can be used to improve psychological training programs and MPR for military personnel in case of possible traumatic situations, helping them better cope with emotional difficulties.

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