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## Diagnostic markers and scale of differential diagnosis of socially-disadaptative post-combat syndrome

### ДІАГНОСТИЧНІ МАРКЕРИ ТА ШКАЛА ДИФЕРЕНЦІЙНОЇ ДІАГНОСТИКИ СОЦІАЛЬНО-ДЕЗАДАПТИВНОГО ПІСЛЯБОЙОВОГО СИНДРОМУ

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#### Abstract

Mental disorders resulting from combat actions can affect up a considerable percentage of servicemen. Specific disorders have been observed in combatants and veterans of different wars, highlighting the influence of combat conditions on mental health. Social maladjustment among it can be highly prevalent, impacting combat readiness and post-war adaptation.

The above emphasizes the significance of differential diagnosis in identifying specific mental conditions like Socially-Disadaptive Post-Combat Syndrome and distinguishing them from other disorders. Socially-Disadaptive Post-Combat Syndrome is a condition that develops after the return of a combatant from a combat zone and is characterized by a maladaptive, conflictual response to a wide range of insignificant social situations.


The study aims to develop a diagnostic tool for identifying Socially-Disadaptive Post-Combat syndrome.


#### Анотація


Психічні розлади внаслідок бойових дій можуть вражати значний відсоток військовослужбовців. У учасників бойових дій і ветеранів різних війн спостерігаються специфічні розлади, що свідчить про вплив бойових умов на психічне здоров'я. Серед них може бути дуже поширена соціальна дезадаптація, що впливає на боєготовність і післявоєнну адаптацію.


Вищесказане підкреслює важливість диференціальної діагностики для виявлення специфічних психічних станів, таких як соціально-дезадаптивний постбойовий синдром, і відрізнення їх від інших розладів. Соціально-дезадаптивний постбойовий синдром – це стан, що розвивається після повернення учасника бойових дій із зони бойових дій і характеризується дезадаптивним, конфліктним реагуванням на широкий спектр незначущих соціальних ситуацій.


Дослідження спрямоване на розробку діагностичного інструменту для виявлення

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This study focuses on combat-related mental disorders among Ukrainian combatants and veterans who participated in the Anti-Terrorist Operation / Joint Forces Operation (ATO/JFO) from 2014 to 2021. The research involves 395 participants, with 39 combatants exhibiting symptoms of Socially-Disadaptive Post-Combat Syndrome forming the main research group, and 21 individuals with PTSD forming the comparison group.

As a result of the study, we systematized diagnostic markers and develop a Diagnostic Scale of Socially-Disadaptive Post-Combat syndrome. Our devised diagnostic scale consists of two sections: a list of criteria related to specific circumstances (comprising 4 criteria - 2 obligatory criteria and 2 optional criteria) and a list of symptoms (comprising 16 symptoms).

We also believe that conducting research on combatants and veterans of other wars is expedient.

**Keywords:** combat mental trauma, mental disorders, combatants, veterans, differential diagnosis, psychometry.

## Introduction

Differential diagnosis of mental disorders has always been a priority in neuroscience (Kent, Nelson, & Northoff, 2023). This is particularly relevant to disorders related to combat-related mental trauma. The percentage of mental disorders resulting from combat actions can reach up to 16%. Moreover, mental disorders can manifest in military personnel even after the war. For instance, Post-traumatic stress disorder (PTSD) – a condition with a delayed onset, can affect veterans at a rate exceeding 8% (Inoue et al., 2023; Negrusa, Negrusa, 2014; Kozhyna et al., 2021). This irreversibly impacts the combat readiness of the army during wartime and subsequently affects the social adaptation of veterans.

All this raises the issue of adequate, effective and valid psychodiagnostic tools. Our work is devoted to the analysis of existing studies of the specific disorders of combatants in various world wars. Our attention is focused on the urgent need for Ukraine – to identify diagnostic markers of Socially-Disadaptive Post-Combat Syndrome and to prove the results regarding the validity, reliability and standardization of the developed scale of differential diagnosis of Socially-Disadaptive Post-Combat Syndrome among

соціально-дезадаптивного постбойового синдрому.

У цьому дослідженні досліджено психічні розлади, пов'язані з бойовими діями, серед українських учасників бойових дій та ветеранів, які брали участь в АТО/ООС з 2014 по 2021 рік. У дослідженні взяли участь 395 учасників, з яких 39 учасників бойових дій мають ознаки соціально-дезадаптивного постбойового синдрому утворив основну дослідницьку групу та 21 особу з ПТСР утворив групу порівняння.

За результатами дослідження нами систематизовано діагностичні маркери та розроблено Діагностичну шкалу соціально-дезадаптивного постбойового синдрому. Розроблена нами діагностична шкала складається з двох розділів: списку критеріїв, пов'язаних із конкретними обставинами (включає 4 критерії – 2 обов'язкових критерію та 2 необов'язкових критерію) та списку симптомів (включає 16 симптомів).

Також вважаємо доцільним проведення досліджень учасників бойових дій та ветеранів інших воєн.

**Ключові слова:** бойова психічна травма, психічні розлади, учасники бойових дій, ветерани, диференційна діагностика, психометрія.

Ukrainian participants in hostilities and veterans who took part in ATO/OOS with 2014 to 2021.

**The aim of the research** is to identify and systematize the diagnostic markers of Socially-Disadaptive Post-Combat syndrome and develop, based on these markers, the Diagnostic Scale of Socially-Disadaptive Post-Combat syndrome in comparison to PTSD.

**The object of the research** is the diagnostic markers of Socially-Disadaptive Post-Combat syndrome and PTSD.

## Methodology and material

In the research we used following methods: theoretical-methodological analysis on the research topic, psychodiagnostic, and mathematical-statistical methods.

This clinical retrospective and prospective study were conducted at the Zaporizhzhia Military Hospital and Zaporizhzhia State Medical University, Zaporizhzhia, Ukraine. We examined 395 combatants and veterans who participated in the Anti-Terrorist Operation/Joint Forces Operation (ATO/JFO) from 2014 to 2021.

The research was conducted in accordance with the principles of deontology and bioethics. The Bioethics Commission of Zaporizhzhia State Medical University (review document, No. 5 dated June 6, 2014) approved this study. All participants provided informed consent for their voluntary participation in the study.

**Sample of the exploration.** Out of 395 combatants, we identified individuals who exhibited symptoms of Socially-Disadaptive Post-Combat Syndrome in their clinical presentation. A total of 39 combatants were included in the main research group (MG). Additionally, we selected combatants who presented with mental disorders similar to Socially-Disadaptive Post-Combat Syndrome in terms of clinical manifestations, debut features, dynamics, and triggering factors, namely PTSD. This comparison group (CG) comprised 21 combatants. All participants in the study were male. There were no statistically significant differences in age and military service-related features and conditions among the patients.

Using the A. Wald procedure, we compared all research groups and identified symptoms of Socially-Disadaptive Post-Combat Syndrome in the MG that significantly differed from the symptoms in the CG. Based on these distinctive symptoms, we developed the Scale of Differential Features between Socially-Disadaptive Post-Combat Syndrome and PTSD.

#### Analysis of recent research and publications

It is well-known that manifestations of social maladjustment among veterans can be significant in terms of prevalence. These include loneliness, which may affect 50% or more, divorce rates reaching up to 20%, involvement in criminal activities accounting for 8% of all committed offenses, unemployment rate of 20%, and suicide rates exceeding 17%. However, the actual figures might be even higher (Inoue et al., 2023; Gates et al., 2012; Negrusa, & Negrusa, 2014; Xia et al., 2020; Finlay et al., 2019; Lwi et al., 2022; Holliday et al., 2022; Reijnen, & Duel, 2019; Burdett et al., 2019).

Moreover, cases of delayed detection of mental disorders related to combat-related mental trauma are not uncommon, leading to negative consequences (Randles, & Finnegan, 2022).

Timely identification and correction of such pathology are essential to minimize these adverse effects.

Combatants and veterans from various wars have been described to experience specific disorders such as Combat Stress Reaction, "Soldier's Heart" (Effort Syndrome or Da Costa's Syndrome), and others. PTSD gained widespread recognition after the Vietnam War (Jones, 2001; Adler, & Gutierrez, 2022; Borges et al., 2020).

Indeed, specific conditions of combat operations in each country and various factors affecting the psyche can result in differences in the clinical presentation, even leading to the identification of new conditions. For instance, after episodes of gas warfare during World War I, the term "Gas Neurosis Syndrome" emerged to describe a specific mental condition observed in combatants of that war (Hulbert, 1920). The Norwegian sailors in the merchant navy who survived World War II were diagnosed with a specific mental disorder known as "War Sailor Syndrome" (Askevold, 1976). For a prolonged period, medical practitioners encountered specific manifestations in Gulf War veterans before the concept of the Gulf War Syndrome was formulated (Auxéméry, 2013). Additionally, in the literature, there is an amalgamation of various pathological mental manifestations under the term Hybrid war syndrome (Danyk, & Zborovska, 2008).

With the onset of the unprovoked and unmotivated invasion of Ukraine by the Russian Federation starting in 2014, Ukrainian combatants have also been documented to experience war-associated mental disorders (Loganovsky et al., 2018). The following pathological conditions have been described: specific alcohol depression, Post-combat delayed response syndrome, Socially-Disadaptive Post-Combat syndrome, and the Ukrainian syndrome (Napryeyenko et al., 2018; Danilevska, 2018a; Danilevska, 2018b; Matyash, & Hudenko, 2014).

The diversity of these disorders burdens and impairs the quality of timely diagnosis, leading to treatment delays, and consequently, disability.

It is known that 7.2% of Ukrainian combatants were declared disabled due to mental and behavioral disorders from 2014 to 2021 (Kyrychenko et al., 2022). However, as of 2018, compared to 2014, there was a slight decrease in the incidence of affective disorders by 14% and neurotic disorders by 3.2% (Havlovskyy, 2019). However, starting from 2022, when the war escalated to a full-scale conflict, negative indicators may increase, further emphasizing the need for high-quality tools in timely psychometry.

In this study, our scientific inquiry was directed towards identifying specific criteria for Socially-Disadaptive Post-Combat syndrome and applying them as a differential diagnostic tool to distinguish this condition.

## Results

Despite the absence of core symptoms of PTSD such as "flashbacks," nightmares, and reminiscences in the clinical presentation of combatants in the MG, we find it appropriate to conduct a differential diagnosis between Socially-Disadaptive Post-Combat Syndrome and PTSD because all combatants experienced life-threatening situations during their participation in the ATO / JFO. Additionally, they exhibited other secondary symptoms such as an enhanced startle reaction, a state of autonomic hyperarousal, hypervigilance, anxiety, depression, and anhedonia in their clinical profile.

We conducted a comparative analysis of markers in combatants from the MG and identified those that showed significant differences from the CG at a level of  $<0.05$ . This was done to determine the markers of Socially-Disadaptive Post-Combat Syndrome that are diagnostically significant.

We utilized TIBCO STATISTICA® 13.0 (TIBCO Software Inc. №JPZ8041382130ARCN10-J) and MICROSOFT EXCEL 2013 (license code 00331-10000-00001-AA404) for data analysis, applying descriptive and mathematical statistical methods for statistical analysis. For calculating mutual information (MI) and Jeffreys divergence (J-divergence, J) based on Kullback's method, we employed the method of sequential analysis developed by A. Wald, relying on T. Bayes' theorem, with adaptations by A.A. Genkin and E.V. Gubler.

Upon ranking these diagnostically significant markers of Socially-Disadaptive Post-Combat Syndrome based on their diagnostic significance level, we obtained the following results (Table 1).

**Table 1.**

*Diagnostic informativeness criteria of Socially-Disadaptive Post-Combat syndrome*

Criteria MG vs CG			
Diagnostic informativeness criteria	$p(\chi^2)$	J	MI
maladaptive verbal and behavioral patterns of social interaction	$<0,001$	6,23	2,37
feelings of subjective distress or disharmony	$<0,001$	1,18	0,14
increased sense of justice	$<0,001$	2,43	0,52
increased tendency to defend their rights including to the level of querulant or conflicting behavior	$<0,001$	3,91	0,95
non-acceptance of civil, political, moral and ideological norms and patterns of interaction of other people	$<0,001$	2,43	0,52
dysphoricity or anger in response to a wide range of social situations	0,015	3,33	0,55
intolerance of other people's thoughts or actions	$<0,001$	2,99	0,71
increased tendency to be offended, touchiness or hurt	$<0,001$	13,11	6,07
egocentrism	0,006	2,36	0,41
nonconformity	0,010	1,61	0,22
conflictedness	$<0,001$	4,15	0,95
tendency to impulsive actions and deeds	0,015	3,33	0,55
automatic comparison of individual components of social and interpersonal interaction in the civilian environment with those available in the combat zone, giving preference to the latter	$<0,001$	3,22	0,84
yearning memories of certain components of social and interpersonal interaction in the combat zone	$<0,001$	3,22	0,84
irritability	$<0,001$	3,72	0,96
mood swings	0,033	2,43	0,35
a wide range of low-significant substressful social factors exacerbate symptoms	$<0,001$	13,22	6,30
a latency period from a few days to one month after leaving the combat zone	$<0,001$	8,45	3,62
stay in the combat zone for 3 months or more	0,005	0,92	0,09
the duration of symptoms is 3 months or more	0,050	0,43	0,02

• *The symptoms that had positive J scores were attributed to the diagnostic symptoms of Socially-Disadaptive Post-Combat Syndrome, while the symptoms that had negative J scores were associated with the diagnostic symptoms of PTSD.*

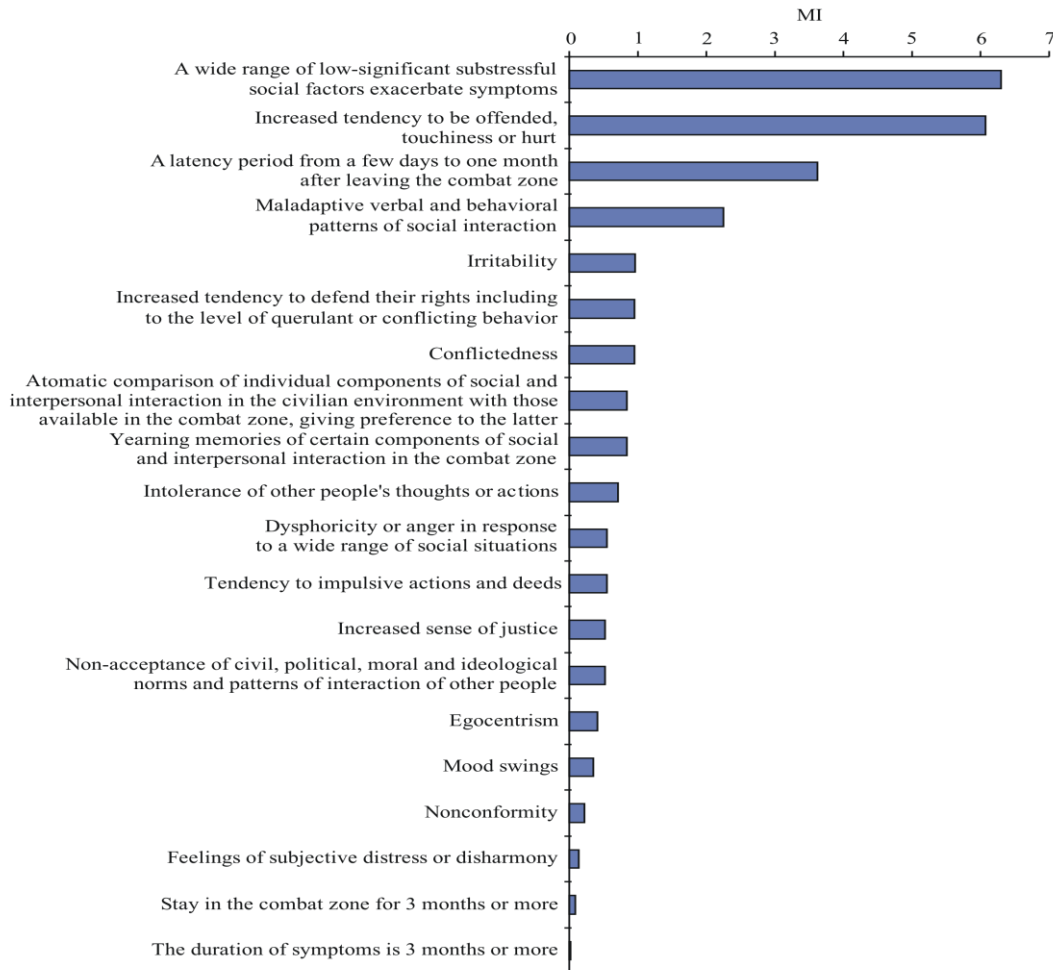
The weight of symptom informativeness is determined by the value of MI, therefore, we ranked the criteria of Socially-Disadaptive

Post-Combat syndrome from more informative to less informative in the context of their significance for differential diagnosis (Fig. 1).

According to the method of sequential analysis by A. Wald, the diagnostic conclusion (in this case, the conclusion about the presence of Socially-Disadaptive Post-Combat Syndrome in the patient) is made based on the summation of J values for each diagnostic criterion; the level of significance of the conclusion is indicated by the threshold value of the J sum ( $\sum J$ ): when  $\sum J \geq 13$ ,

the probability of the conclusion is  $p < 0.05$ ; when  $\sum J = \geq 20$ , the probability of the conclusion is  $p < 0.01$ ; and when  $\sum J = \geq 30$ , the probability of the conclusion is  $p < 0.001$ .

Thus, the group of most significant criteria, which, according to the MI ranking, reach a sum of  $J \geq 30$ , includes the first three criteria from Fig. 1.

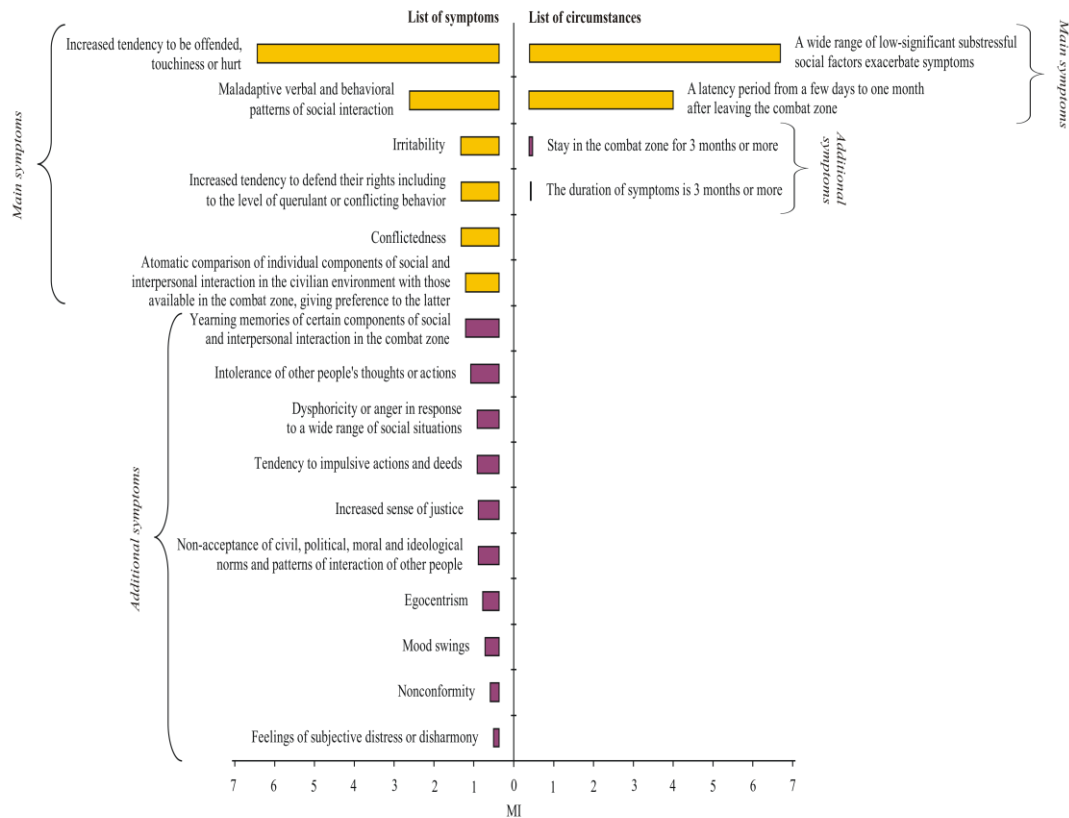


**Fig. 1.** Ranking of criteria of Socially-Disadaptive Post-Combat syndrome in order of strength of their diagnostic value (MI)

In the next stage, we differentiated the diagnostically significant criteria of Socially-Disadaptive Post-Combat Syndrome into two groups: symptoms and circumstances. Criteria such as a latency period from a few days to one month after leaving the combat zone, a wide range of low-significant substressful social factors exacerbating symptoms, stay in the combat zone for 3 months or more, and the duration of symptoms being 3 months or more

were excluded from the general list of diagnostic symptoms and placed in an additional list of circumstances because they are not symptoms per se but indicators of the circumstances contributing to the symptomatology. The rest of the criteria were included in the main list of symptoms. The final ranking of criteria for diagnosing Socially-Disadaptive Post-Combat Syndrome is presented in Fig. 2.





**Fig. 2.** Ranking of symptoms and circumstances of Socially-Disadaptive Post-Combat syndrome in order of strength of their diagnostic value (MI)

Thus, the group of the most significant criteria, which, according to the MI ranking, reach a sum of  $J \geq 30$ , includes the first six symptoms from Fig. 2. Therefore, based on the MI ranking (Fig. 2), the most crucial and sufficient symptoms, from a diagnostic perspective, for reliably establishing the diagnosis of Socially-Disadaptive Post-Combat Syndrome, are as follows: increased tendency to be offended, touchiness or hurt, maladaptive verbal and behavioral patterns of social interaction, irritability, increased tendency to defend their rights, including to the level of querulant or conflicting behavior, conflictedness, automatic comparison of individual components of social and interpersonal interaction in the civilian environment with those available in the combat zone, giving preference to the latter. These symptoms are fundamental to the studied

syndrome and serve as criteria for differentiating it from PTSD. However, the rest of the symptoms are also important and can be considered additional symptoms.

We classified circumstances such as "a latency period from a few days to one month after leaving the combat zone" and "a wide range of low-significant substressful social factors exacerbate symptoms" as obligatory criteria of the circumstances, considering their high MI scores. While the rest were categorized as optional criteria of circumstances.

Based on the established list of criteria, we developed an instrument for the diagnosis and differential delineation of Socially-Disadaptive Post-Combat Syndrome from PTSD (Fig. 3).

**«Diagnostic Scale of Socially-Disadaptive Post-Combat syndrome»**

Patient name: \_\_\_\_\_

Obligatory criteria of the circumstances\*:

- a latency period from a few days to one month after leaving the combat zone
- a wide range of low-significant substressful social factors exacerbate symptoms

Optional criteria of circumstances:

- stay in the combat zone for 3 months or more
- the duration of symptoms is 3 months or more

No.	Symptom	J	A sign of the presence of a symptom
1	Increased tendency to be offended, touchiness or hurt	13,11	
2	Maladaptive verbal and behavioral patterns of social interaction	6,23	
3	Irritability	3,72	
4	Increased tendency to defend their rights including to the level of querulant or conflicting behavior	3,91	
5	Conflictedness	4,15	
6	Automatic comparison of individual components of social and interpersonal interaction in the civilian environment with those available in the combat zone, giving preference to the latter	3,22	
7	Yearning memories of certain components of social and interpersonal interaction in the combat zone	3,22	
8	Intolerance of other people's thoughts or actions	2,99	
9	Dysphoricity or anger in response to a wide range of social situations	3,33	
10	Tendency to impulsive actions and deeds	3,33	
11	Increased sense of justice	2,43	
12	Non-acceptance of civil, political, moral and ideological norms and patterns of interaction of other people	2,43	
13	Egocentrism	2,36	
14	Mood swings	2,43	
15	Nonconformity	1,61	
16	Feelings of subjective distress or disharmony	1,18	
Total ( $\sum J$ ):			

\* - All obligatory criteria of the circumstances must be present to establish a diagnosis.

Reference values:

- $\sum J \geq 13$  - diagnosis of Socially-Disadaptive Post-Combat syndrome possible, the probability of diagnosis is 95%,  $p < 0,05$ ;
- $\sum J = \geq 20$  - diagnosis of Socially-Disadaptive Post-Combat syndrome probable, the probability of diagnosis is 99%,  $p < 0,01$ ;
- $\sum J = \geq 30$  - diagnosis of Socially-Disadaptive Post-Combat syndrome reliable, the probability of diagnosis is 99,9%,  $p < 0,001$ .

**Fig. 3.** The form of Diagnostic Scale of Socially-Disadaptive Post-Combat syndrome

We, therefore, propose the developed instrument "Diagnostic Scale of Socially-Disadaptive Post-Combat Syndrome among PTSD" for screening and diagnosing mental disorders in combatants. We acknowledge that this scale will also be beneficial to healthcare professionals for identifying Socially-Disadaptive Post-Combat Syndrome as a comorbid condition.

**Discussion**

War and post-war periods differ in terms of a surge in mental pathology associated with combat-related psychological trauma. The question of the specificity of psychological trauma in different wars remains debatable. There are indications that the nature of the war and its localization may impose certain

characteristics on the clinical presentation of mental disorders in combatants and veterans, leading to the identification of new, hitherto undescribed psychiatric disorders (Adler, & Gutierrez, 2022; Cypel, DePhilippis, & Davey, 2023; Kozhyna, Zelenska, Viun, Khaustov, & Asieieva, 2021).

A relevant example is the Gulf War syndrome - a condition characterized by a complex of symptoms that puzzled healthcare professionals for a considerable period and was only identified in participants of the war in the Persian Gulf. Additionally, one-third of the sailors in the Norwegian merchant navy became disabled due to War Sailor Syndrome (Askevold, 1976; Boman, 1982; Malt, & Weisaeth, 1989; Minshall, 2014).

However, most of these conditions are not specific to a particular military conflict or national contingent and can be observed in different wars. For example, PTSD is one such condition. While extensively described among American veterans of the Vietnam War, it is also diagnosed in other cases (Magruder et al., 2015; Thakur et al., 2022).

In this study, we report on the criteria for Socially-Disadaptive Post-Combat Syndrome in Ukrainian combatants who participated in the ATO / JFO. The condition we described leads to social maladjustment among military personnel after returning from the combat zone and may be observed as a comorbid disorder, further complicating their well-being. We believe that it requires further clarification of the symptom continuum, and conducting research on combatants and veterans of other wars would be beneficial.

### Conclusions

In this study, we identified symptoms of Socially-Disadaptive Post-Combat Syndrome that significantly differ from PTSD in combatants. Based on their systematization, we constructed a ranking of diagnostic informativeness criteria in ascending order of their diagnostic significance, categorizing these criteria into symptoms and circumstances.

By considering the diagnostic significance of the symptoms, we were able to distinguish the main symptoms and additional symptoms of Socially-Disadaptive Post-Combat Syndrome.

We developed the "Diagnostic Scale of Socially-Disadaptive Post-Combat Syndrome among PTSD" and propose its clinical utilization. The proposed scale can be used for screening and diagnosing mental disorders, including comorbid conditions, among combatants and veterans.

The diagnostic scale developed by us consists of two sections: a list of criteria of the circumstances (comprising 4 criteria - 2 obligatory criteria and 2 optional criteria) and a list of symptoms (comprising 16 symptoms).

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