Published Online: 2025 November 10

Review Article

Advancements in the Diagnosis and Treatment of War-Related Post-traumatic Stress Disorder: A Narrative Review

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Received: 29 April, 2025; **Revised:** 5 November, 2025; **Accepted:** 7 November, 2025

Abstract

Context: War-related post-traumatic stress disorder (WPTSD) is a mental health condition caused by exposure to extreme traumatic events related to war. Its core symptom cluster includes re-experiencing the traumatic event, avoidance behavior, negative changes in cognition and emotion, and increased arousal. Due to the persistence of global conflicts and the diversification of the nature of wars, the incidence rate of WPTSD is rising, affecting both military personnel and civilians in conflict areas. The WPTSD causes significant distress, impairs social functioning, and imposes a substantial burden on families and society. Therefore, we conducted a comprehensive review of the latest advancements in WPTSD research by analyzing existing reports on symptoms, diagnosis, and treatment.

Evidence Acquisition: The researcher conducted a comprehensive search of all articles published from January 2004 to December 2024 in the Web of Science (core collection), PubMed/Medline, and CNKI. The search utilized the keywords “PTSD” and “War”, restricting results to articles published in Chinese or English.

Results: The diagnostic criteria for WPTSD are continuously evolving. The Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition, Text Revision (DSM-5-TR), and the International Classification of Diseases, Eleventh Revision (ICD-11), have refined these criteria, emphasizing symptom diversity and core manifestations. Clinical assessment tools, such as the Clinician-Administered Post-traumatic Stress Disorder Scale (CAPS) and the post-traumatic stress disorder Checklist for DSM-5 (PCL-5), are widely used. Treatment methods, including first-line psychotherapy [trauma-focused cognitive behavioral therapy (TF-CBT), eye movement desensitization and reprocessing (EMDR), and virtual reality exposure therapy (VRET)], pharmacotherapy, and innovative approaches, have demonstrated application value in WPTSD. Significant progress has been made in the diagnosis and treatment of WPTSD; however, there remain some limitations.

Conclusions: It is necessary to further enhance cross-cultural research to optimize diagnostic tools, promote the clinical application of biomarkers and neuroimaging to achieve objective diagnosis, explore multimodal combined treatments and personalized treatment models based on artificial intelligence for refractory patients, conduct long-term follow-up to develop comprehensive rehabilitation models, and strengthen military-civilian cooperation to integrate social support and vocational rehabilitation.

Keywords: Diagnosis, Treatment, War-Related Post-traumatic Stress Disorder

1. Context

War post-traumatic stress disorder (WPTSD) refers to a range of characteristic psychological symptoms that manifest in individuals following the experience or observation of extreme traumatic events related to warfare. As global conflicts persist and the nature of warfare diversifies, the incidence of war-related post-traumatic stress disorder (PTSD) is increasing, presenting a significant challenge that adversely affects

How to Cite: Shi L, Leng W T, Song P Y, Sun Q, Ren F, et al. Advancements in the Diagnosis and Treatment of War-Related Post-traumatic Stress Disorder: A Narrative Review. Iran J Psychiatry Behav Sci. 2025; 19 (4): e162324. https://doi.org/10.5812/ijpbs-162324.

the mental health of both military personnel and civilians. According to relevant investigations and research, the prevalence of PTSD among military personnel engaged in combat ranges from 10% to 30%, while the prevalence among civilians residing in conflict zones is also noteworthy (1, 2). War-related PTSD not only inflicts considerable suffering on those affected but also leads to substantial impairments in social functioning, thereby imposing a heavy burden on families and society at large. In recent years, as the understanding of war-related PTSD has deepened, its diagnostic criteria and treatment methodologies have been continually refined and enhanced. This article aims to systematically review the latest advancements in the diagnosis and treatment of war-related PTSD by synthesizing existing literature, thereby providing valuable references for clinical practice and further research.

2. Evidence Acquisition

This article provides a comprehensive review of the existing research concerning the symptoms, diagnosis, and treatment of WPTSD. The literature search was conducted across multiple databases, including Web of Science (core collection), PubMed/Medline, and CNKI. The keywords utilized in this search were "PTSD" and "War". The scope of the search was restricted to articles published in English and Chinese from January 2004 to December 2024. Initially, studies were screened based on their titles and abstracts; subsequently, relevant articles underwent a thorough evaluation of their full texts. The primary criterion for inclusion in this narrative review was that the studies must primarily address one or more aspects related to the symptoms, diagnosis, or treatment of WPTSD. Additionally, some references cited within the selected studies were also consulted.

3. Results

3.1. Symptoms

3.1.1. Definitions and Characteristics

Research on WPTSD originated from the observation of a series of symptoms exhibited by soldiers during the American Civil War in the nineteenth century. Initially, clinicians referred to these symptoms as "soldier's heart". However, as understanding evolved, these manifestations were redefined and are now recognized as PTSD (3). With advancements in our comprehension of stress disorders, PTSD is currently characterized as a serious mental illness triggered by various significant traumatic events experienced by an individual. War-related PTSD, a specific subtype of PTSD, is particularly associated with warfare — an extreme form of human violence. In comparison to general PTSD, the traumatic experiences associated with war-related PTSD are typically more severe and enduring. Affected individuals often endure multiple traumas, including direct combat exposure, witnessing the deaths or injuries of fellow soldiers, and experiencing torture at the hands of captors (4). These traumatic incidents pose profound threats and evoke intense fear that far surpasses ordinary daily experiences for most people, making them susceptible to lasting mental and psychological damage.

3.1.2. Core Symptom Manifestations

The core symptom clusters of war-related PTSD encompass four primary dimensions: Re-experiencing traumatic events, avoidance behaviors, negative alterations in cognition and emotion, and heightened arousal (5, 6). Re-experiencing trauma is characterized by recurrent intrusive memories, nightmares, or flashbacks; individuals often perceive the traumatic event as if it were occurring anew. Avoidance behaviors involve actively steering clear of people, places, or activities associated with the trauma and a reluctance to engage in discussions about the traumatic experiences. Negative alterations in cognition and emotion are evident through detrimental self-perceptions and perceptions of others, persistent negative emotional states, diminished interest in previously enjoyed activities, and feelings of alienation. Heightened arousal manifests as excessive vigilance, an exaggerated startle response, irritability, and sleep disturbances. These symptoms persist for over one month and result in significant impairment of social functioning.

3.1.3. Neurobiological Basis

From a neurobiological perspective, PTSD involves functional abnormalities in multiple brain regions. Research has shown that patients often exhibit reduced hippocampal volume, which is associated with memory

dysfunction; hyperactivity of the amygdala, leading to heightened fear responses; and diminished function of the prefrontal cortex, which adversely affects emotional regulation (7). In terms of neuroendocrine factors, adverse physiological arousal during the recollection of traumatic events is frequently observed to be related to alterations in neuroendocrine function, potentially linked to the activation of the sympathetic-adrenal-medullary system and the hypothalamic-pituitary-adrenal axis (8). Furthermore, genetic factors play a significant role in disease susceptibility; for instance, researchers have identified that polymorphisms in GSTM1 and GSTM2 genes may increase an individual's risk of developing PTSD following war-related trauma (9).

3.2. Diagnostic Progress

3.2.1. Evolution of Diagnostic Criteria

The diagnostic criteria for PTSD have undergone multiple transformations over the years. The American Psychiatric Association's Diagnostic and Statistical Manual of Mental Disorders (DSM) first recognized PTSD as an independent diagnostic category in its third edition (DSM-III). Since then, the criteria have been continuously refined and enhanced, culminating in the latest version, Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition, Text Revision (DSM-5-TR). Notably, DSM-5 reclassified PTSD from anxiety disorders to a new category termed "Trauma and Stressor-Related Disorders", while also introducing symptom subtypes (10). Recent updates expanded the definition of traumatic events, reorganized symptom clusters, and added negative cognitive and emotional symptoms (11). In contrast, the International Classification of Diseases, Eleventh Revision (ICD-11) proposes a more streamlined set of diagnostic criteria for PTSD, emphasizing core symptoms such as re-experiencing, avoidance, and persistent feelings of threat (12). For war-related PTSD diagnoses, adherence to general PTSD diagnostic standards is essential; it should be explicitly noted that the traumatic experiences or events primarily involve severe trauma related to warfare.

3.2.2. Clinical Assessment Tools

In terms of assessment tools, clinicians commonly utilize the Clinician-Administered Post-traumatic Stress Disorder Scale (CAPS) and the post-traumatic stress disorder Checklist for DSM-5 (PCL-5). These instruments demonstrate good reliability and validity, making them the two most widely used methods for measuring PTSD at present (13). The CAPS-5 is primarily a structured interview tool, in which an interviewer asks questions and scores responses; conversely, PCL-5 is mainly a self-report scale completed by patients. Both tools assess PTSD symptoms over the past month. However, they differ in several key aspects. Firstly, regarding the assessment process and scoring options: In PCL-5, respondents report their level of distress associated with each symptom experienced in the past month on a scale from 0 ("not at all") to 4 ("extremely"). In contrast, CAPS-5 involves an interviewer who asks a series of questions to evaluate not only whether symptoms occurred in the previous month but also their intensity (i.e., severity during typical episodes such as minimal, clearly present, significant, or extreme), frequency of occurrence, and non-specific symptoms (e.g., sleep disturbances). The interviewer then integrates this information according to predetermined scoring rules to determine symptom severity ratings ranging from 0 ("none") to 4 ("extreme"). Consequently, PCL-5 scores reflect perceived distress related to each symptom, while CAPS-5 scores indicate symptom intensity — which varies by symptom type (for example, the degree of distress caused by nightmares; extent of avoidance behaviors; conviction levels regarding distorted beliefs) — as well as frequency and trauma relevance. In recent years, researchers have developed specialized versions targeting war-related PTSD, such as the Military Version of PCL (PCL-M), which aligns more closely with military experiences. The 17 items within PCL-M describe each relevant symptom outlined in DSM-5 while linking them specifically to stress-inducing military experiences. This tool serves as a universal screening instrument for diagnostic purposes (14). Utilizing a Likert-type scale ranging from 1 ("not at all") to 5 ("extremely"), it indicates severity levels for these symptoms; total scores exceeding 49 are considered indicative of potential PTSD (15). According to DSM-5 criteria for diagnosing PTSD — requiring positive endorsement of at least one re-experiencing item, three avoidance items, and two hyperarousal items — PCL-M functions effectively as a brief self-report tool that can readily screen military personnel who may be experiencing underlying PTSD

(16). Indeed, combatants in wartime contexts face high-risk situations for PTSD; thus, employing this straightforward self-assessment measure significantly aids in mitigating non-combat attrition among service members.

3.2.3. Neuroimaging and Biomarker

Neuroimaging and biomarker studies provide objective evidence for the diagnosis of PTSD. Functional magnetic resonance imaging (fMRI) research has revealed that patients with war-related PTSD exhibit a pattern characterized by hyperactivation of the amygdala and insufficient regulation from the prefrontal cortex during emotional tasks (17). Researchers have identified that a smaller right hippocampal volume, as determined through MRI scans, can exacerbate individuals' external symptoms related to traumatic events (18). Marcolini et al. observed abnormalities in the white matter of the uncinate fasciculus in veterans with PTSD, which may be associated with cognitive decline in these patients (19). In terms of biomarkers, recent studies have confirmed that inflammatory factors such as interleukin-6 (IL-6), tumor necrosis factor-alpha (TNF-α), plasma C-reactive protein, platelet monoamine oxidase, microRNAs, and epigenetic markers are closely linked to the onset of PTSD (20-22). However, due to a lack of evidence-based support, these biological indicators have not yet met clinical application standards. Nevertheless, they provide important insights into understanding disease mechanisms and developing objective diagnostic methods. Genetic research has also identified certain gene polymorphisms (such as those related to D2 dopamine receptors, FKBP5, and rs3852144) associated with susceptibility to war-related PTSD; these may serve as potential risk prediction indicators in future studies (23-25).

3.3. Treatment Progress

3.3.1. Psychotherapeutic Approaches

Psychotherapy is the first-line treatment for PTSD, with trauma-focused cognitive behavioral therapy (TF-CBT) and eye movement desensitization and reprocessing (EMDR) being the well-supported by evidence and recognized by psychiatrists both domestically and internationally (26). The TF-CBT assists patients in processing traumatic memories and altering negative cognitions through exposure techniques and cognitive restructuring. The EMDR employs bilateral stimulation to facilitate the adaptive processing of traumatic memories. These therapies have demonstrated moderate to large effect sizes in both military personnel and civilian populations. In recent years, virtual reality exposure therapy (VRET), as an emerging technology, has provided controlled exposure treatment by simulating battlefield environments, allowing patients to revisit traumatic events while reducing their sense of threat. Advanced systems monitor anxiety levels and help individuals process their feelings, aiming to diminish personal experiences of fear (27).

3.3.2. Pharmacological Treatment Options

In terms of pharmacological treatment, selective serotonin reuptake inhibitors (SSRIs) such as sertraline and paroxetine remain the first-line medications, demonstrating efficacy particularly for core symptoms, especially emotional disturbances. Serotonin-norepinephrine reuptake inhibitors, such as venlafaxine, are also recommended for use. For symptoms of hyperarousal, α-1 adrenergic antagonists like prazosin may be considered to improve sleep quality and reduce nightmares (28). Emerging research directions in pharmacotherapy include glutamatergic modulators (e.g., ketamine) (29), glucocorticoids (30), and neuroactive steroids (31); these agents may exert their effects by modulating the processes involved in the consolidation and extinction of fear memories.

3.3.3. Innovative Therapeutic Approaches

Innovative therapeutic methods continue to emerge, showing promising applications. Virtual reality technology is utilized not only for exposure therapy but has also been integrated with biofeedback to develop novel intervention strategies. Neurofeedback therapy employs real-time fMRI or electroencephalography (EEG) feedback to train patients in regulating activity within specific brain regions; preliminary studies indicate improvements in PTSD symptoms (32). Smartphone-based application programs provide convenient tools for symptom monitoring and intervention, making them particularly suitable for frontline soldiers and refugees forced into warfare

situations (33). An interdisciplinary comprehensive treatment model that combines psychotherapy, pharmacotherapy, and social rehabilitation is becoming a new trend in treating war-related PTSD. Additionally, considering the unique challenges posed by wartime environments, stress inoculation training (SIT) exposes soldiers to safe environments with the aim of enhancing their ability to cope with stressors encountered in real-life scenarios; research has confirmed that SIT significantly alleviates anxiety among military personnel while improving performance under pressure (34). Furthermore, mindfulness practices and meditation have been seamlessly integrated into psychological training within military contexts. Mindfulness-based mental health training programs provide compelling evidence that mindfulness training can substantially enhance attention and cognitive resilience under high-stress conditions. Moreover, mindfulness training has demonstrated dual benefits: Reducing stress while simultaneously enhancing emotional regulation and situational awareness among soldiers — contributing to a more holistic approach toward mental health management (35).

4. Discussion

4.1. Conclusions

In recent years, significant progress has been made in the diagnosis and treatment of war-related stress disorders. Diagnostic criteria have been continuously refined, placing greater emphasis on the diversity and complexity of symptoms. Assessment tools are becoming increasingly sophisticated, and advancements in neurobiology are providing new directions for objective diagnosis. Psychotherapy, particularly trauma-focused therapy, has demonstrated lasting efficacy; pharmacological treatment plans are becoming more personalized; and emerging technologies such as virtual reality therapy and neurofeedback show promising potential for application. However, numerous challenges remain to be addressed, including effective interventions for treatment-resistant patients, improvements in long-term prognosis, and issues related to cross-cultural adaptability. Future research could focus on biomarker-guided individualized treatment strategies, explore novel methods for regulating neural plasticity, and enhance collaboration between military and civilian healthcare systems. The aim is to provide more effective support for individuals potentially affected by trauma in our country's future.

4.2. Limitations and Development

This article provides a systematic review of the advancements in the diagnosis and treatment of WPTSD; however, certain limitations remain. Firstly, existing studies predominantly focus on military populations from Europe and North America or specific conflict regions, lacking cross-cultural and cross-regional validation. This limitation may restrict the universality of diagnostic criteria and treatment protocols. Secondly, although neuroimaging and biomarker research offer new directions for objective diagnosis, their clinical application still faces challenges, including insufficient sensitivity and specificity of biomarkers, as well as a lack of standardized testing procedures. As a result, current diagnoses rely heavily on subjective scale assessments. Furthermore, there is limited research on intervention strategies for patients with treatment-resistant conditions. Evidence regarding the long-term efficacy and safety of some emerging therapies — such as neurofeedback and esketamine — is still inadequate to meet complex clinical needs.

Future research should aim to overcome these existing limitations from multiple dimensions. On one hand, it is essential to enhance cross-cultural cohort studies that incorporate trauma characteristics across different wartime contexts to optimize the applicability of diagnostic tools; on the other hand, efforts should be made to promote the clinical translation of biomarkers alongside neuroimaging technologies in order to establish an evidence-based objective diagnostic system. For patients who are resistant to treatment, exploring multimodal combination therapies (e.g., drug-neuroregulation-psychological intervention synergy) could be beneficial, while utilizing artificial intelligence technology to develop personalized treatment prediction models. Additionally, emphasis must be placed on long-term follow-up studies that construct comprehensive rehabilitation models encompassing physiological, psychological, and social functioning. Strengthening collaboration between military and civilian healthcare systems will also be crucial by integrating social support and vocational rehabilitation

into therapeutic frameworks aimed at achieving a transition from symptom relief to holistic recovery.

Footnotes

Authors' Contribution: The first draft was written and revised by L. S. W. L. and Q. S. collected and organized the literature on PTSD in recent years. P. S. and F. R. further refined the analysis of the collected literature and provided crucial support for the manuscript. Y. T. and Y. W. supervised all aspects of the research, including literature analysis, the design of the initial draft ideas, and the writing of the manuscript based on the initial draft. All authors participated in the review and finalization of the manuscript, and all stakeholders read and approved the final version.

Conflict of Interests Statement: The authors declare no conflict of interest.

Funding/Support: The study received no funding/support.

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