REVIEW

Psychiatry and Clinical Psychopharmacology 2025;35(Suppl. 1):S152-S167
DOI: 10.5152/pcp.2025.241019

Evolving Psychotherapeutic Approaches for PTSD: Beyond the Fear-Based Model

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ABSTRACT

Traditional trauma-focused psychotherapies (TFPs) were developed based on an anxiety disorder model of posttraumatic stress disorder (PTSD). However, PTSD is a more complex disorder with heterogeneous onset, presentation, trajectory, and treatment responsivity. As half of treated patients do not respond to first-line treatments, innovative therapies are emerging to improve outcomes. This narrative review of therapist-delivered psychotherapies for PTSD focuses on interventions not yet endorsed by clinical guidelines. A systematic search of MEDLINE and American Psychological Association PsycINFO was conducted for English-language human clinical studies, guidelines, and reviews related to PTSD psychotherapy through June 29, 2024. Data were thematically analyzed, focusing on how emerging interventions modify or diverge from current guideline-recommended treatments. The review identified 4 key themes for improving trauma therapy: (1) optimizing existing TFPs, (2) adapting psychotherapies used for other conditions, (3) reimagining exposure therapies, and (4) new therapeutic modalities. New exposure treatments include those capitalizing on memory reconsolidation science, combination with pharmacotherapies, neuromodulation, or virtual reality technologies, and mind-body and somatic psychotherapies. Moral injury, identity, and spirituality-focused therapies aim to resolve intense internal conflicts, guilt and shame, and issues of meaning and purpose. Finally, multi-modal treatments like 3MDR and psychedelic-assisted psychotherapies have multiple synergistic mechanisms. Ongoing research will be crucial to validating emerging approaches and optimizing their combined potential. A PTSD staging model may provide a structured framework for rigorous empirical evaluation and clinical implementation. Future research should prioritize randomized controlled trials with diverse patient populations and long-term follow-up to ensure their safety, efficacy, and scalability.

ARTICLE HISTORY

Received: October 29, 2024
Revision Requested: February 12, 2025
Last Revision Received: February 18, 2025
Accepted: March 15, 2025
Publication Date: August 11, 2025

INTRODUCTION

Posttraumatic Stress Disorder

Modern psychiatry first conceptualized posttraumatic stress disorder (PTSD) as a fear-based anxiety disorder with a failure of regulatory mechanisms in the face of traumatic reminders.[1] An often chronic, disabling condition, PTSD impacts 10%-20% of women and 6%-8% of men globally.[1] Core features include re-experiencing symptoms such as intrusive memories, flashbacks, or distressing dreams, avoidance of internal and external traumatic reminders, and a heightened sense of threat.[2,3] These diagnostic criteria, however, do not fully capture the lived experience, suffering, and functional challenges of those living with PTSD. Traumatic memories are involuntary, fragmented, decontextualized, sensation-based, and experienced as happening in the present moment.[4] Repeated experiencing of the terror, powerlessness, horror, and other aspects of trauma leads to emotional dysregulation, generalized posttraumatic beliefs, and pervasive negative emotions that constrain perception, break down relationships important for recovery, and disturb identity.[1,5]

The latest diagnostic criteria changes reflect some of these broader consequences of trauma. For example, the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5), moved PTSD from anxiety disorders to a new Trauma and Stressor-Related Disorders category.[2] Updated diagnostic criteria include persistent negative beliefs,

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Cite this article as: Burback L, Winkler O, Jetly R, et al. Evolving psychotherapeutic approaches for PTSD: beyond the fear-based model. *Psychiatry Clin Psychopharmacol*. 2025;35(Suppl. 1):S152-S167.

mood disturbance, reckless or self-destructive behavior, and non-fear emotional responses like guilt and shame. The PTSD dissociative subtype (PTSD-DS) now categorizes cases with persistent or recurring depersonalization (ie, sense of detachment from oneself) or derealization (ie, sense of unreality of surroundings), based on evidence of distinct neurobiology.[2,6] The PTSD-DS is associated with emotional overmodulation of limbic areas, explaining emotional numbing and detachment, and specific alterations in neurochemistry, brain connectivity, and states of consciousness.[1,4,7] The International Classification of Diseases 11th edition introduced Complex PTSD (CPTSD), adding disturbances in self-organization criteria, including affective dysregulation, negative self-concept, and relationship disturbances; affective dysregulation often includes recurrent dissociative symptoms.[3,5] Both diagnoses are associated with high levels of comorbidity and likely exist within a spectrum of sequelae following early, repetitive, inescapable, or severe traumatic events, often combined with attachment disruption.[1,5]

Guideline-Recommended Psychotherapies and Clinical Realities

Trauma-focused psychotherapies (TFPs) are the most effective PTSD treatments and form the backbone of guideline recommendations, along with a few medications and non-trauma-focused psychotherapies (NTFPs) (Table 1).[1] Trauma-focused psychotherapies are typically manualized, time-limited, include past trauma-related memory content, and focus on reducing core PTSD symptoms. The first TFP, Prolonged Exposure (PE), was developed based on animal fear conditioning models and features prolonged, repetitive exposures inducing fear extinction and habituation.[8] This aligned with the conceptualization of PTSD as an anxiety disorder. Trauma-focused Cognitive Behavior Therapy (TF-CBT) and Cognitive Processing Therapy (CPT) emphasize cognitive reprocessing and behavioral strategies based on cognitive models of PTSD, emphasizing the importance of maladaptive thinking. Next, Eye Movement Desensitization and Reprocessing (EMDR) introduced the Adaptive Information Processing model, positing that dysfunctionally stored memories were the basis of a range of psychiatric symptoms. EMDR combines exposure, processing of emotions and bodily sensations, cognitive reprocessing, and dual attention tasks such as alternating eye movements. More recently, Narrative Exposure Therapy (NET) and Brief Eclectic Psychotherapy (BEP) achieved recommendation status in some guidelines; these add components addressing issues of identity, loss, and meaning-making.[1]

MAIN POINTS

- Traditional therapies fall short for many; emerging methods target the multifaceted nature of posttraumatic stress disorder, including its impact on self-referential processing.
- New exposure-based therapies harness developments in memory science, using prediction error to update traumatic memories with positive contextual information.
- Techniques incorporating somatosensory processing, such as somatic psychotherapies and virtual reality-assisted treatments, may improve trauma memory resolution and facilitate emotion regulation, higher-order cortical functions, and positive embodied experiences of self.
- Other therapies focus on addressing existential or identity conflicts, guilt, and shame, offering paths to forgiveness and meaning, or using tools like psychedelics to help dissolve trauma-associated rigidity and promote reconnection and self-compassion.
- A proposed framework aims to tailor treatments to stages of illness and trauma complexity, enhancing clinical applicability and patient outcomes.

However, despite this evolution, PTSD outcomes remain suboptimal, reflecting unaddressed variables and the heterogeneity of the disorder.[9] Up to one half of PTSD patients do not respond to first-line TFPs adequately, and at least a quarter dropout.[1,10] Not surprisingly, robust response is linked to greater brain activation in areas related to fear neurocircuitry and stress responses, indicating that individuals with prominent fear-related symptoms may benefit most.[11] A plethora of pre-, peri-, and posttraumatic risk factors, comorbidities, and trauma-related characteristics, such as trauma type (e.g., service-related, MI, childhood, interpersonal), trauma severity, total trauma burden, and time since trauma occurred, portend poorer outcomes.[1,11,12] More complex or severe clinical subtypes with prominent non-fear responses (e.g., grief, anger, guilt, shame), such as PTSD-DS, CPTSD, military PTSD, PTSD with MI or prolonged grief, and dysphoric PTSD, have greater rates of TFP non-response.[1,5,9,12,13] Therefore, traditional TFPs may not adequately address the psychobiological consequences of traumas rooted in loss, betrayal, humiliation, moral transgressions, or entrapment. In addition, dissociation, avoidance, cognitive inflexibility, and executive deficits can impair engagement and extinction learning relevant to TFP mechanisms.[11,12]

Memory Science and Psychotherapy

Advances in memory science are informing the field and offer potential for improving trauma therapy. For example, suppressing memory retrieval has been found to reduce intrusions and improve emotion regulation, possibly by activating prefrontal mechanisms that suppress hippocampal and amygdala activity and engage extinction processes.[14] Another example is the impact of findings related to memory reconsolidation, the mechanism by which memories are updated.[15] Research indicates that accessing a traumatic memory allows labilization, a temporary destabilization that makes the memory vulnerable to change during reconsolidation. However, exposure is not enough—new information must be registered that creates a mismatch (i.e., prediction error) between expectation and present moment experience, such as a positive felt sense of

Table 1. Psychotherapies Recommended in At Least One Posttraumatic Stress Disorder Guideline (Adapted from Burback et al, 2024; Hamblen et al, 2019; and Lang et al, 2023)[1,70,71]

Recommended Psychotherapies for PTSD	
Psychotherapy	Description
Commonly Recommended First-line Interventions	
Prolonged exposure (PE)	Includes prologed in vivo and imaginal exposure to traumatic memories, and discussion of thoughts and feelings. Emphasizes extinction learning and habituation to challenge catastrophic expectations.
Cognitive processing therapy (CPT)	CPT theorizes that PTSD symptoms result from maladaptive cognitions related to traumatic events. CPT focuses on the discussion and cognitive reprocessing of key posttraumatic cognitive themes, such as safety, trust, power, control, self-esteem, and intimacy. It may also address shame, guilt, and mistrust.
Eye movement desensitization and reprocessing (EMDR)	Includes exposure to memories while applying a dual attention task, such as alternating eye movements. Dual attention tasks are thought to tax working memory and thereby reduce the vividness and emotionality of the memory. EMDR also includes a form of cognitive restructuring.
Trauma-focused CBT (TF-CBT)	Includes CBT principles combined with trauma memory exposure; in some studies, this term is combined with trauma-focused cognitive therapy, which focuses on addressing excessively negative appraisals of trauma, its consequences, or one's own responses to the trauma.
Recommended in Some Guidelines	
Narrative exposure therapy (NET)	Based on PE and TF-CBT, NET includes exposure and focuses on a person's life narrative, improving the contextualization of the traumatic experiences within a person's whole life and identity. It also includes trauma exposure, including cognitive, emotional, and sensory elements.
Brief eclectic psychotherapy (BEP)	Combines elements of CBT, imaginal exposure, psychodynamic psychotherapy, and grief therapy. It includes components to address trauma-related grief, anger, shame, and guilt, and to foster meaning-making regarding traumatic experiences. It also includes a closure ritual (e.g., writing a letter to a perpetrator and burning it at the end of treatment).
Stress inoculation training (SIT)	Based on CBT, SIT involves helping people identify and track their stress and learn coping skills to better manage symptoms, such as deep muscle relaxation, cognitive restructuring, breathing exercises, assertiveness skills, thought stopping, and role play.
Present centered therapy (PCT)	Focuses on increasing adaptive responses to current life stressors and difficulties related to trauma symptoms. It includes psychoeducation, facilitating safety and hope, validation and support, expression of feelings, and problem-solving.
Interpersonal psychotherapy (IPT)	Developed for MDD, IPT focuses on relational aspects contributing to illness, such as complicated bereavement, role disputes, role transitions (i.e., major life changes), and interpersonal deficits.
Cognitive behavior therapy (CBT)	CBT without a trauma focus has been moderately recommended in the 2018 ISSTS guidelines
Written exposure therapy (WET)	Five sessions of brief (30 minutes) written exposures and no homework. Weak recommendation in the 2023 American Veterans Affairs/Department of Defense guidelines.[70]
Mindfulness-based stress reduction	An 8-week, present-centered mindfulness-based program for stress, anxiety, mood, and pain management. Includes mindfulness meditation, body awareness, and non-judgmental acceptance of experience. Weak recommendation in the 2023 American Veterans Affairs/Department of Defense guidelines.[70]

BEP, brief eclectic psychotherapy; CBT, cognitive behavioral therapy; CPT, cognitive processing therapy; EMDR, eye movement desensitization and reprocessing; IPT, interpersonal psychotherapy; NET, narrative exposure therapy; PCT, present-centered therapy; PE, prolonged exposure; SIT, stress inoculation training; TF-CBT, trauma-focused cognitive behavioral therapy;WET, written exposure therapy.

safety, self-efficacy, or compassion.[4,15,16] Whereas extinction creates a new inhibitory memory that competes with the original traumatic one, reconsolidation is thought to modify the original traumatic memory with the new contextual information.[16] However, exposure without prediction error may reinforce trauma memory consolidation, for example, when high arousal or dissociation impairs perception of a new experience.[15,16]

Expanded models of Posttraumatic Stress Disorder

Expanded PTSD models also move the field forward by succinctly collating and communicating findings across disciplines that demonstrate the complexity of PTSD in humans. For example, the *Memory and Identity Theory of CPTSD* incorporates an understanding of how trauma and adversity disturb the interconnected processes underpinning memory, identity, meaning-making, and survival responses over the life course.[5] This work builds on previous theories and explains how risk factors, trauma characteristics (e.g., life-threat, loss, MI), and individual vulnerabilities co-create traumatic memories, associated negative identities, other symptoms, and comorbidities unique to each individual.[5,15] Identities are viewed as plural, based on moment-to-moment activation of memory-based states with cognitive, emotional, and somatosensory components and variable integration into coherent self-systems, depending on the degree of self-awareness. This theory also incorporates the impact of early adversity

on brain development, such as the hippocampus and prefrontal cortex, important for memory, self-awareness, and executive function.

Similarly, Kearney and Lanius (2022) introduced a hierarchical brain-body disconnect model of PTSD. This model proposes somatic sensory processing dysfunction as another key feature of the disorder, especially with early attachment disruption.[7] While integrating the cortex and limbic system, they argue that brainstem neuroscience is pivotal to understanding threat responses, formation of traumatic memory, body and self-representations, homeostasis, and consciousness.[4,7] This model highlights the importance of safe relational touch and positive bodily experiences during early life (e.g., secure attachment experiences, play) for developing the neural capacity to feel safe, capable, and worthwhile, for mindfulness and healthy socio-emotional function, and optimal vertical information processing between brain and body. Without this foundation, trauma can lead to a brain-body disconnect impairing awareness, regulatory capacities, and self-referential processing, blocking full development of a cohesive, relational, and agentive sense of self.[7]

Both the hierarchical brain-body disconnection model and the Memory and Identity Theory accentuate the importance of somatosensory processing and its relationship to identity and explain the role of developmental factors in PTSD. Implicit in these formulations are the premises that: a) PTSD is a brain-body-psyche disorder arising from a network of fear and non-fear associated memories existing within a transdiagnostic spectrum of trauma-related sequelae; b) previous life experiences, including lower intensity adversities, shape PTSD presentations; c) memory, meaning-making, identity, relationship, and survival responses are interrelated, embodied, and involve non-cognitive structures such as the brainstem; and d) exposure may overwhelm information processing capacities in some people, especially those with severe early trauma or attachment disruption. These insights are not yet adequately addressed in guideline-recommended treatments, driving efforts to innovate.

Purpose

Many new psychotherapies are entering routine clinical practice, often ahead of the evidence base, as clinicians strive to meet patient needs unmet by traditional approaches. This review will summarize and thematically organize emerging psychotherapeutic interventions not yet endorsed by PTSD clinical guidelines. This paper aims to be a resource to map the current landscape, cross-pollinating ideas, and promoting further research. Implied is the need for more holistic, neuroscientifically informed treatments capitalizing on advances in understanding PTSD and its complexity as the field continues to advance beyond fear and cognitive models.

METHODS

This narrative review of therapist-delivered psychotherapy for adults with PTSD followed a semi-structured approach, building on a recent comprehensive review that included articles up to June 2022.[1] A MEDLINE and APA PsychINFO search was conducted for English-language human clinical studies, guidelines, and reviews related to psychotherapy and PTSD from January 1, 2021, to June 29, 2024. Covidence software (Veritas Health Innovation, Melbourne, Australia) was used to remove 218 duplicates and screen the resultant 1794 articles. Additional targeted searches were conducted in MEDLINE (Ovid platform), EMBASE (OVID platform), APA PsycINFO (OVID platform), and Google Scholar as needed. As the purpose of this review was to map significant trends, a hierarchy of evidence was not applied. Articles were chosen based on whether they represented a new approach or significant update. Given article space limitations, this review excluded PTSD prevention, computerized and other non-therapist delivered treatments, and couples therapy. Results were thematically analyzed and summarized in Tables. The results section will highlight major themes, especially as they relate to how new trauma-specific interventions may modify, add to, or diverge from current guideline-recommended treatments.

RESULTS

This review identified an array of psychotherapeutic interventions for PTSD in various stages of research. Major overlapping themes include optimizing TFPs and borrowing treatments from other conditions; updating and reimagining exposure-based therapies; integrating the brain and body; focusing on MI, Self, and spirituality; and psychedelic-assisted psychotherapies (Tables 2-5).

Optimizing Trauma-Focused Psychotherapies and Borrowing from Other Conditions

A large body of work has focused on improving the efficacy of and barriers to recommended TFPs (Table 2).[1] This includes increasing cost-effectiveness through group delivery, which proves moderately less effective than individual TFPs, and intensive treatment scheduled twice weekly to twice daily.[1,17] Compressed schedules, offering structured and focused treatment, may reduce avoidance, distraction, and attrition.[1,17] Interventions combining TFPs or integrating TFPs with non-trauma-focused elements are also common. For complex cases, emotion regulation skills have been added to exposure to reduce dropouts.[1,18] Several NTFPs initially developed for other conditions are also being adapted for PTSD (Table 3).[1,19] These include cognitive behavioral approaches, mind-body-based interventions, and creative art therapies. Positive initial studies for these NTFPs suggest that exposure may not be necessary for symptom reduction in all individuals. These

Table 2. Approaches to Optimize Trauma-Focused Psychotherapies (Adapted from Burback et al, 2024)[1]

Addressing Barriers and Optimizing Current TFPs	
Strategy	Description
Improving efficiency, access, and dropout rates	Improving efficiency (e.g., eliminating unnecessary components), cost-effectiveness (e.g., group therapy formats, lay therapists, incorporating self-help or digital components), engagement, and access (e.g., remote delivery, in-home treatment).
Combining TFPs	Combining different TFPs or their components. For example, using PE to activate trauma memories before processing them with EMDR, or adding cognitive strategies to PE.
Adding non-trauma focused elements	Addition of coping or emotion regulation skills (e.g., PE+SIT, DBT+PE, STAIR+PE, STAIR+NET)[18] or exercise.[26]
Concurrent treatment of SUDs	Interventions that combine treatments for PTSD and SUDs (e.g., Creating Change, COPE).
Intensive scheduling	"Intensives" or "massed" treatment involving multiple sessions per week, in order to accelerate recovery and reduce dropout.
Altering length of exposure element	Instead of lengthy exposures (e.g., PE), use of brief exposures (e.g., Written Exposure Therapy), micro exposures (e.g., Flash Technique), titrated, pendulating (e.g., SE), or fluctuating exposure (e.g., 3MDR) have been developed.
EMDR 2.0	Adds techniques to optimize activation of the memory network and multiple and often multi-modality working memory-taxing tasks. It may incorporate modifying posture, adding music, movement, and imaginal interweaves (similar to rescripting), and techniques to titrate exposure.

DBT, dialectical behavior therapy; EMDR, eye movement desensitization and reprocessing; PE, prolonged exposure; SE, somatic experiencing; SIT, stress inoculation training; STAIR, skills training for affective and interpersonal regulation; TFP, trauma-focused psychotherapy.

therapies may also treat ancillary aspects of PTSD, such as psychosocial and relational challenges, and address poor coping skills, low mindfulness, or psychological inflexibility that maintain or complicate PTSD.[1]

Updating and Reimagining Exposure-Based Therapies

Many interventions modify exposure treatments, including those capitalizing on memory reconsolidation processes.

Table 3. Adapting Therapies Developed for Other Conditions (Adapted from Burback et al, 2024)[1]

Adapting Psychotherapies Developed for Other Conditions	
Cognitive Behavioral Approaches	
Acceptance and commitment therapy (ACT)	Emphasizes psychological flexibility through mindfulness and acceptance strategies, and committed, value-based action to change behavior.
Metacognitive therapy	Emphasizes modifying metacognitive beliefs that perpetuate rumination, worry, hypervigilance, and subsequent maladaptive behaviors. Focuses on the person's reaction to PTSD symptoms rather than trauma details.
Behavioral activation	Improves mood through activity scheduling and reinforcement strategies, understanding the impact of behavior on thoughts and emotion, and developing positive coping responses.
Skills based treatments	DBT, Seeking Safety, TARGET, and the Unified Protocol all incorporate emotion regulation skills training, often with CBT, mindfulness, and/or interpersonal components.
Schema therapy[19]	Used for personality and developmental issues, schema therapy combines cognitive and psychodynamic approaches. Goals include addressing entrenched self-defeating emotional and cognitive thinking patterns (i.e., EMS), behaviors and psychosocial patterns. Patients learn to strengthen 'healthy adult' modes through experiential techniques such as imagery rescripting and chair work.
Mind-Body Based Interventions	
Mindfulness-based treatments and meditation	Non-judgmental, compassionate attention to the present moment, which trains attention and facilitates emotion regulation and disentanglement from beliefs. These treatments include interventions like Compassion-Focused Therapy,[72] combining mindfulness-based strategies, Buddhist psychology, and a focus on embodied compassion, values, forgiveness, taking responsibility, and the transcendent Self.
Adapted yoga	May include movement-based and breathing-based interventions to improve interoceptive awareness and tolerance of bodily experience, emotion regulation, autonomic function, and connection with the body.
HRV biofeedback	Self-regulation training through modulation of vagus nerve activity, using real-time feedback from measured HRV.
Adjunctive Use of Creative Therapies	
Creative art therapies	Includes modalities such as artistic expression, dance, music, theater, and expressive writing to facilitate psychological and emotional exploration and experiencing.

ACT, acceptance and commitment therapy; CBT, cognitive behavioral therapy; DBT, dialectical behavioral therapy; EMS, early maladaptive schemas; HRV, heart rate variability; TARGET, Trauma Affect Regulation: Guide for Education and Therapy.

Table 4. New Therapies Reimagining Exposure for Posttraumatic Stress Disorder (Adapted from Burback et al, 2024)[1]

Modifying Exposures Used in TFP	
Flash technique[20]	Patient concentrates on a positive engaging focus (e.g., a positive memory) simultaneously with a dual attention task. The person blinks while subliminally accessing the traumatic memory when the therapist says "flash," then immediately returns to the positive focus. It is thought to involve SN-induced switching between CEN and DMN networks, causing alternating activations of the amygdala, followed by regulation by the PFC. This may strengthen the connection between the PFC and amygdala, counter overconnectivity within subcortical regions, and create prediction error for memory reconsolidation processes.
Memory Rescripting Interventions	
Accelerated resolution therapy (ART)	Combines features of EMDR with imaginal rescripting of traumatic events, visual imagery, use of metaphors, and Gestalt techniques.
Imaginal rehearsal therapy (IRT)	CBT and exposure-based intervention for trauma-related nightmares. The person is asked to recall and then rescript nightmares, including more adaptive interpretations, active responding, and positive or acceptable endings. This is rehearsed to displace unwanted content.
Reconsolidation of traumatic memories (RTM)	Traumatic memories are reviewed in an imaginary movie theater as a fast (~45 seconds) black-and-white movie, altering key aspects (e.g., resolution, color, speed, distance, perspective) to create emotional distance. These changes are thought to be incorporated during reconsolidation
Virtual and Augmented Reality	
VRET, ARET	Virtual reality and augmented reality interventions use visual, auditory, and other sensory elements to create an engaging, immersive environment to counter avoidance and better activate traumatic memory networks.
Immersive Motion-Assisted Psychotherapy	
Multi-modal motion-assisted memory desensitization and reconsolidation (3MDR)	Multi-modal, virtual reality supported intervention incorporating treadmill walking within a personalized, multi-sensory virtual reality environment, and dual attention tasks from EMDR. Patients self-select music and images that act as trauma cues. 3MDR includes brief, repetitive exposures to the trauma images alongside the therapist-coach; protocol questions facilitate differentiation of the image from memories, followed by processing of narrative, emotional and somatosensory content while moving forward on the treadmill. After exposure sessions are complete, reconsolidation sessions allow reflection, meaning-making and integration of learnings.
Potentially Synergistic Combinations	
Pharmacological enhancement of exposure[29]	Pairing pharmacological agents with exposure may enhance fear extinction, alter memory reconsolidation (propranolol, oxytocin), induce HPA negative feedback (hydrocortisone, dexamethasone), reduce anxiety, or enhance trust and executive function (oxytocin). Positive (hydrocortisone, yohimbine), mixed (propranolol, dexamethasone, D-cycloserine, oxytocin), and negative results (rapamycin, mifepristone, methylene blue) have been reported.[29]
Combination with neuromodulation technologies[34,35]	Magnetic field (rTMS) or direct current (tDCS) is passed through the skull at specific locations to alter underlying cortical and subcortical activity. These technologies may normalize the function of brain circuits, facilitating executive function and inhibitory control important for fear extinction and memory reconsolidation.
Combined with stellate ganglion blockade (SGB)[32]	Ultrasound-guided injection of local anesthetic into the neck temporarily blocks the cervical sympathetic trunk, rapidly reducing hyperarousal and hyperreactivity for 3 to 6 months. It may act via the peripheral vagus nerve and brain regions involved in autonomic control and fear memory.
Combination with Neurofeedback[31,33]	EEG facilitated biofeedback. Individuals learn to self-regulate by changing brain rhythms to impact a video game display on the screen. This may normalize aberrant neural circuits by engaging top-down cognitive and emotional control centers like the PFC, and the integration of anterior and posterior parts of the DMN. It may also modulate the temporoparietal junction and posterior insula, which are involved in embodied processing of sense of self.[73]

3MDR, multi-modal motion-assisted memory desensitization and reconsolidation; ARET, augmented reality exposure therapy; ART, accelerated resolution therapy; CBT, cognitive behavioral therapy; CEN, central executive network; DMN, default mode network; EEG, electroencephalogram; EMDR, eye movement desensitization and reprocessing; HPA, hypothalamic-pituitary-adrenal axis; IRT, imaginal rehearsal therapy; PFC, prefrontal cortex; RTM, reconsolidation of traumatic memories; rTMS, repetitive transcranial magnetic stimulation; SGB, stellate ganglion blockade; SN, salience network; tDCS, transcranial direct current stimulation; VRET, virtual reality exposure therapy.

Table 4 summarizes various interventions featuring modified exposure, including short or brief pendulating exposures that shift attention between trauma-related content and present-moment experiences with an attuned therapist.[1] Evidence now suggests that shorter or written exposure may be as effective as traditional PE. The Flash Technique, a promising intervention combining positive affective states with subliminal exposure to trauma memories and dual-attention tasks, is an extreme example of shortening exposure; a randomized clinical trial (RCT) comparing Flash to EMDR is underway.[20] The following sections detail other specific intervention types, including rescripting techniques, virtual and augmented reality, and combination strategies.

Table 5. Emerging Non-traditional Approaches for Posttraumatic Stress Disorder (Adapted from Burback et al, 2024; Zaretsky et al, 2024)[1,49]

Emerging Psychotherapies for PTSD	
Somatic and Brainstem-Level Therapies	
Somatic, body-oriented trauma psychotherapies	Includes SE and SP; focuses on interoceptive awareness and titrated experiencing of bodily states, including sensation, posture, urges, and defensive motor responses. Uses mindful attention to regulate bodily arousal and emphasizes moment-to-moment relational attunement within a framework of nonjudgmental curiosity. Sensorimotor Psychotherapy also has a strong emphasis on addressing developmental wounds.
Emotional freedom technique	Combines somatic and cognitive therapy, integrating cognitions with bodily tapping of various acupressure points.
Brainspotting	Neurophysiological method that uses specific eye positions to access trauma memories and associated emotional, sensorimotor, and habitual patterns. Thought to recruit and utilize superior colliculi and brainstem-mediated processes to allow the integration of this unassimilated information without overaccessing cortically stored information. Also important to this method are relational attunement and safety, music, and mindful curiosity of experience.[41,42]
Deep brain reorienting (DBR)	Similar to other somatic therapies but primarily focuses on subcortical orienting, pre-affective shock, and affective responses elicited by trauma cues. This reduces cue salience and leads to positive shifts in awareness and sense of self.[39] Slow embodied processing of pre-affective shock is believed to reduce overwhelm and dissociation.
Interventions with Self and Identity Focus	
Internal family systems (IFS)[43,44]	IFS views the Self as constituted of parts that function as an internal system that can be altered by trauma. Mindful and compassionate exploration of internal conflicts aims to foster decentering, metacognitive awareness, self-compassion, interoceptive awareness, and improved emotional regulation, as well as reduce depression, somatization, and shame/guilt.
Dialogical exposure therapy (DET)	Combines exposure with gestalt theory, focusing on "self-processes" distorted by trauma. Major goals include self-acceptance, restoring a sense of self-continuity, and regaining the ability to shape interactions in the environment.
Emotion focused therapy (EFT)[45]	An experiential modality incorporating gestalt and person-centered therapy, EFT focuses on the therapeutic relationship, attachment, meaning-making and emotional processing of trauma memories. It also focuses on reducing maladaptive fear and shame and resolving issues with perpetrators. Similar to DET, it may include empty chair technique for confrontation with perpetrators or empathic exploration of issues with perpetrators, therapists, or parts of self.
Moral Injury and Spiritually Oriented Interventions	
Moral injury (MI) interventions	Interventions used for MI include adapted PE and CPT, Adaptive Disclosure Therapy, ACT, the Impact of Killing in War, Compassion-Focused Therapy, mindfulness-based treatments, and Trauma-Informed Guilt Reduction Therapy. These often include elements of disclosure, empathy, choice, taking responsibility, forgiveness, making amends, and reconnecting with self and others. Emerging treatments for MI include virtual reality-supported psychotherapy (i.e., 3MDR), animal assisted therapies, Restore and Rebuild (narrative exposure, emotion regulation, self-compassion, and cognitive restructuring of self-related beliefs).[74]
Spiritually oriented interventions	Interventions that integrate spiritual/religious components, such as Spiritual-Oriented CPT, Soul Repair, and Building Spiritual Strength. Chaplains may use pastoral counseling, meaning-making activities, forgiveness and relational repair, spiritual/religious coping, and other practices (e.g., prayer, meditation, spiritual guidance/direction, narratives, storytelling, spiritual writing).
Non-Trauma-Focused Interventions	
Animal assisted therapy (canine or equine therapy)[75]	Use of dogs or horses to increase social, community, and treatment engagement, sense of safety, self-efficacy, and attentional control.
Psychedelic-Assisted Psychotherapy	
Classical psychedelics (LSD, psilocybin, DMT)	Cognitive, mood and perceptual effects due to multiple receptor actions, including 5-HT2 agonism, other serotonergic and dopamine effects, TAAR, and downstream effects on glutamate and BDNF. LSD increases oxytocin release associated with increased empathy and trust. Network alterations disrupt cortical control, alter functional connectivity, and release inhibition over sensory, interoceptive, and other information, leading to alterations in perception of the self and reality, including mystical or transcendent experiences. Evidence for reduced amygdala reactivity and increased neuroplasticity.
MDMA	Increased release of serotonin, catecholamines, oxytocin, cortisol, prolactin, and vasopressin; increased cognitive flexibility and ability to access and process painful emotions; improved fear extinction learning; reduced amygdala activation; and increased PFC activity. Oxytocin facilitates self-compassion, connection, trust, and empathy.
Ketamine	Multiple mechanisms proposed: NMDA antagonist; rapid antidepressant; blockade of intrusive memory formation; increased top-down inhibition of amygdala; increased fear extinction; upregulation of BDNF and enhanced neuroplasticity; altering self-referential processing (DMN). Dissociation from bodily senses and rigid thought patterns may allow access and reprocessing of traumatic or unconscious material and perspective-taking. Higher doses can induce mystical or archetypal experiences, like classic psychedelics.

3MDR, multi-modal memory desensitization and reconsolidation; 5-HT2, 5-hydroxytryptamine; ACT, acceptance and commitment therapy; BDNF, brain derived neurotrophic factor; CPT, cognitive processing therapy; DBR, deep brain reorienting; DET, dialogical exposure therapy; DMN, default mode network; DMT, N,N-dimethyltryptamine; EFT, emotion focused therapy; IFS, internal family systems; LSD, lysergic acid diethylamide; MDMA, 3,4-methylenedioxy-methamphetamine; MI, moral injury; NMDA, N-methyl-D-aspartate; PE, prolonged exposure; PFC, prefrontal cortex; SE, somatic experiencing; SP, sensorimotor psychotherapy; TAAR, trace amine-associated receptors.

Rescripting and Imagination Techniques: Rescripting techniques aim to transform traumatic memories, encouraging the patient to imagine enacting new experiences or expressions of Self.[21] Posttraumatic stress disorder symptom reduction may occur by creating alternative memories, altering emotional responses and cognitions, and adopting an observer perspective, thereby facilitating a sense of mastery. Additionally, adding contextual information during reconsolidation can alter the memory itself.[21] New manualized treatments that prominently feature rescripting and are supported by emerging evidence include Imaginal Rehearsal Therapy (IRT), Accelerated Resolution Therapy (ART), and Reconsolidation of Traumatic Memories (RTM) (Table 4).[1,22]

Virtual and Augmented Reality: Virtual reality exposure therapy (VRET) and augmented reality exposure therapy (ARET) use technology to enhance trauma therapy by reducing avoidance and increasing emotional engagement.[23] Virtual reality exposure therapy creates an immersive experience with multi-sensory trauma-related cues (e.g., visual, sound, haptic, olfactory, vibration) through headsets or large screens, activating multiple aspects of the trauma memory network.[23] Augmented reality exposure therapy overlays digital trauma cues onto the physical world rather than immersing the person in a virtual environment.[23] Initial studies, including small RCTs, show promise for VRET in treating civilian and military PTSD, while ARET is under development.[1]

Immersive Motion-Assisted Psychotherapy: Multi-modal motion-assisted memory desensitization and reconsolidation (3MDR) combines elements of evidence-based TFPs with treadmill walking within a personalized multi-sensory virtual reality environment (Table 4).[1,24] Participants experience brief, immersive exposures to self-selected trauma cues alongside a therapist who helps them access associated narrative, emotional and somatosensory content. A dual attention task is also used to facilitate processing. Treadmill walking may optimize arousal, promote divergent thinking, and leverage the effects of forward movement on embodied cognition and memory reconsolidation (e.g., being upright, moving forward, and facing the trauma contrasts with the traumatic experience).[25] The contribution of exercise, known to enhance extinction learning, is yet unknown.[26] 3MDR is supported by 3 RCTs in military and veteran populations, including treatment-resistant PTSD, and is associated with improved emotion regulation, symptoms of MI, and psychosocial functioning, with low dropout.[1,24,25]

Pharmacological Enhancement of Exposure-Based Treatment: The rationale for pharmacologically augmented psychotherapy includes reducing overwhelming hyperadrenergic states, improving memory access and processing, facilitating fear extinction, and manipulating memory reconsolidation.[27,28] Psychedelic-assisted psychotherapies will be considered separately below. Several pharmacological agents have been tested with mixed results (Table 4), possibly due to study heterogeneity, timing, presence or absence of prediction error during exposure, boundary conditions (e.g., age and strength of memories), and biological subgroups.[1,16,29] Hydrocortisone-augmented exposure therapy shows the most promise; for example, 30 mg oral hydrocortisone given before PE sessions improved PTSD symptoms and dropout rates compared to psychotherapy alone.[30]

Combination with Neuromodulation Approaches: Combining TFPs with neuromodulation technologies, including repetitive transcranial magnetic stimulation (rTMS), transcranial direct current stimulation (tDCS), stellate ganglion blockade (SGB), and neurofeedback (Table 4), is another active area of research.[1,31-33] These technologies may facilitate psychotherapy by reducing overwhelm or normalizing brain circuits, facilitating executive function and inhibitory control important for fear extinction and memory reconsolidation.[1,31-35] Importantly, neuromodulation technologies hold potential for individualizing treatment by focusing on specific brain areas or circuits. However, despite the emergence of pilot trials, data does not show an advantage over TFP alone and should be considered exploratory.[34,35]

Top-Down and Bottom-Up: Integrating the Brain and Body

Many emerging therapies aim to enhance awareness of bodily experience. Non-trauma focused mind-body interventions, such as mindfulness-based therapies, meditation, and yoga, are common adjuncts (Table 3).[1] These interventions work through mechanisms such as vagus nerve activation, improved attentional control, distress tolerance, cognitive flexibility, and facilitating self-compassion.[1,36,37] Although methodological issues hamper the evaluation of the clinical evidence, many of these practices are associated with improved indicators of autonomic health, emotion regulation, interoceptive capacity, and PTSD-relevant brain changes.[38] Neurofeedback, experiential or expressive arts therapy, and equine-assisted therapy may be other examples.[7] Specific somatic and brainstem-level interventions are detailed below.

Somatic Psychotherapies: Based on an embodied model of trauma processing, somatic psychotherapies, such as Sensorimotor Psychotherapy (SP) and Somatic Experiencing (SE), focus on mindful, titrated bodily experiencing of somatosensory feelings and defensive motor responses (e.g., orienting, flight, fight, freeze) associated with traumatic memories, rather than thoughts or narratives (Table 5).[1] Emphasizing moment-to-moment relational attunement and co-regulatory support, these therapies may reduce overwhelm, foster corrective relational repair, and allow memory recontextualization. This is achieved through new sensory and motoric experiences of mastery that "contradict past horrors," leading to the resolution of

trauma-related cognitions.[4] While few studies exist, these somatic therapies include evidence-informed mindfulness, exposure, attachment theory, and neuroscience principles.[1,4,7]

Brainstem-Level Interventions: Both Brainspotting and deep brain reorienting (DBR), influenced by SE, focus primarily on orienting processes to resolve trauma, with minimal narrative content.[39-42] Brainspotting involves focusing on specific eye positions to access and process unintegrated trauma responses.[41,42] Deep brain reorienting, based on brainstem neuroanatomy and neurophysiology, focuses on immediate subconscious neurophysiological sequences activated by trauma cues.[39] Deep brain reorienting seeks to reduce cue salience and resolve pre-affective shock and memory-based conflicts between simultaneously evoked, automatic survival responses that may be linked to dissociation, avoidance, and somatic sensory processing dysfunction.[39,40] Authors suggest that the brainstem superior colliculus, important for orienting, may also underlie a core sense of self and that DBR may target deeply embodied aspects of complex or attachment trauma.[40] Theories remain to be tested but offer a radically new approach. Interim findings of an RCT of DBR have been published, demonstrating improved PTSD in a complex population.[39]

The following sections will introduce therapies focused on self, identity, MI and psychospiritual aspects of trauma.

Moral Injury, Self and Spirituality

Identity: Identity shifts are implicitly important to most therapies. Cognitive (CPT, Schema Therapy), narrative (NET), sensorimotor (DBR, somatic therapies), compassion-focused, meaning-making (e.g., BEP), gestalt (e.g., ART), expressive or creative arts, and interpersonal (IPT) strategies inherent in PTSD interventions may lead to shifts in self-concept. However, specific interventions, such as Dialogical Exposure Therapy (DET), Emotion Focused Therapy (EFT), and Internal Family Systems (IFS), explicitly focus on healing the trauma-impacted Self, utilizing a range of strategies to enhance self-acceptance, self-continuity, and self-efficacy (Table 5).[1,43,44]

In line with the *Memory and Identity Theory of CPTSD*, some of these treatments work with "parts" of the self, already commonplace in psychotherapeutic treatment of dissociative disorders.[5] This may involve conversations with externalized symbolic aspects of the self (eg, DET, EFT) or explicit parts work therapies (e.g., IFS) that identify and resolve internal conflict between self-states. Internal Family Systems, based on systemic family therapy, is widely used clinically, both independently and integrated with other treatments, including as part of the 3,4-Methylenedioxymethamphetamine (MDMA)-assisted psychotherapy protocol. However, the use of IFS, DET, and EFT specifically for PTSD is only supported by small pilot trials.[43-45]

Moral Injury and Spirituality: New therapies address the challenges of moral and spiritual injuries, including resolving wounds to relationships with God, Self, and/or others.[1,46] Moral injury (MI) results from potentially morally injurious experiences (PMIEs) like betrayal, perpetration, witnessing, or failing to prevent actions that transgress deeply held moral beliefs.[47] Moral injury co-occurring with PTSD is linked to intense psychological and spiritual impairment, and often severe, "treatment-resistant" PTSD.[1] Because PMIEs often involve betrayal, perpetration, humiliation, or loss, themes include prolonged grief, recalcitrant blame or self-criticism, existential themes, and intense guilt, shame, or anger.[12] Moral injury is associated with depression, anhedonia, social alienation, negative or conflicted identities, purposelessness, loss of trust, substance use, and self-harming or suicidal behavior.[1,12,47] Interventions studied for MI and spiritual injury are summarized in Table 5.[1] Psychedelic-assisted psychotherapies also have psychospiritual impacts and will be discussed below.

Psychedelic-Assisted Psychotherapy

Of all developing interventions, psychedelic-assisted psychotherapy (PAP) has generated the most intense interest and controversy.[48] With ancient roots in traditional healing practices around the world, Western medical use to facilitate psychotherapy dates from the 1950s, until psychedelics became illicit in the 1970s. MDMA and ketamine, not strictly psychedelics, are also considered in this category. This review will focus on implications for PTSD psychotherapy specifically, as reviews detail their pharmacological effects (Table 5).[49] MDMA and psilocybin, for example, may facilitate greater openness, access to and tolerability of trauma-related and unconscious material, and the loosening of rigid beliefs and defenses.[1,49] Effects on neuroplasticity may also enhance learning and therapeutic change.[49] However, psychedelics are mind-manifesting and alter consciousness in ways that depend on set, setting, and individual factors. Thus, the psychosocial context, associated interventions, and individual factors are highly important to outcomes.[50] Further, PAP is depth work, implicitly and unpredictably extending into attachment, self-referential processing, identity, and psychospiritual themes of a person's life. Thus, controversy abounds regarding the appropriate type and extent of clinician training to ensure good outcomes. In the following sections, common classic psychedelics will be discussed first, followed by MDMA-assisted therapy (MDMA-AT) and ketamine-assisted psychotherapy (KAP).

Classical Psychedelics: Classical psychedelics for PTSD include ayahuasca, lysergic acid diethylamide (LSD), and psilocybin. These alter mood, cognition, and perception through 5-HT2A receptor agonism, among other effects (Table 5).[49] Importantly, these compounds may disrupt cortical control of subcortical regions, allowing a more

hyperconnected, "entropic" state that enhances access to sensorimotor, interoceptive, and unconscious "bottom-up" information. Psychedelics also interrupt the default mode network (DMN), which is associated with rigid trauma-related beliefs and self-concepts, improving the capacity to access and integrate traumatic memories, and may induce positive emotion.[1,49] Mystical or transcendent experiences can occur, involving unity or blurred boundaries between self, others, or the universe, potentially powerful and transformative corrective experiences offering new learnings that can be incorporated during memory reconsolidation.[37]

Clinical data for ayahuasca in treating PTSD is minimal. Promising data for LSD-assisted psychotherapy mainly consists of clinical reports before the 1980s and new uncontrolled data.[49,51] Psilocybin is of particular interest for PTSD due to its shorter duration, making it practical for clinical settings, with several trials underway and positive initial evidence for treating PTSD comorbidities such as depression.[49]

MDMA Assisted Psychotherapy: MDMA-assisted therapy (MDMA-AT) is currently the most researched PAP for PTSD. MDMA, an empathogen (i.e., evoking empathy), enhances connection, trust, and self-compassion, which may be particularly beneficial for those with chronic, interpersonal, or developmental trauma. The Multidisciplinary Association for Psychedelic Studies protocol, utilized in most MDMA-AT studies, incorporates trauma exposure and aspects of transpersonal, psychodynamic, Jungian, IFS, and somatic therapies, including therapeutic touch in the service of facilitating corrective experiences.[52] Treatment utilizes 2 therapists and includes 3 phases: preparation, MDMA sessions, and integration. During MDMA sessions, participants take up to 125 mg of MDMA and focus on inner experiences with periodic therapist interaction. Integration sessions help patients apply insights gained during sessions to daily life.[52]

MDMA-AT studies, including 2 phase 3 RCTs, report highly positive efficacy and tolerability data for civilian and military PTSD, lasting up to 6 years.[49] However, the United States Food and Drug Administration (FDA) declined to approve MDMA-AT in August 2024, following methodological and safety concerns.[53] Further research is required to establish long-term safety and comparative effectiveness.

Ketamine-assisted Psychotherapy: Ketamine, a dissociative anesthetic, has primarily been studied as a stand-alone pharmacological treatment rather than as an adjunct to psychotherapy. Current treatment guidelines support ketamine pharmacotherapy as an adjunctive treatment for depression. Although results vary and studies are heterogeneous, evidence is also evolving for PTSD.[54,55] Like psychedelics, ketamine alters consciousness and may facilitate therapy by creating psychological distance from distressing content and altering memory reconsolidation.[56] While data is limited, ketamine has been paired with PE,[56] somatic therapy,[57] eclectic treatments,[58] and a group treatment modeled after the MDMA-AT protocol.[59] Small, uncontrolled, and observational data suggest KAP can reduce PTSD and associated depression and anxiety symptoms, improve function, and possibly decrease hospitalizations, with few serious adverse effects.[56-60] Ketamine-assisted psychotherapy is increasingly offered in clinic settings, calling attention to the need for further rigorous empirical studies.[54]

DISCUSSION

This review summarized emerging psychotherapeutic interventions aiming to improve PTSD outcomes. Advances in neuroscience and a holistic understanding of PTSD are driving these developments, as well as the inability of current TFPs to fully address the effects of trauma. Clinical science has been chasing practice, as clinicians have long recognized the limitations of recommended treatments in the real world, frequently adapting or adopting approaches not yet recognized by guidelines to meet patient needs.[61-63]

While trauma memory processing is crucial for symptom resolution, empirical questions remain about the need for lengthy exposures.[64] In some contexts, research suggests that briefer exposures may be more effective, and prediction error appears necessary to alter trauma memory during reconsolidation.[15,16] Many of the interventions highlighted in this review purposefully capitalize on these insights. 3MDR, for example, introduces new contextual information by asking about expectations during preparation, calling attention to mismatches between expected fears and actual experience, emphasizing safety and self-efficacy, using treadmill walking to induce divergent thinking and positive embodied cognition, and post-exposure reflection on new learning. Rescripting therapies, such as ART and RTM, add maneuvers for patients to directly change their memories through imagination. Deep Brain Reorienting proposes to deactivate the salience of trauma memory cues, making full memory exploration unnecessary.[22,39] Finally, RTM and the Flash Technique purport to rapidly modify traumatic memories without significant distress, contrasting sharply with traditional exposure models.

Many of the highlighted methods may also enhance somatic sensory processing by combining bottom-up with top-down strategies, theoretically fostering improved vertical and horizontal information processing, including associated self-referential processes.[4,7] These treatments often involve "encouraging reconnection with felt bodily experiences of movement and touch within a positively valenced therapeutic alliance [to] contradict previous negatively valenced multi-sensory experiences and attachment disruptions, leading to upstream regulation of arousal and affect, modulation of exteroceptive sensory input and embodied cognitive capacities."[7] Movement and

posture may be important tools to create prediction error, given the role of vestibular and somatosensory areas in adjusting perceptual experience to anticipate and adapt to threat.[4,7] It has been proposed that such interventions may help to contextualize sensation-based trauma memory fragments by connecting these traces with the association cortex (i.e., memory contextualization), which remains to be validated.[4,7] Interventions integrating top-down and bottom-up strategies include mind-body interventions, somatic and brainstem-level psychotherapies, 3MDR, neurofeedback, equine-assisted psychotherapy, and psychedelic-assisted psychotherapy.

Psychedelic-assisted psychotherapies theoretically offer multiple synergistic mechanisms, along with considerable challenges. Enhanced experiential trauma processing, altered self-referential thinking patterns, feelings of connection, and mystical or identity dissolution experiences can change beliefs and shift identity.[1,49,50] However, altered states may also increase the risk of temporary destabilization and vulnerability to boundary violations by others, emphasizing the need for experienced, attuned, and ethical therapists and careful attention to set, setting, and interpersonal dynamics.[65] Barriers include the cost, training and infrastructure required to study and integrate the full spectrum of potential treatments. Group-based models are being developed to reduce cost and capitalize on complex interactions between group processes, individual and shared social identity, and psychedelic effects like identity dissolution, a heightened sense of connectedness, and enhanced social learning.[50] Other efforts are aimed at producing more PTSD-focused, manualized, and scalable interventions, such as a combination with PE.[66] However, more efficient treatments could compromise outcomes by constraining the depth, personalization, and potential for corrective relational and psychospiritual experiences. Lack of scientific rigor in psychedelic studies and methodological issues are widely recognized, and solutions have been proposed.[53] Some have suggested that psychedelics should be integrated into the total wealth of psychotherapy knowledge rather than specific types of therapy, "fostering broader systemic changes in therapeutic practices… [to] maximize the therapeutic benefits of psychedelics, respecting their complex nature and multifaceted effects."[65] Regardless, issues of spirituality and Self will likely remain aspects requiring integration into traditional models.

Many other research gaps remain (Table 6). For example, the translation of memory reconsolidation science to human clinical contexts may be complicated.[16,67] Memory retrieval does not necessarily equate to memory destabilization due to boundary conditions, such as age and the strength of traumatic memories.[16] The hippocampal competitive trace theory suggests that repeated memory retrievals may cause multiple new competitive traces, leading to selective strengthening of core overlapping content, decontextualization, and transformation into semantic

Table 6. Examples of Future Directions for Posttraumatic Stress Disorder Psychotherapy

Type	Examples
Conceptual	Development of an integrative, neuroscience-informed framework for personalization of PTSD psychotherapies, including operational definitions, assessment, mechanisms of change, and therapy processes Clinical relevance of expanded PTSD theories, including the role of somatosensory processing deficits Boundaries of MI versus PTSD MI subtype, and applicability to civilian trauma populations
Neuroscience	Establishment and validation of PTSD subgroups, including genetic factors Neurobiology and role of non-fear emotions, such as shame and disgust Neuroscience underpinnings of identity disruptions, MI, and psychospiritual challenges in the context of trauma Neuroscience-informed distinctions between posttraumatic guilt and shame Neuroscience of MI with and without PTSD Boundary conditions for memory reconsolidation Is full memory reprocessing needed, or can memories be disconnected from salience (e.g., RTM, DBR)?
Methodological	Optimal measurement tools to capture treatment progress, beyond PTSD symptoms, especially in those with multiple traumas or prominent non-fear emotions Methods for studying therapies not amenable to blinding, or with high expectancy effects (e.g., psychedelics) Leveraging machine learning for psychotherapy research Potential of wearable technology for monitoring therapy processes.
Population gaps	Psychotherapy individualization and adaptation for specific subgroups, populations, identities, or cultures
Interventions	Efficacy of emerging psychotherapies, including in the long-term What works for whom, and at what point in their illness trajectory? Synergistic and antagonistic modality combinations Impact of therapeutic touch, movement, or altered body positioning Role of positive emotions or positive memories in PTSD therapy Optimal use of pharmacological agents to enhance therapy, including factors such as stage of illness, timing of intervention and agent, subgroups, and biomarkers
Policy	What treatment model(s) are most cost-effective? Does a staged model for PTSD improve outcomes?

DBR, deep brain reorienting; PTSD, posttraumatic stress disorder; RTM, reconsolidation of traumatic memories.

knowledge over time.[67] This may mean that therapeutic contextual information may form a competitive memory trace competing with multiple original traces in some circumstances. In addition, repeated retrieval of the new positive experience may be needed for older traumas. This may also indicate the need to treat PTSD earlier, before repeated cycles of memory consolidation occur. Further, the optimal exposure duration and the exact period during which memories are vulnerable to change are unknown, may be variable, and could be impacted by comorbidities and expectancy effects.[11,16] Further, trauma memories are unique[4] and may respond differently than animal-based models. Finally, given that psychedelics are thought to reopen critical periods for learning, research related to psychedelic impacts on reconsolidation boundary conditions may be promising.[68]

Most of the emerging approaches captured in this review attempt to address current challenges and merit further research. Future studies should also specifically consider that PTSD often follows distinct developmental pathways shaped by attachment patterns, early adversity, and the consequences of timing or accumulation of traumas.[1,5,7,11] For example, complex early trauma may benefit from phased approaches that include skills training (e.g., Skills Training for Affective and Interpersonal Regulation [STAIR]) or identity work (e.g., IFS), whereas single-incident adult trauma often responds well to standard TFPs. Moral or spiritual injuries—commonly linked to betrayal or moral transgressions—also call for therapies that address guilt, shame, anger, or existential themes.[1,46] Because the type of trauma can powerfully shape symptom presentation, a "one-size-fits-all" therapy may be suboptimal.[69] Tailoring exposure elements and integrating methods such as rescripting, somatic techniques, or MI-focused therapy may increase engagement, reduce dropout, and address the unique emotional demands of different traumas. Social factors—family, community, and peer networks—also play a central role in PTSD outcomes.[11] Supportive relationships create a sense of safety and trust, which can reduce avoidance and foster engagement with therapy. Conversely, social isolation or conflict amplifies symptoms and undermines treatment gains. Group-based and spiritually integrated interventions may enhance connectedness and facilitate communal healing, reinforcing positive relational experiences that contrast with those of the original trauma.[50] Accordingly, multiple authors have advocated for improving current manualized treatments by addressing patient-specific challenges[11] or creating personalized, flexible, sequential, modular, or multi-modal treatments based on therapeutic mechanisms and processes, clinical subtypes, and shared decision making.[12,18,63,64,69] A main theme is a call for precision care based on what works for whom and at what point in treatment.[9,69]

A PTSD staging model has been proposed to organize research and inform clinical guidelines, with refinements over time.[1] This staging model operationalizes 4 phases of progression and grades of therapy resistance. This would allow mapping of symptom biotypes, severity indicators, symptom trajectories, and other indicators of response to specific established and emerging treatments, lending itself to machine learning. It may be that some approaches would be better suited to specific subgroups, or earlier in the illness trajectory. Initial options for matching treatments to stage of illness have been proposed, awaiting validation by further research (Figure 1).

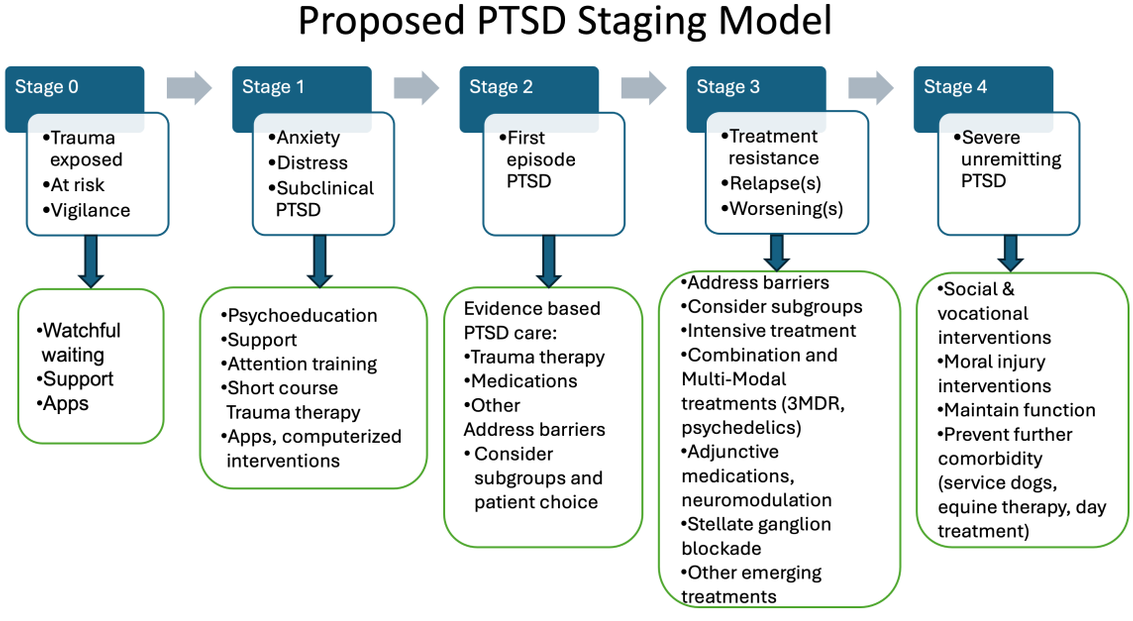

Figure 1. Proposed posttraumatic stress disorder staging model (adapted from Burback et al, 2024).

Notwithstanding the need for future research, there is much that clinicians can do now to improve care. First, clinicians can familiarize themselves with integrative, neuroscience-informed models of PTSD, trauma-related dissociation, and trauma-informed perspectives on common PTSD comorbidities.[5-7,15] Learning about memory reconsolidation and its implications for exposure-based treatments, and improving the capacity to recognize and mitigate dissociation impairing trauma processing, may be transformative for those already offering exposure-based treatments.[15,16] In addition, some TFPs, such as CPT, have evolved modifications for specific patient needs that can be utilized.[63] Further training to incorporate neuroscience-informed emerging treatments can broaden therapeutic offerings. Even in resource-strapped environments, incorporating exercise, psychoeducation for social supports, and other adjuncts may be helpful.

In conclusion, Posttraumatic stress disorder is now understood as heterogeneous in onset, presentation, trajectory and treatment responsivity. Many treatments are emerging to improve outcomes, both through efforts to optimize existing treatments and new therapy approaches. Many new therapies incorporate insights from memory reconsolidation science, or modify exposure through combination with pharmacotherapies, neuromodulation, or immersive virtual reality (VR) technologies. Others may address sensorimotor aspects of PTSD, MI, or the consequences of trauma on identity or psychospiritual function. Multi-modal treatments, such as 3MDR or psychedelic-assisted psychotherapy, may have multiple synergistic effects to overcome treatment barriers. A PTSD staging model may provide a structured framework for rigorous empirical validation, clinical implementation of these approaches, and optimizing their combined potential. Due to the experimental nature of many of these therapies, future research should prioritize RCTs with diverse patient populations and long-term follow-up to ensure their safety, efficacy, and scalability.

Data Availability Statement: The data that support the findings of this study are available upon request from the corresponding author.

Peer-review: Externally peer-reviewed.

Author Contributions: Concept – L.B., O.W., R.K., J.S., E.V.; Design, Resource and Materials - L.B.; Literature Search, Data Collection and Processing - L.B.; Analysis and/or Interpretation - L.B.; Initial manuscript writing - L.B.; Critical review and Manuscript Revisions - L.B., O.W., R.J., J.S., Y.Z., V.B., E.V.

Acknowledgements: The authors would like to thank Ingrid Pacey and Ruth Lanius for reviewing the manuscript, and Theresa Borosch for assisting with proofreading.

Declaration of Interests: Eric Vermetten is an Associate Editor at Psychiatry and Clinical Psychopharmacology, however, his involvement in the peer-review process was solely as an author. JS has received honoraria for speaking and/or advisory boards from Abbvie, Bausch, Eisai, Idorsia, Janssen, Lundbeck, Otsuka, and Novonordisk. LB and OW are supported by the Academic Medicine and Health Services Program (AMHSP), a joint program funded by the University of Alberta and Alberta Health Services to ensure physicians affiliated with Alberta's faculties of medicine are compensated for providing patient care along with their work related to research, innovation, education, administration, and leadership. VB is supported by an Academic Scholar Award from the University of Toronto Department of Psychiatry and has received research support from the Canadian Institutes of Health Research, Brain & Behavior Foundation, Ontario Ministry of Health Innovation Funds, Royal College of Physicians and Surgeons of Canada, Department of National Defense (Government of Canada), New Frontiers in Research Fund, Associated Medical Services Inc. Healthcare, American Foundation for Suicide Prevention, Roche Canada, Novartis, and Eisai.

Funding: The authors declared that this study has received no financial support.

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