

## Chapter

# PTSD and Violence: Understanding the Connection and Implications for Treatment

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## Abstract

This chapter explores the relationship between Post-Traumatic Stress Disorder (PTSD) and violent behavior. PTSD is often linked to increased risk of violence, including self-directed, interpersonal, and collective violence. The chapter examines the biological, psychological, and environmental factors contributing to this association, highlighting the neurobiological mechanisms and cognitive processes involved. It also discusses the challenges in assessing and diagnosing PTSD-related violence and reviews various treatment approaches, including psychopharmacological interventions and trauma-focused therapies. By providing a comprehensive overview of current research and clinical practices, this chapter aims to enhance the understanding and management of violence in individuals with PTSD, emphasizing the importance of integrated and innovative approaches.

**Keywords:** PTSD, violence, aggression, trauma, neurobiology, psychopharmacology, trauma-focused therapy, risk factors, assessment, treatment

## 1. Introduction

*“Everything was beautiful, and nothing hurt.”*

– Kurt Vonnegut, *Slaughterhouse-Five*

*“It’s only after we’ve lost everything that we’re free to do anything.”*

– Chuck Palaniuk, *Fight Club*

The psychological impact of war has been described for centuries in historical accounts and literature. First-hand accounts of distress can be found in Roman Gladiators and religious soldiers in the Crusades [1]. In literature, Erich Maria Remarque’s *All Quiet on the Western Front* vividly captures the fear and despair of young soldiers, while Tim O’Brien’s *The Things They Carried* illustrates the emotional weight carried by Vietnam War veterans. The formal diagnosis of PTSD emerged following the Vietnam War, when returning soldiers exhibited a unique set of symptoms linked to the constant threat of violence and exposure to horrific scenes and potential atrocities. These soldiers were not only witnesses and victims of violence but also potential perpetrators amidst a backdrop of death and destruction, highlighting how trauma disorders have long been rooted in violent experiences.

The relationship between traumatic experiences and violent behavior is often described as “the cycle of trauma” and is reflected in the truism “hurt people hurt people,” which describes the tendency of individuals exposed to pain, trauma, or emotional distress to inflict a similar pain on others. This is supported by a vast amount of research which consistently shows a strong link between traumatization and aggression in both male and female military and civilian populations [2–4]. Studies show that individuals diagnosed with PTSD are significantly more likely to exhibit aggressive behavior and are twice as likely to engage in physical aggression. PTSD [5, 6].

The relationship between trauma and violence is complex and non-linear; it is best understood as a bi-directional, mutually reinforcing cycle in which trauma exposure and violent behavior perpetuate each other. Experiencing trauma can lead to aggressive behavior, and conversely, engaging in violence can create or worsen trauma, often referred to as “perpetrator PTSD” [7]. Individuals may find themselves caught in a cycle where they are both victims and perpetrators, constantly re-experiencing and contributing to violence. This cycle is exemplified by the concept of “combat addiction,” where individuals repeatedly engage in aggressive behaviors to recreate the heightened arousal of their past combat experiences, both physiologically and psychologically [7]. Those who derive gratification from violent acts before deployment are at an increased risk of committing further violent acts afterward [8, 9].

The effects of war-related trauma are not confined to military contexts; they extend to increased violence within communities and families, including higher rates of intimate partner violence (IPV) and child abuse [10, 11]. Additionally, childhood abuse survivors who identify with their aggressors—internalizing and adopting the aggression of their perpetrators—face an elevated risk of violent behavior themselves, with the risk intensifying based on the degree of identification [12].

In the general population, individuals with traumatic experiences or PTSD diagnoses are more likely to exhibit higher rates of general aggression, violent crime, and intimate partner violence [13–16]. A PTSD diagnosis is also significantly associated with an increased risk of violent crime conviction, with one study showing the rate to be over six times higher than that of the general population [15, 17]. This evidence underscores the profound and far-reaching consequences of trauma and PTSD on both individual behavior and broader societal violence.

## **2. Understanding PTSD and violence**

PTSD is characterized by a cluster of symptoms and behaviors that develop following exposure to one or more traumatic events involving actual or threatened death, serious injury, or sexual violence [18]. According to the DSM-5TR, PTSD symptoms are categorized into four clusters: intrusive memories, avoidance of reminders, disturbances in mood and cognition, and hyperarousal [18]. The hyperarousal criterion includes irritable behavior, angry outbursts, verbal and physical aggression, and reckless behavior. This diagnostic criterion thus encapsulates how trauma exposure and the development of PTSD may result in symptoms that manifest as violent behavior [19].

Firearm-related deaths are a significant global public health issue [20]. The United States is one of the leads and rates are significantly higher than other high-income countries [21]. In the United States, the major forms are homicides, aggravated assaults, IPV, elder abuse, and sexual abuse [22]. These forms of violence are prevalent across various populations but disproportionately affect certain demographic

groups. Homicide is a leading cause of death for Black Americans under the age of 45, highlighting the intersection of violence, trauma, and systemic inequities [22]. Geographic differences also impact violence rates, with higher incidences observed in urban and economically disadvantaged areas [23]. Firearm injuries have become a leading cause of death among young people in the United States. In 2022, firearm injuries ranked among the top five causes of death for individuals under 45 years old and were the leading cause of death for those under 20 [24]. These alarming statistics underscore the urgent need for comprehensive approaches to violence prevention, including addressing underlying mental health conditions like PTSD.

The connection between PTSD and violence reflects a broader interplay of trauma, psychological distress, and behavioral dysregulation. Individuals with PTSD can be hypervigilant and constantly alert, perceiving potential threats in everyday situations. This heightened state of arousal, combined with the emotional dysregulation in PTSD, increases the likelihood of aggressive responses [8, 25–27]. Moreover, the chronic stress and re-experiencing of trauma can erode coping mechanisms, making violent outbursts more probable.

Understanding the pathways that link PTSD to violence is crucial for developing effective interventions and prevention strategies. Addressing PTSD not only improves individual outcomes but also has the potential to reduce broader societal impacts of violence, thereby improving public health and safety.

### **3. Manifestations of violence in PTSD**

Violent behaviors associated with PTSD can be directed inwardly or outwardly, known as auto-aggressiveness and hetero-aggressiveness, respectively [19]. Auto-aggressiveness refers to self-directed violence, such as self-injury and suicidal behaviors, often used as maladaptive coping mechanisms to manage emotional pain, overwhelming distress, or feelings of hopelessness. Conversely, hetero-aggressiveness manifests as violent or aggressive acts towards others, frequently triggered by perceived threats or symptoms of hyperarousal and irritability commonly seen in PTSD [4].

Violent behavior in individuals with PTSD can manifest in various forms, including verbal and physical aggression, sexual abuse, the use of weapons such as knives and firearms, and traffic-related aggression [28]. These aggressive behaviors can be directed interpersonally towards specific individuals or collectively towards groups of people, reflecting the broad impact of PTSD on social interactions and community safety.

Research indicates a strong relationship between PTSD and gang violence. Gang members often experience high levels of trauma exposure and PTSD symptoms, and PTSD is itself a risk factor for chronic gang membership [29, 30]. This creates a cycle of violence that perpetuates gang involvement with ongoing exposure to violence and trauma. Incarcerated youth, especially those involved in gangs, report greater exposure to violence and higher PTSD symptoms compared to their non-incarcerated peers [31]. For these young gang members, inflicting harm on others can be particularly traumatizing, further entrenching them in the cycle of violence and PTSD [32].

While there is no standardized definition of a mass shooting, many studies describe them as incidents where four or more people are killed in a public setting with a firearm [33]. Perpetrators of mass shootings frequently have histories of trauma and adverse experiences, including significantly higher rates of childhood abuse compared to control groups [34]. The most profound trauma experiences include

childhood maltreatment, poverty, exposure to domestic violence, witnessing violence, the deaths of family members and friends, and bullying during adolescence [35].

This history of trauma among mass shooters again demonstrates the reinforcing cycle of violence and PTSD, where early exposure to trauma increases the likelihood of violent behavior in later life. The impact is bidirectional; survivors of mass shootings also show more severe symptoms of PTSD, illustrating how traumatic events can ripple through individuals and communities, exacerbating existing mental health challenges [36].

While traumatic experiences may play a role, it is important to acknowledge societal factors that contribute to violence. The vast body of research suggests that the availability of firearms in the United States is a critical contributor to mass shootings [37–39]. Compared to other high-income countries with stricter gun control laws, the U.S. experiences far higher rates of mass shootings and firearm-related homicides, suggesting that gun availability significantly escalates the frequency of these violent events [28, 40, 41]. This suggests that while trauma plays a significant role, access to firearms increases the potential for these acts of violence to occur on a larger scale.

Understanding the varied manifestations of violence in PTSD is crucial for developing targeted interventions. By addressing the underlying trauma and associated PTSD symptoms, it may be possible to disrupt the cycle of violence, offering individuals pathways to healing and reducing the broader impact of PTSD-related aggression on society.

## **4. Etiology and risk factors**

### **4.1 Risk factors for violence**

The most common risk factors for violence are younger age, male sex, past violent conduct, low empathy and antisocial features, and substance abuse [42, 43]. Access to firearms and gun ownership has been associated with an increased risk of violence, including homicide and serious injury [44]. It is important to note that women also can be perpetrators of violence and the incidence of this is likely underreported [3, 45]. Some studies have found no significant difference in aggression in female compared to male veterans who reported aggressive behaviors [46].

### **4.2 Biological**

Neurobiological mechanisms play a crucial role in our physiological response to traumatic stress, and understanding these mechanisms may help explain the connection between trauma and violent behavior, providing us with targets for treatment. Aggression is influenced by structural and functional abnormalities in several brain regions, including the prefrontal cortex, temporal lobe, striatum, septum, hypothalamus, hippocampus, and amygdala [47, 48]. However, it is important to acknowledge that neurobiological dysfunction can be driven by other psychological and environmental stressor and that the following are not independent contributors to PTSD and aggression.

In response to stress, the amygdala activates the sympathetic nervous system (SNS) and the Hypothalamic–Pituitary–Adrenal (HPA) axis, resulting in cortisol production. In a normally functioning system, the hippocampus regulates this response by inhibition when the stressor is no longer present. In individuals with PTSD, these

systems can malfunction: the amygdala becomes hypersensitive and triggers stress responses in the absence of actual threats; the SNS and HPA axis are improperly regulated, resulting in prolonged stress activation; and hippocampal dysfunction reduces its ability to suppress the stress response. This dysregulation contributes to the persistent stress reactivity seen in PTSD [49].

Neuroimaging studies have implicated key brain regions like the amygdala, anterior cingulate cortex, medial prefrontal cortex, insula, and hippocampus in the pathology of PTSD [50]. Functional imaging has also shown that increased connectivity and excitability in the left anterior middle frontal gyrus and the right orbito-frontal cortex are associated with lower levels of anger in PTSD patients [51].

Perturbations in neurotransmitter systems, including serotonin, dopamine, norepinephrine, GABA, and glutamate, contribute to increased aggression and are implicated in the pathology of PTSD [47, 52]. Deficits in serotonin and GABAergic systems, coupled with imbalances between limbic drives and prefrontal control, are key factors in aggressive behavior [53]. Epigenetics may play an important role in the neurobiology of PTSD and associated aggressive behaviors. Recent research has identified a correlation between the methylation of genes involved in dopaminergic neurotransmission, synaptic plasticity, and mitochondrial function with reduced PTSD symptoms following psychotherapy [54].

### 4.3 Psychological

The relationship between trauma and aggression is mediated by various psychological and behaviors factors including substance use, emotional dysregulation, impulsivity, and the severity of PTSD symptoms [2]. These factors play a critical role in the expression of aggressive behavior and should be carefully considered in the diagnosis and treatment of individuals with PTSD.

Individuals with PTSD frequently experience psychiatric comorbidity, in particular, major depression, substance use disorders, and other anxiety disorders, which contribute to increased clinical severity and functional impairment [55, 56]. Sleep problems and physical pain are also related to PTSD-related aggression [57]. Comorbid PTSD and substance use disorders are strongly associated with violent behavior; studies report that over half of individuals with this dual diagnosis have experienced some episode of violence [25, 58]. Research on U.S. veterans of the Iraq and Afghanistan wars found that those with both PTSD and alcohol misuse had a significantly higher rate of violence perpetration compared to those with either condition alone [58]. Alcohol consumption can heighten aggression by affecting neurotransmitter systems, inducing structural or functional changes in specific brain regions, and disrupting behavior and cognitive processes [47]. This suggests a reinforcing cycle: alcohol use exacerbates PTSD symptoms like anger and irritability, which can lead to aggressive actions, while worsened PTSD symptoms drive further self-medication through alcohol, increasing the risk of impulsive and disinhibited behavior [58].

The severity of PTSD symptoms is related to an increased risk of violent behavior [59]. The hyperarousal symptom cluster, in particular, plays a crucial role in the development of aggression and is independently associated with violent crime over time [8, 25–27]. PTSD-related violence has also been described during flashback episodes and sleep disturbances [7].

Anger, hostility, irritability, and aggression are related but distinct constructs that should be separately assessed in PTSD patients [60]. Anger involves physiological responses, cognitive evaluations, and behavioral expressions, reflecting how an



individual reacts emotionally and physically to perceived threats or frustrations [5]. In contrast, hostility is a broader, more enduring attitude or mental outlook characterized by cynicism, suspicion, and negative thinking towards others, predisposing individuals to interpret social interactions as adversarial or threatening [5].

Anger is a significant risk factor for violence in individuals with PTSD, and the trait of anger is notably higher in this population compared to those without PTSD [51, 61, 62]. Anger is independently associated with impulsivity and a heightened focus on perceived threats, which can drive aggressive behavior [48]. Emotional dysregulation, which includes difficulty managing anger, has been shown to fully account for the relationship between PTSD and impulsive aggression in veterans [63].

Hostility and antagonistic behavioral responses have been shown to increase the likelihood of physical aggression in those with PTSD [6, 59]. Hostility is associated with increased negative thought patterns and ruminations and is involved with misinterpreting social cues as hostile, which can play a significant role in connecting PTSD to aggressive behaviors [4, 64].

Taken together, while PTSD is associated with violent behavior, specific trauma-related variables, such as heightened anger, hostility, and the use of alcohol for self-medication, play a more significant role in predicting violent actions than the diagnosis of PTSD alone [65]. Recent findings suggest that individuals with higher anger-related symptoms tend to have a poorer prognosis in PTSD-focused treatments, perhaps due to interferences with compliance, therapeutic alliance, and reintegration back into society [5]. This highlights the need for interventions specifically aimed at reducing anger-related issues to improve outcomes for those with PTSD who exhibit high levels of anger, hostility, and aggressive behavior [5].

#### **4.4 Environmental and historical**

Various environmental factors can elevate the risk of violence in individuals with PTSD, including the nature of trauma exposure. Research indicates that war-related trauma is associated with increased aggressive behaviors [9]. Men with PTSD related to combat and exposure to war atrocities were significantly more likely to exhibit aggressive behaviors towards their partners compared to men without PTSD [66]. Child sexual abuse is strongly associated with the subsequent development of PTSD [19]. Childhood physical, sexual, and emotional abuse is a significant predictor of involvement in the criminal justice system [15]. A PTSD diagnosis in individuals with a history of childhood trauma is strongly associated with violent criminal charges, even after accounting for variables such as sex, age, race, education, and income [59].

Lower socioeconomic status (SES), unemployment, and financial instability are risk factors for violence in individuals with PTSD [58, 67]. Combat veterans with PTSD and lower SES are more prone to interpersonal violence compared to those without PTSD [59]. PTSD is highly prevalent in inner-city populations, where lower SES is linked to more severe PTSD symptoms following trauma exposure [23]. Social support also plays a critical role; individuals who feel unsupported by their family members are more likely to experience problems with aggression [67].

### **5. Assessment and diagnosis**

Violent behavior, anger, and irritability are common reasons for individuals to seek mental health care; however, distinguishing PTSD-related violence from other

psychiatric conditions can be challenging due to overlapping symptoms and high comorbidity rates [55, 68]. For example, borderline personality disorder features emotional dysregulation, impulsivity, and anger, which can lead to aggressive behaviors [18]. Antisocial personality disorder is marked by impulsivity, aggressiveness, and a disregard for the safety of others [18]. Manic or mixed episodes in bipolar disorder are often characterized by impulsivity, irritability, and agitation, which may also manifest as violence [18]. Violence has been associated with psychotic disorders, though this is often mediated by factors such as low social support, substance abuse, and adverse life events [69, 70]. This overlap makes it challenging to discern whether violence is directly attributable to PTSD, influenced by other comorbid conditions, or represents an entirely separate diagnosis.

In forensic and clinical settings, the subjective nature of PTSD symptoms, such as flashbacks, hypervigilance, and emotional dysregulation, can lead to potential misdiagnosis or malingering, particularly when legal or financial incentives are present [7]. Individuals may exaggerate or feign PTSD symptoms to avoid legal responsibility for violent acts, complicating the diagnostic process. Clinicians must carefully assess the credibility of reported symptoms and differentiate genuine PTSD from other motives, using structured interviews, collateral information, and objective assessment tools where possible.

Establishing a clear link between trauma exposure and violent behavior is another challenge in diagnosing violence-related PTSD. Not all individuals exposed to trauma will exhibit violent behavior, and not all violent individuals have PTSD. Clinicians must carefully evaluate the timeline of trauma exposure and the onset of aggressive behaviors to determine causality. This process often involves detailed patient histories, collateral reports, and sometimes extensive record reviews to understand the individual's trauma background and behavioral patterns.

While structured assessment tools exist, such as the PTSD Checklist (PCL-5), there are no standardized tools specifically designed to diagnose PTSD-related violence. Most current assessments focus on identifying PTSD symptoms rather than directly linking these symptoms to violent behavior. This gap necessitates the development of specialized instruments that can more accurately assess the relationship between PTSD and aggression.

Risk assessment tools for assessing violence in general do exist and are essential for identifying and managing violent behavior in various clinical settings and populations. All patients with PTSD should be assessed for risk of dangerousness to self and others, as well as historical risk factors for violence. Structured professional judgment approaches, which integrate empirical risk factors with clinical expertise, are increasingly favored over purely clinical or actuarial methods, enhancing the accuracy of violence risk assessments and information prevention strategies [71, 72].

The Brøset Violence Checklist and Violence Risk Screening-10 is valuable in acute care mental health settings due to its ease of use, allowing clinicians to quickly and effectively assess the risk of violence. The Violence Screening and Assessment of Needs (VIO-SCAN) is another efficient tool consisting of just five items that enable clinicians to identify veterans at higher risk of violence quickly [73]. Other widely used tools include the Psychopathy Checklist-Revised (PCL-R) and the Historical-Clinical-Risk Management-20 (HCR-20), which are applicable in community treatment settings and offer a structured approach to violence risk assessment. These tools' accessibility and user-friendly formats make them practical choices for clinicians in diverse settings.

Identifying the underlying factors that contribute to aggressive behaviors, such as comorbid psychiatric conditions, trauma history, and specific symptom clusters,

allows clinicians to tailor interventions that address both mental health needs and the risk of violence. With a clear understanding of each individual's unique risk profile, clinicians can implement evidence-based treatments that address the complex interplay of trauma, PTSD symptoms, and aggression.

## **6. Treatment approaches**

The US Department of Veterans Affairs and the US Department of Defense (VA/DoD) updated their Clinical Practice Guideline for Management of PTSD in 2023, emphasizing trauma-focused therapies as the first-line treatment [74]. However, access to quality evidence-based therapy may not be feasible for all individuals due to barriers such as limited availability, reluctance to engage in therapy, or severe symptoms that impede participation. In such cases, initiating treatment with medications, especially when addressing symptoms like aggression, may be reasonable and necessary. Given the high comorbidity of PTSD with other psychiatric conditions, individualized evaluations and clinical judgment are essential beyond relying solely on guidelines.

Several pharmacotherapies, including SSRIs/SNRIs, atypical antipsychotics, and mood stabilizers, show potential in treating either PTSD or aggression individually, though they are generally considered second-line treatments for PTSD, and limited research has explored their effectiveness for co-occurring PTSD and aggression symptoms [75].

### **6.1 Pharmacological interventions**

Advancements in the understanding of neurobiology and clinical research have guided the exploration of various medication classes for managing aggression in PTSD. Selective Serotonin Reuptake Inhibitors (SSRIs), in general, have long been recognized for their anti-aggressive properties and are considered first-line pharmacotherapy for PTSD, and have been shown to significantly reduce hyperarousal symptoms [76–78]. The VA/DoD 2023 guidelines for treatment of PTSD recommend sertraline, paroxetine, and the serotonin-norepinephrine reuptake inhibitor venlafaxine [74]. Studies targeting impulsive aggressive behaviors have also demonstrated the effectiveness of fluoxetine [77, 79]. Several double-blind placebo controlled studies have reported significant reductions in impulsive aggressive behaviors with SSRIs, particularly fluoxetine [80].

If the serotonin-reuptake inhibitor class prove ineffective, only partially effective, or are inappropriate for the patient, mood stabilizers or antipsychotics may be considered despite the VA/DoD's general recommendation against their use. These medications, while carrying potential risks and lacking robust data in PTSD treatment specifically, have shown benefits in managing impulsive aggression in certain populations [81, 82]. The decision to use these medications should carefully weigh the potential benefits against the risks, particularly concerning violence prevention.

Randomized controlled trials have provided strong evidence for the efficacy of several antiepileptic drugs in treating impulsive aggression, including phenytoin, carbamazepine, oxcarbazepine, lamotrigine, valproate/divalproex sodium, and topiramate [81]. Divalproex sodium and carbamazepine have shown efficacy in reducing explosiveness, violent behavior, and angry outbursts in veterans [83]. Studies have also reported that mood stabilizers, including lithium, phenytoin, and oxcarbazepine/



carbamazepine, effectively reduce impulsive aggression compared to placebo [84]. There are only two case studies demonstrating the effectiveness of lamotrigine explicitly related to the treatment of co-occurring PTSD and aggression [85, 86].

Atypical antipsychotics have demonstrated efficacy in treating aggression, though their use is tempered by significant side effects and modest effect sizes [87]. Meta-analyses suggest that atypical antipsychotics may offer modest benefits for symptoms of hyperarousal and hypervigilance in PTSD [82]. Adjunctive therapy with low-dose risperidone has shown benefits in reducing irritable aggression in combat-related PTSD, while olanzapine and risperidone have been effective in managing symptoms of combat-related psychosis [88–90].

Despite their use for some PTSD symptoms, benzodiazepines are not recommended due to their potential to increase aggressive behavior over time [46]. The VA/DoD 2023 guidelines strongly advise against the use of benzodiazepines in treating PTSD due to their association with increased risks and limited efficacy in managing aggression [74].

## 6.2 Psychotherapeutic interventions

Similarly to the limited research on pharmacological treatments, there is a significant need for more empirical studies focusing on psychotherapy for co-occurring PTSD and aggression, though existing evidence may provide stronger support for therapy-based approaches [75]. Given the significant role that anger and hostility play in increasing the risk of violence in PTSD, it is crucial for treatment to include targeted therapies that address these constructs [6, 62]. Treatment focused on managing anger may help individuals identify the physical, emotional, and situational triggers of anger. Anger management programs emphasize developing strategies to control anger, such as identifying and altering harmful self-talk, using time-outs, practicing conflict resolution skills, and engaging in group discussions to manage high-risk anger scenarios [83]. Notably, an emotional regulation program developed by Miles et al. demonstrated effectiveness in reducing aggression and emotional dysregulation in a veteran with PTSD, with benefits persisting after the treatment ended [91].

Cognitive Behavioral Therapy (CBT) interventions specifically targeted at reducing anger and aggression have shown some promise [92]. For example, a group CBT intervention designed by Voorhees et al. led to significant reductions in anger among participants [92]. Anger-focused CBT interventions have also been shown to reduce aggressive driving behaviors in combat veterans, which suggests that targeted therapeutic techniques can address context-specific aggression [93]. A randomized controlled trial targeting both aggression and substance use in veterans resulted in significant reductions in aggressive behaviors, emphasizing the potential of CBT to mitigate violence with high-risk comorbid conditions [94]. Finally, Birkley and Schumm developed a CBT protocol tailored for anger, hostility, and aggression related to PTSD, based on the 2010 VA/DoD Guidelines for treating anger-specific symptoms [5].

Trauma-focused therapies such as Cognitive Processing Therapy (CPT), Prolonged Exposure (PE), and Present-Centered Therapy (PCT) have also been effective in reducing aggression in service members with PTSD [95–97]. Other trauma-informed therapies like *Strength at Home* (SAH) and *Managing Emotions to Reduce Aggression* (MERA) can help reduce aggressive behaviors in veterans with PTSD [98, 99]. Additional treatment modalities include, Narrative Exposure Therapy for Forensic Offender Rehabilitation (FORNET), initially developed for

former child soldiers in Eastern DR Congo, which significantly reduce violent behavior and PTSD symptoms, highlighting its scalability and effectiveness in various contexts [54, 100].

Innovative psychosocial interventions show promise, including gratitude exercises, emotion recognition training, motivational interviewing, art therapy, and trauma-informed narrative approaches, which have demonstrated effectiveness in reducing violence and aggression among veterans and prison inmates [101]. A systematic review further suggests that mindfulness-based CBT may be particularly effective in reducing anger and aggression, highlighting the importance of integrating mindfulness techniques into traditional therapeutic frameworks [48].

## **7. Prevention and management strategies**

Effectively preventing and managing aggression in individuals with PTSD requires a comprehensive, multi-faceted approach that goes beyond single treatment modalities. Key strategies include thorough clinical assessments, addressing dynamic risk factors, and providing targeted interventions.

An essential first step is a detailed assessment that considers a patient's history of trauma, specific symptoms of PTSD, comorbid psychiatric conditions, and any history of violence. This intake should include a careful evaluation of dynamic risk factors, such as current stressors, access to weapons, substance use, and social support systems. Employing structured professional judgment approaches can help clinicians assess the risk of violence and tailor interventions to individual needs. These tools should be used alongside clinical expertise to guide decision-making.

Given the strong link between substance use disorders and heightened aggression in PTSD, early identification and treatment of these conditions are critical [26, 58]. Integrated care models that simultaneously address PTSD and substance use can reduce the risk of impulsive and disinhibited behaviors [102]. Encouraging safer substance use practices and promoting access to treatment options such as medication-assisted therapy (MAT) may be beneficial in managing comorbid addiction issues [103].

Limiting access to firearms, dangerous objects, and other means of violence is a crucial component of managing individuals at risk [44]. This includes discussing safety planning with patients and their families to create a safer environment. Developing individualized safety plans that include coping strategies, emergency contacts, and steps to de-escalate potential conflicts can empower patients and reduce immediate risks.

Addressing social determinants of health, such as housing instability, food insecurity, and access to healthcare, is essential for reducing violence risk [58, 59]. Providing connections to social services can help stabilize patients and reduce triggers that may exacerbate PTSD symptoms. Encouraging participation in support groups, peer mentorship programs, and community-based activities can provide a sense of belonging and help mitigate isolation, which can worsen PTSD symptoms [104].

A positive therapeutic relationship has been shown to significantly impact treatment outcomes for individuals with PTSD and aggression [105]. Building trust, validating the patient's experiences, and consistently engaging them in their treatment plan can enhance compliance and reduce the risk of violence. Ongoing monitoring of symptom severity, treatment efficacy, and potential risk factors allows clinicians to make timely adjustments to the care plan, ensuring that interventions remain relevant and effective.

## 8. Future directions and research

Future research should prioritize interdisciplinary studies that explore the genetic, neurobiological, and psychological mechanisms underlying PTSD-related aggression [106]. Although existing neurobiological and neurochemical evidence suggests a link between PTSD and violence, further research is necessary to fully understand these mechanisms and establish a definitive causal relationship [47, 49, 107]. Additionally, while research has explored treatments for PTSD and aggression individually, there is a pressing need for studies focused on empirically supported interventions that address the co-occurrence of these conditions [75].

Integrative research could identify novel biomarkers, therapeutic targets, and personalized treatment approaches that address the complexities of PTSD. This integration can identify novel biomarkers, therapeutic targets, and personalized treatment approaches that address the complexity of PTSD. Exploring the role of digital health interventions, such as mobile apps, telehealth platforms, and virtual reality (VR) therapies, could expand access to effective treatments, particularly for those in underserved or rural areas [108]. There is a need for longitudinal studies that track the outcomes of individuals with PTSD and aggressive behavior over time [26, 46]. Such research can help identify which treatment approaches are most effective in the long run and how interventions can be adjusted as patients' needs evolve.

Studies should investigate how factors like race, gender, socioeconomic status, and exposure to community violence uniquely impact PTSD and aggression. Understanding these differences can inform culturally sensitive and tailored interventions that address the specific needs of these populations. Given the high prevalence of PTSD and aggression in younger populations exposed to violence, there is a critical need for research on early intervention programs [31, 32]. Prevention efforts that focus on trauma-informed care in schools and juvenile justice settings could reduce long-term violence risk [109].

Stigma associated with PTSD, violence, and mental health treatment can prevent individuals from seeking help [110]. Research should explore public health campaigns, provider training, and community engagement strategies that reduce stigma and promote acceptance of mental health care. Addressing provider hesitancy to treat individuals with a history of violence is vital. Developing training programs that equip clinicians with the skills to safely manage aggressive behaviors in clinical settings can help improve access to care [111].

## 9. Conclusions

The complex relationship between PTSD and violent behavior is shaped by biological, psychological, and environmental factors. The cyclical nature of trauma and aggression, where individuals can be both victims and perpetrators, underscores the need for a deeper understanding of the mechanisms involved. Neurobiological factors contribute to heightened stress responses and impaired emotional regulation in PTSD. Psychological factors like anger and hostility, along with co-occurring conditions like substance use disorders, further elevate the risk of aggression. Environmental influences, including socioeconomic stress, childhood trauma, and combat exposure, add layers of complexity to the trauma-violence connection. Assessing PTSD-related violence is challenging without structured assessment tools, which, when combined with clinical judgment, are essential for identifying risk, guiding prevention, and

providing effective treatment. Treatment requires a multifaceted approach, prioritizing trauma-focused therapies and incorporating pharmacological interventions when necessary. There is a lack of empirically supported treatments for co-occurring PTSD and aggression, highlighting an urgent need for further research to develop and evaluate effective interventions for addressing these dual conditions. Prevention strategies should include thorough assessments, safety planning, and enabling strong support systems. Future research should focus on integrating genetic, neurobiological, and psychological insights to develop personalized treatments, address disparities, and reduce stigma. Innovative therapies and technology-based interventions hold promise for enhancing care. Ultimately, a holistic, patient-centered approach is key to breaking the cycle of trauma and violence and improve outcomes for individuals and communities alike.

### **Conflict of interest**

The author declares no conflict of interest.


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