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Risk Factors for the Development of Psychopathology Following Trauma

Sehrish Sayed[1] · **Brian M. Iacoviello**[1] · **Dennis S. Charney**[1]

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Abstract Traumatic experiences can lead to a range of mental health problems with posttraumatic stress disorder (PTSD) leading as the most documented disorder following trauma. Epidemiological research has found the rate of exposure to trauma to far outweigh the prevalence of PTSD. Indicating that most people do not develop PTSD following a traumatic event, this phenomenon has led to an interest in evaluating risk factors to determine who develops PTSD. Risk factors for the development of psychopathology following trauma exposure fall into three categories: pre-trauma, peri-trauma and post-trauma factors. Pre-trauma factors can include age, gender, race/ethnicity, education, prior psychopathology, and neurobiological factors. Peri-trauma factors can include the duration/severity of trauma experience and the perception that the trauma has ended. Post-trauma factors can include access to needed resources, social support, specific cognitive patterns, and physical activity. To date, several important risk factors have been found to impact the risk of developing PTSD including gender, age, education, IQ, race and ethnicity, sexual orientation, pre-trauma psychopathology, prior trauma exposure, familial psychiatric history, and neurobiological factors. This article outlines the state of research findings on pretraumatic, peritraumatic, and posttraumatic risk factors for the development of PTSD and associated psychopathology following trauma.

This article is part of the Topical Collection on *Disaster Psychiatry: Trauma, PTSD, and Related Disorders*

✉ Sehrish Sayed
seharish.moughal@mssm.edu

[1] Department of Psychiatry, Icahn School of Medicine at Mount Sinai, One Gustave L Levy Pl, Box 1230, New York, NY 10029, USA

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Introduction

Potential reactions following trauma can vary widely across individuals and can include symptoms such as sleep difficulties, somatic symptoms (e.g., energy and appetite impairments), and emotional symptoms (e.g., increased anxious arousal, irritability, outbursts of anger, chronic sad mood, or hopelessness). More severe manifestations of post-trauma psychopathology include the development of psychiatric disorders such as posttraumatic stress disorder (PTSD), major depressive disorder (MDD), and substance abuse disorders [1–4], and often, these disorders are observed to be comorbid in post-trauma patients. As PTSD is often considered the most severe manifestation of post-trauma psychopathology, this review will focus more specifically on the risk factors for developing PTSD and associated psychopathology in response to trauma exposure. Identification of risk factors for the development of PTSD could inform the optimal delivery of services and resources after trauma and disaster to those who are most likely to develop psychopathology and might benefit the most from early intervention.

PTSD is defined not only by its presumed cause (trauma exposure) but also by specific symptom clusters that characterize the disorder. In contrast to normative reactions to trauma, individuals with PTSD respond with heightened intrusive recollections, avoidant behavior, emotional liability (particularly irritable outbursts), or numbness, and hyper arousal for danger or threat. These symptoms cause significant distress and impairment in daily functioning. Additionally, PTSD is often associated with other co-morbid psychiatric disorders, it carries a high risk for chronicity, and individuals with PTSD have a sixfold

increase in suicidality [5, 6]. A recent meta-analysis of 42 studies with a total of 81,642 participants on long-term remission rates reported an average of 44 % of individuals with PTSD at baseline was non-cases at follow-up 40 months later without specific treatment. Additionally, remission rates varied across studies between 8 and 89 %; studies with the baseline within the first 5 months following trauma the remission rate was 51.7 %, as compared to 36.9 % in studies with the baseline later than 5 months following trauma [7]. This realization has led to the need for early and/or preventive interventions for PTSD. While some interventions have been proven to be ineffective or even harmful, such as the ones developed for delivery immediately following the trauma [8•], other psychotherapies delivered after trauma such as cognitive-behavioral [9] and prolonged exposure [10] therapies have been shown to be moderately effective in reducing symptoms and preventing chronic PTSD.

Although, a staggering 89.7 % [11] of Americans are exposed to a significant traumatic event over the course of their lifetime, the majority of trauma-exposed individuals do not develop psychiatric disorders. Lifetime PTSD prevalence using the same event definition for DSM-5 was 8.3 % [11]. As the epidemiologic literature has made clear, PTSD is not an inevitable result of trauma exposure, as a relatively small percentage of those exposed to trauma develop PTSD whereas many others do not. Therefore, it is important to identify risk factors that may lead to the development of the more severe manifestations of psychopathology following trauma. In addition, understanding of factors that promote resilience to psychopathology in trauma survivors can conversely inform risk factors (e.g., if *X* is a factor for resilience, the converse or absence of *X* may indicate a risk factor). See Iacoviello and Charney (2014) [12•] for a review of the psychosocial factors associated with resilience after trauma exposure.

Risk factors for the development of PTSD can be classified in three domains: pretrauamatic, peritruamatic and posttraumatic. Pretraumatic factors can include demographic, health history, neurobiological, and cognitive characteristics of the individual that predispose them to develop PTSD upon trauma exposure versus exhibiting resilient outcomes. Peritraumatic factors can include the perception of the trauma and how it is experienced by the individual on a cognitive level as well as on a biological level in terms of the body's stress response [13–15]. Posttraumatic variables include the long-term response to trauma, including factors such as social support [16, 17] and the perception of ongoing threat to safety [18].

Pretraumatic Factors

Gender

Females develop PTSD about twice as often as males [19–21]. The lifetime prevalence rate of PTSD for women is 8.5 and 3.4 % for men [22]. This pattern of gender differences is consistent with previous reports from NCS (10.4 vs 5 %). Generally, males report more traumatic exposures but females are exposed to more sexual trauma and are more likely to develop PTSD [20, 23, 24]. Women with PTSD also experience symptoms longer than men [25] and are more likely to report poorer quality of life [26]. In a recent quasi-prospective study assessing PTSD in Danish bank employees exposed to bank robbery, the authors found that females reported more PTSD symptoms than males [27]. The researchers contribute a combination of pre-, peri-, and posttruamtic risk factors such as neuroticism, depression, physical anxiety sensitivity, peritraumatic fear, horror, and helplessness, panic, dissociation, tonic immobility, posttraumatic cognitions about self and the world, and feeling let down together accounted for 83 % of the effect of sex on PTSD severity.

Age

PTSD can affect people at any age; however, there are some discrepancies in terms of what age groups have the lowest prevalence. According to the NCS-R, the highest lifetime prevalence of PTSD was in a group of 45–59 years old (9.2 %) and the lowest prevalence (2.5 %) was in the group over 60 years old [28].

Education/IQ

Cognitive reserve is considered to be an important etiologic factor in the development of PTSD [29, 30]. Low intelligence is a risk factor for PTSD after exposure to a traumatic event [31]. Education is strongly correlated with IQ, and IQ has been shown to be inversely correlated with the risk of PTSD and other psychiatric disorders [32]. Breslau and colleagues reported that children who had an IQ greater than 115 at 6 years old had a decreased risk of PTSD after a trauma exposure [33]. In a 17-year prospective study, researchers concluded that overall, high IQ protected trauma-exposed individuals from developing PTSD. Consistent with these results, it has also been reported that IQ assessed at age 5 was inversely associated with the risk of developing PTSD at age 32 [34].

Race and Ethnicity

Race and ethnicity may be risk factors for PTSD, although the evidence is inconsistent [29]. A 2004–2005 National Epidemiologic Survey on Alcohol and Related Conditions study was designed to assess the role of race and ethnicity of 34,653 white, black, Hispanic, and Asian Americans. The researchers found that the lifetime prevalence of PTSD was highest among Blacks (8.7 %), intermediate among Hispanics and Whites (7.0 and 7.4 %), and lowest among Asians (4.0 %) [35]. Although Whites were more likely than the other groups

to have any trauma, among those exposed to trauma, PTSD risk was slightly higher among Blacks and lower among Asians compared with Whites [36]. These results are consistent with previous studies reporting whites have higher risks of exposure to any traumatic event [37, 38]. In a sample of survivors of physical trauma, Hispanic Whites were more likely to report PTSD and with greater symptom severity compared to non-Hispanic Whites [39]. They also reported more symptoms related to cognitive and sensory perception, such as hypervigilance and emotional reactivity.

Sexual Orientation

Profound sexual orientation disparities have been associated with the risk of PTSD. Lesbians, gay males, and bisexuals, referred to as sexual minorities, experience higher rates of early childhood abuse and greater exposure to violence and traumatic events [40]. Sexual minorities have been reported to have a 1.6 to 3.9 times higher risk of PTSD compared to a heterosexual reference group [41]. Several studies have found elevated prevalence of both childhood maltreatment and adulthood PTSD in sexual orientation minorities [42, 43].

Pretrauma Psychopathology

The psychopathology of an individual prior to the trauma has also been implicated as a risk for developing PTSD, with increased risk-associated externalizing and anxiety issues. Children rated as having externalizing problems above the normal range at age 6 were more likely to develop PTSD than children who were rated as normal externalizers [33]. Likewise, children who were categorized as highly anxious or having depressive mood in first grade were also at higher risk of PTSD at age 15 when exposed to traumatic events compared to their peers who did not have these psychological symptoms [44]. Children with difficult temperaments, fewer friends, or antisocial behaviors were more likely to develop PTSD than their peers who did not have these characteristics [34].

Prior Trauma Exposure

It is now well known that exposure to prior trauma has been implicated in PTSD. Several studies have confirmed that pretrauma psychopathology increases the risk of PTSD. Additionally, childhood abuse is a risk factor for PTSD. Women who experienced physical abuse during childhood had a higher risk of lifetime PTSD [45]. Additionally, people who experienced a traumatic event before the target stressor reported higher levels of PTSD symptoms than those who did not, especially among individuals who experienced noncombat interpersonal violence [45]. However, more recent studies have shown that it is not the prior trauma experience, but the development of PTSD symptoms in response to a prior trauma that increased the risk of PTSD after a later trauma [46, 47].

Familial Psychiatric History

The evidence to support the association between family psychiatric history and PTSD is inconsistent. Individual studies have shown that parental mental health disorders are associated with increased risk of PTSD, even after controlling previous traumatic events [48]. Maternal depression has also been shown to be associated with increased risk of PTSD [34]. Statistically significant associations between PTSD and family psychiatric history of depression, anxiety, and psychosis have also been reported [49]. However, in a meta-analysis of over 75 different studies investigating PTSD risk factors, this association was not found to be significant [50].

Neurobiological Factors

Neuroimaging tools have provided a platform to examine the neurobiology of PTSD. Studies have also identified neurobiological factors that appear to influence resilience, including genetic factors and neurochemical systems involved in the stress response and the function of specific neural networks [51, 52]. Research in this area has generally focused on the sympathetic nervous system and the hypothalamic-pituitary adrenal axis but other neurobiological systems have also been implicated in the pathologic and protective responses to stress.

Recently, a study was conducted using data from a large longitudinal study of 340 healthy young adults researchers and demonstrated that individual differences in threat-related amygdala reactivity predicts psychological vulnerability to life stress occurring 1–4 years later [53]. The authors provided evidence for the utility of threat-related amygdala reactivity using fMRI as a predictive biomarker of risk for psychological vulnerability to stressful life events. The results of this study are consistent with previous studies that identify risk factors for depression and anxiety disorders in relation to increased amygdala reactivity to threat [54–56]. More research is required to implicate any neurobiological mechanisms of PTSD risk or resilience; however, identifying biomarkers and neuroimaging models for the purposes of diagnosis of PTSD would shift the paradigm from relying solely on self reported symptoms and help determine targets for pharmacologic treatment.

In addition, recent genetic studies showed that relatives of PTSD patients had higher risk of the disorder than relatives of similarly trauma-exposed controls who did not develop PTSD [29]. Additionally, twin studies of male Vietnam veterans established a genetic influence of about 30 % for the vulnerability of PTSD, even after genetic influences on trauma exposure are accounted for [57]. Another twin study among young women reported PTSD vulnerability at 7.2 % [58].

Twin and family studies also provided evidence that most genes that affect the risk of PTSD also influence the risk of other psychiatric disorders, including major depression, generalized anxiety disorder, and substance abuse [59].

Researchers have identified genetic markers linked to PTSD by analyzing blood samples from 188 U.S. Marines taken before and after deployment into conflict areas. U.S. Marines who developed PTSD symptoms were compared to those who did not. They identified modules of co-regulated genes involved in innate immune function and interferon signaling [60]. These results were replicated in an independent smaller sample of 96 Marines.

Peritraumatic Factors

Trauma Type and Severity

Peritraumatic factors can include the perception of the trauma and how it is experienced by the individual on a cognitive level, as well as on a biological level in terms of the body's stress response [13, 15]. Trauma type and severity are important in determining the risk of developing PTSD, whereas the highest PTSD risk is associated with physical injury or sexual assault [29]. The perception of the trauma as a true threat to one's life and that one has suffered major losses as a result are also associated with greater risk [45, 61].

Continued Perception of Threat

The ineffectiveness and occasional harmfulness of debriefing as an immediate intervention after disaster or trauma highlight the importance of "ending" the perception of threat or trauma as soon as possible to maximize the likelihood of adaptive outcomes. The main idea behind debriefing was to promote emotional processing by encouraging recollection of the event, versus promoting avoidance and maladaptive emotional outcomes. Debriefing has origins with the military, where sessions were intended to boost morale and reduce distress after a mission. Debriefing was done in a single, mandatory session with seven stages: introduction, facts, thoughts and impressions, emotional reactions, normalization, planning for future, and disengagement [62, 63]. There are several theories as to why debriefing increased incidents of PTSD. First, those who were likely to develop PTSD were not helped by a single session. Second, being re-exposed too soon to the trauma could lead to retraumatization. Whereas exposure therapy and cognitive behavioral therapy (CBT) allow the person to adjust to the stimuli before slowly increasing severity, debriefing did not allow for this. This suggests that the ability to disengage from the traumatic experience and perceive it as "over," may be an important factor influencing adaptive responses to trauma versus the development of PTSD.

Posttraumatic Factors

Several psychosocial factors are associated with resilience following trauma to decrease the chance of developing psychopathology such as depression, substance abuse, and PTSD. These factors include optimism, cognitive flexibility, active coping skills, the extent of one's social support network, physical health, and embracing a moral compass. In addition, the growing literature on psychological first aid as a strategy for minimizing the emergence of post-trauma psychopathology also informs factors that can contribute to risk versus resilience after trauma exposure. Each of these factors is described and reviewed below.

Access to Needed Resources

Psychological first aid (PFA) [64] is an evidence-informed modular approach for assisting people in the immediate aftermath of disaster and trauma to reduce initial distress and to foster short and long-term adaptive functioning. It is based on the idea of addressing pragmatic needs: what does the individual need immediately after the trauma, how can their experience be normalized instead of pathologized, and how can they be encouraged to cope effectively? As such, PFA does not necessarily involve discussion of the traumatic event. PFA is based on the premise that these are important components of adaptive recovery, and accordingly, their absence could be deemed risk factors for the development of PTSD.

Critical components of PFA include protecting the individual from further harm and providing the perception that the trauma is over. This includes connecting individuals with required services (social services, emergency housing, food, clean clothes, etc.). The opportunity to talk without pressure and the presence of active listening, compassion and addressing and acknowledging concerns contributes to a sense of social support. During PFA, discussion will often include normalizing the individual's emotional responses to the trauma, discussing possible coping strategies and relevant referrals. It is important to note that despite some smaller preliminary reports, evidence for the efficacy of PFA is currently lacking [65].

Social Support

Data suggest considerable emotional strength comes from maintaining a social support network. Social networks can be in the form of individual relationships or organizational support. Lack of social support by a spouse, friends, and family after a traumatic event and ongoing life stress also increases the risk of developing PTSD [45, 50]. In recent studies of PTSD in veterans from Operation Enduring Freedom in Afghanistan and Operation Iraqi Freedom, PTSD was greatly associated with less social support, difficulties in relationships

and poor social functioning [66]. In a separate cross sectional study of National Guard veterans from both wars, being in a relationship, having fewer psychosocial dysfunction and reporting greater perceptions of control and family support increased the likelihood of resilient outcomes versus psychopathology [67].

Post-Trauma Cognition

Cognitive flexibility refers to a person's ability to reappraise the perception and experience of the traumatic experience instead of being rigid in one's perception. Being rigid in one's perception makes acceptance and recovery increasingly difficult. Traumatic experiences can be reevaluated, adjusting the perception and meaningfulness of the event. For example a person who encounters a traumatic event involving an assault by a man can hold on to the belief that all men are dangerous. This type of inflexibility leads to the development of several PTSD symptoms such as hyperarousal, hypervigilance, and avoidance. Being open to the idea of acceptance and assimilation of the traumatic event into one's life narrative can lead to recovery [68]. Implications for psychosocial interventions to promote resilience after trauma include cognitive processing therapy (CPT) [69] and prolonged exposure therapy [70] both geared towards modifying cognitions associated with the trauma and enhancing cognitive flexibility as a means of initiating symptom reduction (e.g., reducing avoidance after modifying the core beliefs associated with the trauma).

Optimism refers to the maintenance of positive expectancies for important future outcomes [71]. Optimism can be conceptualized as both a personality trait as well as a situational trait, which varies across time and situations. Research studies have demonstrated optimism as being associated with psychosocial well-being in a non-PTSD trial of breast cancer survivors [72] and with lower posttraumatic symptoms after experiencing a deadly earthquake [73]. Together, optimism and cognitive flexibility provide an individual with faith that they can eventually prevail and survive [74].

Physical Activity

Physical activity is an important factor that can promote resilience. Physical fitness confers resilience by inducing positive psychological and physiological benefits [75]. In contrast to a physically inactive lifestyle, being active is inversely related to stress, physical health problems, and the development of chronic diseases such as PTSD, depression, and substance abuse [76, 77]. In a recent study of 202 people in Seoul and Syeonggi, the degree of family's participation in recreational sports boosted family resilience [78]. Several studies of resilience including meta-analysis and reviews indicate that physical exercise can provide a mechanism to promote resilience and recovery from stress [79]. Right now, more studies need to examine the relationship between physical exercise and PTSD as there is currently limited data.

Embracing a Moral Compass

Engaging in positive altruistic (unselfish) behavior can result in positive core beliefs. It was reported that a resilient family has excellent communication ability between its members and resolves problems altruistically [80]. Although studies of altruism and PTSD are limited, altruism has been strongly associated with resilience in children and adults [81, 82]. Altruistic behavior can contribute to purpose in life. The hopelessness theory of depression has shown that hopelessness and depression can stem from maintaining negative beliefs regarding the stability, globality, and internality of the negative life event that occurred [83]. Conversely, maintaining positive core beliefs may prevent the development of hopelessness by helping the individual adopt a more adaptive way of thinking when faced with traumatic events. While more empirical study of these ideas is needed in traumatized samples, a study of Pakistani earthquake survivors' found that their purpose in life was associated with lower PTSD and depressive symptoms [84].

Conclusion

The risk of developing PTSD after exposure to a traumatic event depends on a complex mix of factors, including gender, age, ethnicity, socio-demographic factors, childhood behavioral problems, prior exposure to a traumatic event, and a family history of psychological disorders. Conversely, protective factors for PTSD include adequate social support, cognitive capacities, and access to needed resources, all of which may help promote positive mental health and thus reduce the risk for PTSD. Increasing knowledge regarding these factors can help promote resilience and decrease psychopathology following trauma. Additionally, identifying these factors can inform psychosocial targets for interventions for individuals recovering from trauma.

Compliance with Ethics Guidelines

Conflict of Interest Sehrish Sayed and Dennis S. Charney declare that they have no conflict of interest.

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