

Pediatric PTSD: Clinical, Forensic, and Diagnostic Understanding

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Exposure to trauma is a common event in the lives of children and adolescents living in the United States. Although a minority of youth develop full posttraumatic stress disorder (PTSD) after a traumatic event, those who do tend to have an extended course of symptoms in multiple functional domains and higher rates of psychiatric comorbidities. Pediatric PTSD can play an important role in legal settings, and requires that an expert witness be well versed in advances in clinical and conceptual models of this diagnosis and familiar with current research devoted to the posttraumatic response in youth. This review is designed to be a resource for the forensic evaluator and outlines the current understanding of epidemiological and clinical features of pediatric PTSD, as well as the neurobiological, dimensional, and developmental conceptual models that describe it.

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In the field of forensic psychiatry, it has been stated that “No diagnosis in the history of American Psychiatry has had a more dramatic and pervasive impact on law and social justice than posttraumatic stress disorder” (Ref. 1, p 23). With regard to youth, research has shown that traumatic exposures are very common during childhood and adolescence, with most individuals exposed to at least one traumatic event before the age of 18, and a significant number exposed to multiple episodes.² For children and adolescents, PTSD can enter into cases involving personal injury, medical malpractice, violent crime, physical and sexual abuse, neglect, custody evaluations, and the termination of parental rights. It also has been associated with increased awarded damages and can be used in cases of sexual abuse to argue that sexual activity was not consensual.³ In criminal cases, a diagnosis of PTSD can be used to illustrate that a criminal act has in fact occurred. In civil court, the existence of a posttraumatic response is of key importance in determining compensatory damages in tort claims. Compensation size can be influenced by a

litigant’s severity of dysfunction and distress, as well as the duration of these effects, which the forensic evaluator must comment on through the report and testimony.⁴ The forensic role that pediatric PTSD may play in court proceedings points to the clear need in both the civil and criminal settings for qualified forensic evaluators who have expertise in child development and the presentation of posttraumatic symptoms in this population. When testifying in court, forensic examiners must be up to date in their knowledge of research in posttraumatic symptomatology in youth, in accordance with the *Frye* or *Daubert* standards for the admissibility of expert testimony (where applicable). The expert must additionally understand and apply the new Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5),⁵ criteria in evaluations.

Epidemiology and Clinical Features

It has been estimated that approximately 3 million cases of child abuse or neglect are reported each year in the United States.⁶ The National Child Traumatic Stress Network has reported that 25 percent of youth have experienced a traumatic event by the age of 16 years, including encountering natural disasters, rape, physical assaults, witnessing violence, combat or war-related stressors, and illness or injury.⁷ Data from the Great Smoky Mountains Study² showed that, in a community sample, nearly 68 percent of the children and adolescents surveyed had a lifetime exposure to

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at least one traumatic event, and 37 percent had been exposed to more than one. In this group nearly 25 percent had been exposed to violent trauma, whereas sexual trauma occurred at a prevalence rate of 11 percent. In addition, physical illness, natural disasters, serious accidents, fire, and exposure to noxious agents accounted for an additional 33 percent of cases. A more recent study of 6,483 adolescent–parent pairs in the National Comorbidity Survey Replication Adolescent Supplement (NCS-A) showed that 61.8 percent had been exposed to a potentially traumatic stressor.⁸ In this sample, the most common stressors were the unexpected death of a loved one (28.2%), man-made or natural disasters (14.8%), and witnessing a death or a serious injury (11.7%). Nationwide surveys of adults have shown that 16 percent of women and 22 percent of adults have a childhood history of sexual abuse, and 30 percent have reported a history of physical abuse.⁹ Epidemiological studies in adult populations have also demonstrated that a significant proportion of the population will in some form experience a traumatic stressor in their lifetime.^{10–12}

Despite such high prevalence rates of traumatic exposure, a minority of youth and adults go on to meet full criteria for PTSD. Recent estimates of the prevalence of PTSD within the pediatric and adolescent population have ranged from 0.5 percent to 9.2 percent, compared with a lifetime prevalence of up to 14 percent in the adult population.^{2,6,8,13,14} It has been observed that children and adolescents have shown in general a lower prevalence of PTSD after exposure to traumatic events than adults, although this lower rate may have been significantly influenced by a lack of developmentally informed diagnostic criteria. As with adults, approximately 30 percent of youth exposed to trauma have met full DSM-IV diagnostic criteria for PTSD.^{14,15}

Studies have also shown that the likelihood that youth will develop full PTSD is influenced by the type and severity of exposure. Natural disasters have been shown to result in lower rates of pediatric PTSD (up to 5% reported).¹⁶ Acute physical trauma has been associated with pediatric PTSD rates of 23 percent.¹⁷ Rates of pediatric PTSD associated with warfare and also violent crime have been shown to range between 27 and 33 percent.^{18–21} Witnessing the sexual assault of their mother or parental homicide resulted in rates of 100 percent.²² Sexual abuse resulted in a wider range, with some studies demonstrating rates as high as 90 percent.¹⁶ In a study examining

rates of PTSD in foster care children, 64 percent of those who had been sexually abused had PTSD, whereas 42 percent of those who had been physically abused went on to meet full criteria for PTSD.²³

Data from the NCS-A demonstrated that in adolescents age 13 to 17, rape had the highest risk of lifetime PTSD at 39.3 percent.⁸ followed by kidnapping (37%), sexual assault (31.3%), physical assault by a romantic partner (29.1%), and physical abuse by a caregiver (25.2%). Traumatic exposures to kidnapping, physical abuse by a caregiver, and domestic violence were identified as the most likely to occur in childhood or early adolescence. Being stalked, mugged, involved in a motor vehicle accident, and assaulted by a romantic partner were associated with mid- and late adolescence. Adolescents who did not live with both biological parents were also more vulnerable to exposure to trauma.

Accumulated evidence has pointed to a multifactorial etiology for PTSD's pathogenesis, incorporating neurobiological, psychological, social, and genetic factors. Three key components that have been demonstrated in multiple studies to contribute to the development of PTSD in children have been: the severity of the trauma exposure, levels of parental distress, and length of time from the trauma exposure.²⁴ Previous trauma exposure, a history of multiple traumas, poor social support, previous psychiatric disorders, and a history of parental psychiatric disorders have all also been implicated as risk factors.¹⁴

Pretrauma externalizing behaviors and prior anxiety have both been associated with higher rates of PTSD.^{2,25} An avoidant coping strategy of thought suppression may be associated with greater negative outcomes, which include increased symptoms of re-experience and higher rates of PTSD 8 months after traffic accidents.^{26,27} Younger age when experiencing trauma has been found in multiple studies not to be associated with a higher risk of developing PTSD.²⁸

Most pediatric patients with PTSD experience a reduction in symptoms or spontaneously remit with time (natural recovery). However, a significant number of traumatized children continue to manifest sustained symptoms for years.¹⁴ In a study of Australian school-age children who were traumatized by a bush fire, PTSD symptoms remained elevated 18 months after the initial stressor.²⁹ LaGreca *et al.*³⁰ found that nearly 70 percent of children exposed to Hurricane Andrew had at least moderate PTSD symptoms 10

months later. Another study found that 74 percent of children highly exposed to a sniper shooting continued to report symptoms of PTSD 14 months later.³¹ Likewise, Scheeringa *et al.*³² found that posttraumatic symptoms in preschoolers did not remit over a course of 2 years, even with community treatment. Of adolescents and young adults who had been in Pol Pot's forced labor camps as children, 24 percent continued to meet criteria for PTSD 15 years after exposure.³³ McLaughlin *et al.*⁸ demonstrated that the mean recovery from PTSD in adolescents was 14.8 months. A longer duration of posttraumatic symptoms in the pediatric population has been noted frequently enough that it has been argued that children and adolescents are unlikely to remit spontaneously.³⁴

In addition to a protracted course of PTSD, traumatic exposure has correlated with high rates of comorbid psychiatric disorders. In one study of 364 abused children, 35 percent met criteria for PTSD, whereas 58 percent had separation anxiety/overanxious disorder, 36 percent had phobic disorder, 22 percent had attention deficit hyperactivity disorder (ADHD), and 22 percent demonstrated oppositional defiant disorder.³⁵ Youths with PTSD have been found to have significantly higher rates of dysthymia and major depressive disorder, as well as high rates of generalized anxiety disorder, panic disorder, and specific phobia compared with non-PTSD controls in a group of 55 youths aged 8–17 years.³⁶ In a community sample of 1,420 children and adolescents, it was demonstrated that traumatized children had nearly twice the rate of psychiatric comorbidity than children who were not exposed, with a greater magnitude of posttraumatic symptoms correlating with higher comorbidity rates in a dose-dependent relationship.² The prevalence of comorbid depressive and anxiety disorders in particular were associated with the number of traumatic exposures that the individual had experienced. Even for children who did not meet full criteria for PTSD, significant impairment in multiple domains was noted, including disruption of important relationships, school problems, physical problems, and the exacerbation of emotional problems.

Sexual abuse during childhood in particular has been found to be a predictor of depression, conduct disorder, and adult substance abuse.³⁷ Childhood sexual abuse has also been associated with a significantly higher risk of adolescent suicide attempts, with sexually abused teens eight times more likely to

attempt suicide repeatedly than controls,³⁸ and an estimated 20 percent of all adolescent suicide attempts attributed to sexual abuse.³⁹ The development of borderline personality disorder (BPD) has also been found to be highly associated with a history of childhood sexual abuse, with 67 percent of subjects with BPD in one study reporting a history of sexual abuse.⁴⁰ A more recent longitudinal study of a large nationally representative population showed that 50 percent of subjects with PTSD and BPD had a history of sexual trauma before age 16 years.⁴¹

Evolution of Developmental, Dimensional, and Neurobiological Frameworks

With increasing recognition of the differences in pediatric and adult PTSD, the conceptual framework through which it is understood in children and adolescents has evolved. A field that once debated whether PTSD could even exist in the pediatric population⁴² has greatly expanded to incorporate current research in physiology, genetics, developmental models, and an understanding of the dimensional nature of psychiatric illness. Advances in the understanding of PTSD in children and adolescents have occurred in three key areas that forensic evaluators must be well acquainted with: neurobiological models, dimensional models, and developmental models.

Neurobiological Models of Pediatric PTSD

It has been shown in multiple studies that trauma has the potential to disrupt several normal neurodevelopmental processes in children and adolescents. At its core, PTSD can be thought of as resulting from a dysregulation of the neural networks that control the fear and stress response.⁴³ The dysregulation includes not only the critical structures of the hypothalamic–pituitary–adrenal (HPA) axis, but also the hippocampus, amygdala, prefrontal cortex and corpus callosum and the interconnections between these regions.^{6,9,43} In addition neurotransmitter systems have been implicated in the pathogenesis of PTSD, including dopamine, norepinephrine, serotonin, GABA, and glutamate.^{9,43}

Neuroimaging of anatomical changes associated with PTSD is of particular importance in forensic evaluations, as it can be used in court to assert that direct physical consequences of a traumatic event

have occurred. In the neuroimaging of adults with PTSD the most consistent anatomical finding has been a reduction of hippocampal volume, which has been associated with deficits in verbal declarative memory.^{9,44} In children however, most imaging studies have demonstrated no change in hippocampal volume compared with controls after exposure to trauma.⁴⁴ More recent longitudinal studies have found that the severity of PTSD and cortisol levels predicted volume reductions of the hippocampus over a 12- to 18-month interval.⁴⁵ These two findings, taken together, have led to the hypothesis that prolonged, excessive exposure to cortisol caused by trauma leads to neuronal death and a reduction in volume of the hippocampus over time, which becomes increasingly visible on imaging as adulthood approaches.^{6,44,46}

One of the most robust and replicated findings from structural imaging of PTSD in youth is the reduced cross-sectional area and connectivity of the corpus callosum.^{44,47} Three recent studies have demonstrated a relationship between particular types of trauma and changes in specific areas of the sensory cortex.^{48–50} Collectively, these studies seem to show that differing perceptual modalities can affect different parts of the sensory cortex. For example, seeing a trauma leads to changes in the visual cortex, whereas hearing something traumatic alters the auditory cortex.

Multiple other structural and functional abnormalities have been demonstrated on imaging after traumatic exposure. Pituitary volume seen on MRI in pubertal and postpubertal youth with a history of maltreatment was significantly larger than in controls.⁵¹ Studies in traumatized adults have found a hyperactivation of the amygdala in response to threatening words or faces compared with controls, which has been replicated in a functional fMRI study in youth presented with angry expressions.⁵² Abnormalities in neuronal metabolism in the medial prefrontal cortex have also been demonstrated on proton magnetic resonance spectroscopy (MRS),⁵³ as have differences in the activity of the frontal and prefrontal cortex on fMRI in traumatized adolescents.⁵⁴ Multiple studies have shown reductions in total cerebral volume in youth with PTSD or chronic trauma.⁴⁴ This observation has not been reported in adults and may represent a finding unique to children and adolescents.

Dimensional Models of Pediatric PTSD

Earlier conceptual frameworks viewed PTSD as a categorical entity in which a child either had PTSD, or did not. In this view, those individuals who met criteria for the type of traumatic event, specific symptoms, duration, and impairment, as defined by the DSM, were considered to be demonstrating a pathological syndrome. Those with posttraumatic symptoms that were present to a lesser extent did not exceed the diagnostic threshold and instead were lumped into the category of having a “normal” reaction to an extreme stressor that did not warrant diagnostic categorization.⁵⁵ However, evidence suggests that this paradigm is not correct. For children and adolescents with these subthreshold symptoms, it has been demonstrated that their levels of impairment and distress are not significantly different from those who do meet full criteria for PTSD.⁵⁶ These findings collectively demonstrate not only the need to recognize and treat these subthreshold symptoms in youth, as they are associated with significant distress and comorbidity, but also that, as with adults, the posttraumatic response is one that is graded and continuous.

In considering a wider range of posttraumatic responses in children and adolescents, opinion on what may constitute a precipitating event has been refined. The limits of the DSM-IV A2 criteria, particularly for young children, have been long recognized.^{15,57} It has been found that, whereas “high-magnitude” events, such as child abuse or accidents, are clearly predictive of developing PTSD, “low-magnitude” events, such as deaths or losses, occur more commonly and are more likely to lead to posttraumatic symptoms in children because of their higher frequency of occurrence.⁵⁸ It has been shown that low-magnitude events such as the death of a loved one, parental separation, and breakup with a best friend or romantic interest, accounted for two-thirds of cases that resulted in painful recall and half of cases of subclinical PTSD.⁵⁹ Of note, in that study, although distress as measured by the presence of symptoms was clearly evident, very few participants met the criteria for full PTSD. In a forensic allegation of PTSD allegedly resulting from paternal sexual abuse in which one of the authors provided expert testimony, in court the child smiled and waved at the defendant. She had on numerous occasions stated in therapy that she missed her father and was not afraid of him. PTSD was diag-

nosed in the course of the forensic psychiatric evaluation, but was most likely secondary to the child's having been abruptly removed from her parents and placed in foster care.

PTSD is more appropriately viewed as dimensional and can exist as a continuum in children and adolescents. Taxometric analysis has illustrated this in the adult population, as well as more recently in adolescents.^{55,60} A dimensional structure suggests the presence of an additive etiology for PTSD in children and adolescents, which would mean that no single genetic or environmental factor singularly leads it to develop,⁵⁵ which is at odds with the categorical definition used by the DSM-IV.¹³

Developmental Models of Pediatric PTSD

Very young children have much different cognitive, emotional, language, and memory capabilities from those of school age children or adolescents, who in turn are also developmentally distinct from adults. PTSD entered the DSM-III in 1980,⁶¹ but it was not until the DSM-III-R⁶² that the American Psychiatric Association first recognized that children's reactions to trauma can differ from an adult's. Each of the subsequent editions and revisions of the DSM have incorporated developmental considerations into the PTSD criteria, which has paralleled advances in understanding of development, neurobiology, and the natural history of pediatric PTSD, culminating in the changes made to the DSM-5. The necessity of incorporating a development perspective into diagnostic criteria has been driven by the need to diagnose PTSD more accurately across the age spectrum, as well as to tailor interventions, inform mental health policy, and enhance research efforts.

In considering developmental stages, posttraumatic symptoms can be manifested differently in four age clusters: preschool children, school-age children, adolescents, and adults. As outlined by Salmon and Bryant,¹⁶ factors that need to be incorporated in understanding a child's response to trauma include memory encoding and retrieval, his knowledge base, language capabilities, and emotion regulation. Each of these shapes the posttraumatic response and is dependent on age and developmental stage.

A child's knowledge base and language development influence how they interpret, encode, and appraise any event committed to memory. Younger children encode memories with less detail and are

more likely to forget or distort aspects of an event than older children or adolescents. This tendency is part of the normal progression to adult memory processing and must not be misconstrued on evaluation as volitional or pathological. The limited knowledge base that younger children possess influences their emotional response, as events that are unlike their usual experiences will not be understood and may not be appraised as traumatic. This has the potential to be protective against distress and posttraumatic symptoms,^{63,64} though the converse can also be true, and a lack of knowledge about a traumatic event can lead to greater distress and misinterpretation.^{65,66}

Language development at the time of encoding has a great effect on the degree to which an event can be verbally reported. Events that are experienced before adequate language has been acquired can be expressed behaviorally in play or interactions with other individuals, which has influenced the DSM-5 to incorporate a greater emphasis on behavioral features of PTSD for the preschool subtype.¹³ There is little evidence that preverbal memories can be reported verbally after language development.⁶⁷

The ability of children or adolescents to regulate their emotions after a trauma in part influences the degree of the stress response to it. As children age, the regulation of emotions is gradually transferred from parents and caretakers to internalized regulatory processes. Younger children may cope with a stressful situation by covering their eyes or ears, or by leaving,^{68,69} whereas older children employ cognitive strategies, such as reappraisal, thought suppression, shifting attention, and cognitive avoidance.⁶⁹⁻⁷¹ More effective use of cognitive strategies with age imparts greater affective control and potential for resilience. Cognitive inhibition, which is the means by which intrusive or irrelevant information is kept from full consciousness, most likely does not develop until after age 10.¹⁶ With regard to reporting their feelings, children are not able to conceptualize complex or mixed emotions fully until approximately age 10.^{72,73} Together these factors suggest that children do not have the potential to manage their thoughts or emotional responses to a trauma adequately until mid-childhood.¹⁶ Children in a more chaotic environment are more likely to develop posttraumatic sequelae.

Younger children lack strategies to retrieve information from memory spontaneously and require structure from adults to do so. For this reason, the

younger the child, the less likely he is to initiate a conversation about the event or provide details about it.^{74,75} Therapeutic discussion of the trauma is important in several regards, however. Failure to discuss the event will prevent the child from reappraising it or correcting misconceptions, and adult therapeutic support will not be available to help the child regulate his emotional responses more effectively.¹⁶ There are potential negative consequences to discussion as well, as memories in younger children can become distorted through suggestion or the passage of an extended period since the event. The repeated forensic interrogation by child protective services, law enforcement, plaintiff attorney interrogation, deposition, and trial testimony all can exacerbate PTSD symptoms and potentially lead to cognitive distress.

In the absence of more developed language skills and emotional regulation, the responses of preverbal children and preschoolers are largely characterized by mood, anxiety, and behavioral symptoms.⁷⁶ Even if they are too young to have an understanding of a stressor, the effect on their caretakers can significantly disrupt their routine and alter their support structure, leading to regression and detachment.⁷⁷ In infants less than 12 months of age, posttraumatic responses can be manifested as increased crying and irritability, separation anxiety, “freezing,” and an exaggerated startle response.⁷⁸ Toddlers tend to be more clingy, have disturbances of sleep (sleep terrors, nightmares), show a regression in behaviors and acquired skills, have increased temper tantrums, and may become selectively mute. By the fourth to sixth years, children begin to act out aggressively; they may regress by demonstrating nocturnal enuresis and loss of acquired speech, manifest somatic symptoms (headaches, stomachaches), or refuse to attend school. Younger children may be more susceptible to the posttraumatic symptom of re-experience (intrusive thoughts, images, or perceptions), because their memory is more visually and perceptually based.⁷⁹ The egocentrism that is a defining characteristic of younger children may lead them to feel responsible for causing a trauma, which results in more prominent guilt for them than in adolescents or adults.^{70,80} Magical thinking has been associated with “omen formation,” in which young children believe that in retrospect “signs” of the traumatic event approaching could have been seen.^{21,81} Young children are not able to manifest avoidance in the same way that older youth and adults can, simply because where they go

and what they do are dictated by their adult caretakers.⁸²

School-age children (age 6 to puberty) have a greater ability to have empathy for others who were affected by a traumatic event, and can begin to engage in the “how” and “why” of a tragedy.⁸³ They exhibit more symptoms in their interactions with others, including social phobia and isolation, a fear of novel situations, separation anxiety, and repetitious traumatic play.⁷⁸ Posttraumatic play can seem joyless, and can involve re-enactments of the trauma, or drawings with traumatic content.³ Sleep disturbances and regression are seen, similar to younger children. Dreams may be vaguely formed and difficult for the child to describe. Children older than 6 may not demonstrate avoidant symptoms, but may instead develop new incident-specific fears that resemble phobias.⁸² They also may not have visual flashbacks or numbing symptoms.⁴² A sense of having a foreshortened future may have little validity in this and younger age groups, as they have little ability to conceptualize a time in the future. It has been noted that children may also have long periods of re-experiencing that alternates with periods of avoidance and numbing, instead of both occurring at the same time.⁸⁴

Although adolescents demonstrate symptoms of PTSD that are most similar to those of adults, aggressive outbursts and risk-taking behaviors are more salient in teenagers. Risk taking may take the form of substance use or high-risk sexual behaviors. Rebellion at home and school are common outcomes of trauma, as are school avoidance, depression, and anxiety.^{34,78} Other frequently seen symptoms are loss of interest in previously enjoyed activities, withdrawal from family and peers, changes in life attitudes, eating disorders, somatic complaints, loss of affective control, personality changes, self-destructive and impulsive behaviors, and impaired relationships.^{85,86}

Adolescents who have been exposed to prolonged or multiple stressors may present with primarily dissociative symptoms, including depersonalization, derealization, self-injurious behaviors, and intermittent angry and aggressive outbursts.⁴² In clinical settings, parents often underestimate posttraumatic symptoms as adolescents may try to hide their reaction to a stressor for fear it may be abnormal or because they are attempting to protect others from distress.⁸⁷ However, it is important to note that this finding may not apply in the forensic context where

there could be an incentive for parents to overreport posttraumatic symptoms.

Summary

Exposure to trauma is the reality for most children and adolescents living in the United States. Despite this, a minority develop the full syndrome of PTSD. The response to trauma and development of full PTSD are influenced by several factors, including the type of trauma and severity of exposure, age and living environment, gender, preexisting emotional or behavioral problems, and aspects of personality and coping styles. Pediatric PTSD can be best understood through three conceptual models that incorporate research findings in the areas of the neurobiology of children and adolescents, childhood cognitive and psychological development, and the dimensional nature of mental illness. It has been demonstrated that exposure to a traumatic stressor causes changes in the child and adolescent brain at the levels of neurotransmitter activity, the functioning of anatomical regions of the brain, and the neural circuitry that connects these regions. The expanding field of neuroimaging has additionally found that trauma can be associated with changes in brain structure and functionality, although whether these changes are specific to and predictive of PTSD remains to be seen.

Those children and adolescents who meet the criteria for PTSD tend to have an extended course of active symptoms that are associated with several other psychiatric disorders, including behavioral disorders, mood disorders, anxiety disorders, and substance abuse disorders. The psychological sequelae are not limited to formal diagnoses, but also confer an increased risk of emotional dysregulation, suicide, disturbances of attachment and identity formation, cognitive deficits and poor academic performance, and impulsive and aggressive behaviors.

The role of the forensic expert is one of integral importance in assessing the validity of a plaintiff's or litigant's complaints, and the severity of the impact of an alleged trauma. In formulating a case and presenting clinical findings to the court, the evaluator must use knowledge of the variable presentation of PTSD by developmental stage, the natural course of PTSD in youth, and the differentiation between pathological and nonpathological responses to stress.

It is certain that lawyers and courts will continue to rely on the DSM in cases that involve alleged trauma and, with the release of the DSM-5, will look to the forensic expert to address whether a DSM-5 diagnosis of PTSD can be made. The DSM-5 has attempted to improve on what many have seen as limitations of the applicability of the DSM-IV criteria for the pediatric population by incorporating a greater focus on developmental and behavioral aspects of PTSD. This has led to changes in the diagnostic criteria in the DSM-5 (including a developmental subtype for children ages 6 and below) that may not only affect the likelihood of making a diagnosis, but also the prevalence of pediatric PTSD, and must also be well understood and carefully applied in any forensic evaluation.

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