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Review article

Traumatic Stress and Posttraumatic Stress Disorder in Youth: Recent Research Findings on Clinical Impact, Assessment, and Treatment

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A B S T R A C T

Childhood trauma can have a profound effect on adolescent development, with a lifelong impact on physical and mental health and development. Through a review of current research on the impact of traumatic stress on adolescence, this article provides a framework for adolescent health professionals in pediatrics and primary care to understand and assess the sequelae of traumatic stress, as well as up-to-date recommendations for evidence-based treatment. We first review empirical evidence for critical windows of neurobiological impact of traumatic stress, and then we discuss the connection between these neurobiological effects and posttraumatic syndromes, including posttraumatic stress disorder, depression, aggressive behavior, and psychosis. This article concludes by considering the implications of this current research for clinical assessment and treatment in pediatric and primary care settings.

IMPLICATIONS AND CONTRIBUTION

Childhood trauma has a profound impact on adolescent health and development. Adolescent medicine clinicians are critical to screening, assessment, and triage of traumatized youth. Clinicians should understand the diverse manifestations of traumatic stress, screen all adolescents for trauma, provide psychoeducation and risk assessment, and collaborate with families for treatment.

Childhood trauma has been called "the hidden epidemic" [1], as evidence mounts that early traumatic experiences can have both immediate and long-term consequences. Childhood trauma is common; 38.5% of American adults endorse having experienced a traumatic event before age 13 years [2], and 25.1% of youth report having undergone a significant trauma before age 16 years [3]. These traumas include a wide range of terrifying or life-threatening experiences, including child maltreatment (including physical and sexual abuse and neglect), medical traumas, accidents, natural disasters, war, terrorism, refugee trauma, traumatic loss, severe bullying, and exposure to domestic and community violence.

The effects of such events can last long into adulthood, as traumatic experiences in childhood lead to a greater risk of psychiatric, cardiac, metabolic, immunological, and gastrointestinal illness later in life [1,4]. The immediate effects of traumatic stress on children and adolescents are also profound. Most youth who experience significant trauma display disturbances of mood, arousal, and behavior immediately, and although many recover, approximately one-third develop enduring symptoms of posttraumatic stress disorder (PTSD) [5]. The risk for PTSD for each child depends on the nature of the trauma; the child's age and gender; and personal, family, and community factors [6].

Increasing evidence demonstrates that trauma, particularly repeated trauma and maltreatment, can have lifelong impact on multiple domains of functioning, including adaptive and interpersonal functioning, emotion regulation, cognition and memory, and neuroendocrine function [1]. Children and adolescents who have experienced trauma can manifest severe disturbances

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in mood, behavior, attention, attachment, and impulse control [7–12], which may mimic other psychiatric disorders, such as bipolar disorder and ADHD. Adolescents with PTSD are at increased risk for major depression, aggression, and conduct disorder [13,14]. They manifest more frequent suicidal ideation and attempts even after controlling for depressive symptoms, gender, and treatment setting [15]. Youth exposed to violence or maltreatment perform less well academically and are more likely to drop out of school [16, 17]. Adolescents with a history of early trauma engage in more risk-taking behaviors, such as substance abuse (including binge drinking), multiple sex partners, and criminal involvement, and are at a greater risk for sexual assaults and relationship violence [15,18–23,24]. Girls who have experienced trauma, particularly sexual abuse, are at increased risk for precocious puberty and STDs [24]. Teens (of both genders) with a history of childhood trauma are at a greater risk of teen pregnancy, and pregnancies in girls with trauma exposure have a greater risk of fetal death and premature birth [24–26].

Adolescents who have experienced trauma are often reluctant to access mental health services [27]. Therefore, pediatricians and adolescent medicine practitioners are the first line of treatment for many traumatized youth. Although many clinicians specializing in adolescent medicine may not have the expertise to provide specialized treatment for symptoms of posttraumatic stress, it is useful for community practitioners to understand the potential manifestations of traumatic stress, assess for PTSD, and determine the need for intervention. Adolescents experiencing symptoms of traumatic stress often fear they are "going crazy," and pediatricians and primary care providers can provide crucial education about the effects of traumatic stress to reduce their anxiety and normalize their experience. Clinicians can also help to advise their patients in a gentle informed way of the benefits of mental health treatment. In this review, we will synthesize recent research on traumatic stress and PTSD in adolescents, with a focus on the implications of such research on clinical assessment and treatment.

Methodology of Search

Research literature on the impact of traumatic stress in adolescents was reviewed after a systematic search of PubMed and PsycInfo. Articles included in the review were those published since 1995 and in English. Articles' reference lists were also reviewed manually to identify additional studies of importance.

Neurobiological Impact of Childhood Traumatic Stress

Childhood trauma can have a broad impact on mental health. Many traumatized children experience brief symptoms of depression, anxiety, or developmental regression but return to baseline quickly, whereas others suffer long-standing PTSD and other psychiatric syndromes, from internalizing symptoms such as depression and anxiety to externalizing symptoms such as behavioral problems. The cause of this diversity of outcomes is not fully understood. The growing field of developmental traumatology suggests that differential outcomes occur in part because of risk and resilience factors in the child (e.g., age, gender, genetic makeup, pretrauma functioning, experience of previous traumas) and environmental factors (e.g., parental psychopathology, attachment, social supports, socioeconomic status) that predate the trauma. These risk factors interact with trauma type, frequency, and severity to impact the developing brain.

There is growing evidence for "critical windows" of vulnerability to traumatic stress in brain development [28–32]. From infancy to adolescence, different brain regions undergo bursts of myelination, synapse formation, pruning, and neural networking. These periods of activity are sensitive to disruption by stress hormones such as cortisol that can suppress glial cell division, dendritic branching, and synaptogenesis, and lead to neuronal loss [30,33]. Epigenetic effects (silencing of genes by methylation) in crucial brain regions during these critical periods can also produce lasting changes in function and stress response [34]. Critical brain areas such as the hippocampus, amygdala, cerebellar vermis, corpus callosum, and cerebral cortex appear to be particularly vulnerable, with differential sensitivity over the course of development [30,35,36].

Adding further complexity, different brain areas are particularly susceptible to different types of trauma and can have different vulnerability depending on the gender of the child [30,37,38]. Genetic differences may impact stress sensitivity, with genes such as 5-HTTLPR (the serotonin transporter promoter polymorphism), the corticotropin-releasing hormone receptor FKBP5 (which modulates glucocorticoid receptors), and the brain-derived neurotrophic factor genes impacting gating of fear circuits that may influence trauma response [34,39]. Hormonal effects are also at play, as sex hormones can exacerbate or inhibit dysregulation in the limbic system and hypothalamic-pituitary-adrenal axis [30,34] and may contribute to the higher rates of PTSD seen in girls [5]. Ongoing irregularities of the hypothalamic-pituitary-adrenal axis and cortisol response, with hypercortisolemia in childhood evolving into hypocortisolemia later in life, can also have lasting effects on cognition, behavior, and learning, as well as on physical health [24,40].

The different neurologic effects that result produce the diverse outcomes of traumatic stress. Each affected brain area can lead to different symptoms. These include memory deficits, disinhibition of anxiety, and dissociation (hippocampus, cingulate, and prefrontal cortices); hyperarousal and aggressive behavior (amygdala); deficits in integration of language and emotion (corpus callosum); and poor modulation of attention and emotional dysregulation (cerebellar vermis) [1,30,35,36]. These effects can manifest immediately, or they may influence development in insidious ways that only present later in adolescence or young adulthood [32]. Alone or in combination, these effects and others appear to underlie the symptom profiles seen in PTSD and other psychiatric sequelae of childhood trauma.

Manifestations of Traumatic Stress in Adolescent Mental Health

Clinicians must be vigilant for different manifestations of traumatic stress in adolescents. Immediately after trauma, many adolescents will manifest transient symptoms of acute stress disorder. These self-limited (<4 weeks by definition) and often fluctuating symptoms include anxiety, insomnia, numbing, dissociation (altered consciousness including reduced awareness or amnesia), detachment, reexperiencing, and avoidance. Although many adolescents recover from these symptoms, in some, it persists for >1 month, at which point a PTSD diagnosis should be made. PTSD appears to be most common after experiencing abuse or maltreatment, violent crime, assault on or death of a parent (including domestic violence), and acute physical trauma (particularly with brain injury), but children who have undergone multiple or chronic traumas such as refugee trauma and