Post-traumatic Stress Disorders in Children and Adolescents

Bruce D. Perry, M.D., Ph.D.*

Ishnella Azad**

ChildTrauma Academy &
Departments of Psychiatry, Pediatrics, Pharmacology and Neuroscience
Baylor College of Medicine
Houston, Texas

The ChildTrauma Academy
www.ChildTrauma.org
A Partnership of: Baylor College of Medicine and Texas Children's Hospital

** MS IV, Baylor College of Medicine

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Abstract

Millions of children are exposed to traumatic experiences each year. Over thirty percent of these traumatized children develop a clinical syndrome with significant emotional, behavioral, cognitive, social and physical symptoms called post-traumatic stress disorder (PTSD). The symptoms of PTSD fall into three main clusters: 1) re-enactment of the traumatic event in play, dreams or behaviors; 2) avoidance of cues associated with the event or general withdrawal and 3) physiological hyper-reactivity manifesting as hypervigilance, sleep problems, anxiety and cardiovascular reactivity. Significant physical and medical problems in childhood, adolescence and adulthood appear to be related to childhood trauma. Few treatment outcome studies exist for childhood PTSD. Current treatment approaches include post-acute psychoeducation, individual psychotherapy, pharmacotherapy and cognitive-behavioral therapy. Despite increasing attention over the last ten years, childhood PTSD remains an understudied public health problem.

Introduction: Neurophysiological Core of Post-traumatic Stress Disorder

Each year in United States more than five million children are exposed to some form of extreme traumatic stressor. These traumatic events include

natural disasters (e.g., tornadoes, floods, hurricanes), motor vehicle accidents, life threatening illness and associated painful medical procedures (e.g., severe burns, cancer), physical abuse, sexual assault, witnessing domestic or community violence, kidnapping and sudden death of a parent, among others [1,2]. These events, posing an actual or perceived threat to the individual, activate a stress response. During the traumatic event, the child's brain orchestrates adaptive stress-mediating neural systems including the hypothalamic-pituitary-adrenal (HPA) axis, central nervous system (CNS) noradrenergic (NA), dopaminergic (DA) systems and associated CNS and peripheral systems that provide the adaptive emotional, behavioral, cognitive and physiological changes necessary for survival [3].

Individual adaptive responses during traumatic stress are heterogeneous [4,5]. The specific nature of a child's responses to a given traumatic event may vary with the nature, duration and the pattern of traumatic stressor and the child's constitutional characteristics (e.g., genetic predisposition, age, gender, history of previous stress exposure, presence of attenuating factors such as supportive caregivers). Whatever the individual response, however, the extreme nature of the external threat is often matched by an extreme and persisting internal activation of the neurophysiological systems mediating the stress response and their associated functions [3]. A primary adaptive feature of the threat-response system is single-trial "learning" – the capacity to generalize from a threatening event to other experiences with similar features. Unfortunately, this very adaptive capacity is at the core of the emotional, behavioral and physiological symptoms that develop following a traumatic experience.

Neural systems respond to prolonged, repetitive activation by altering their neurochemical and sometimes, microarchitectural (e.g., synaptic sculpting) organization and functioning. This is no different for the neural systems mediating the stress response. Following any traumatic event children will likely experience some persisting emotional, behavioral, cognitive and physiological signs and symptoms related to the, sometimes temporary, shifts in their internal physiological homeostasis. In general, the longer the activation of the stress-response systems (i.e., the more intense and prolonged the traumatic event), the more likely there will be a 'use-dependent' change in these neural systems [3,4,6]. In some cases, then, the stress-response systems do not return to the pre-event homeostasis. In these cases, the signs and symptoms become so severe, persisting and disruptive that they reach the level of a clinical disorder [5]. In a new context and in the absence of any true external threat, the abnormal persistence of a once adaptive response becomes maladaptive.

**Post traumatic stress-related clinical syndromes**

Post traumatic stress disorder (PTSD) is a clinical syndrome that may develop following extreme traumatic stress (DSM IV) [7]. Like all other DSM IV diagnoses, it is likely that heterogeneous pathophysiologies
underlie the cluster of diagnostic signs and symptoms labeled PTSD. With this in mind, there are six diagnostic criteria for PTSD: 1) extreme traumatic stress accompanied by intense fear, horror or disorganized behavior; 2) persistent re-experiencing of the traumatic event such as repetitive play or recurring intrusive thoughts; 3) avoidance of cues associated with the trauma or emotional numbing; 4) persistent physiological hyperreactivity or arousal; 5) signs and symptoms present for more than one month following the traumatic event and 6) clinically significant disturbance in functioning. A child is considered to have Acute Stress Disorder (DSM IV) when these criteria are met during the month following a traumatic event. PTSD is further characterized as Acute when present for less than three months, Chronic for more than three months or Delayed Onset when symptoms develop initially six months or more after the trauma.

Post traumatic stress disorder has been studied primarily in adult populations, most commonly combat veterans and victims of sexual assault. Despite high numbers of traumatized children, the clinical phenomenology, treatment and neurophysiological correlates of childhood PTSD remain under studied. The clinical phenomenology of trauma-related neuropsychiatric sequelae are poorly characterized [8,9]. Most of the studies of PTSD have been following single discreet trauma (e.g., a shooting). The least characterized populations are very young children and children with multiple or chronic traumatic events.

Several factors complicate the study of PTSD in children. It has only been in the last ten years that child-specific structured interviews for PTSD have been available. The development of trauma-specific psychometrics continues [10,11]. In very young children diagnostic assessment is difficult due to the inability of infants and toddlers to self-report trauma-related symptoms, the differential expression of symptoms across the developmental spectrum and the difficulty determining the nature and extent of certain traumatic experiences (e.g., exposure to domestic violence or physical abuse) [12,13]. A key complication in studying and treating trauma-related neuropsychiatric problems in children is the complex and varied clinical presentations that may result following acute or chronic trauma [8].

Clinical presentation

Children with PTSD may present with a combination of problems including impulsivity, distractibility and attention problems (due to hypervigilance), dysphoria, emotional numbing, social avoidance, dissociation, sleep problems, aggressive (often re-enactment) play, school failure and regressed or delayed development. In most studies examining the development of PTSD following a given traumatic experience, twice as many children suffer from significant post-traumatic signs or symptoms (PTSS) but lack all of the criteria necessary for the diagnosis of PTSD [14]. In these cases, the clinician may identify the trauma-related symptom as
being part of another neuropsychiatric syndrome.

The clinician is often unaware of ongoing traumatic stressors (e.g., domestic or community violence) or the family makes no association between the present symptoms and past events (e.g., car accident, death of a relative, exposure to violence) and may provide no relevant history to aid the clinician in the differential. As a result, PTSD is frequently misdiagnosed and PTSS are under recognized. Children with PTSD as a primary diagnosis are often labeled with Attention Deficit Disorder with Hyperactivity (ADHD), major depression, oppositional-defiant disorder, conduct disorder, separation anxiety or specific phobia. Ackerman and colleagues examined the prevalence of PTSD and other neuropsychiatric disorders in 204 abused children (ages 7 to 13) [15]. Thirty four percent of these children met criteria for PTSD. Over fifty percent of the children in this study suffering both physical and sexual abuse had PTSD. Using structured diagnostic interview, the majority of these children met diagnostic criteria for three or more Axis I diagnoses in addition to PTSD. Indeed, only 6 of 204 children met criteria for only PTSD. The broad comorbidity reported in this study echoes previous studies.

DSM IV diagnostic criteria yield multiple labels in maltreated children but these diagnoses rarely provide useful information about etiology, course, treatment response or prognosis. At present, despite an evolving clinical phenomenology, it is clear that PTSD is not the only, nor an inevitable, outcome of traumatic events during childhood. Post-traumatic hyperarousal or dissociative-like symptoms often co-exist with these other Axis I disorders. Furthermore, severe early trauma appears to be an expresser of underlying constitutional or genetic vulnerability and may be a primary etiologic factor in the development of a broad range of disorders later in life.

Incidence and prevalence

Estimates of lifetime incidence of PTSD range from 3 to 14 % [7]. Cuffe and co-workers examined population prevalence of PTSD in a community sample of adolescents [16]. They found that 3 % of females and 1 % of males met DSM IV criteria for PTSD. In this study females reported more traumatic events than males. Being female, experiencing rape or sexual abuse and witnessing an accident or medical emergency were associated with increased risk for PTSD. Children exposed to various traumatic events have much higher incidence (from 15 to 90+ %) and prevalence rates than the general population [1]. Several studies published in 1998 confirm previous reports of high prevalence rates for PTSD in high-risk groups. Thirty five percent of a sample of adolescents diagnosed with cancer met criteria for lifetime PTSD [17]; 15 % of children surviving cancer had moderate to severe PTSS [18]; 93 % of a sample of children witnessing domestic violence had PTSD [19]; over 80 % of the Kuwaiti children exposed to the violence of the Gulf Crisis had PTSS [20]; 73 % of juvenile male rape victims develop PTSD [21]; 34 % of a sample of
children experiencing sexual or physical abuse and 58% of children experiencing both physical and sexual abuse all met criteria for PTSD [15]. In all of these studies, clinically significant symptoms, though not full PTSD, were observed in essentially all of the children or adolescents following the traumatic experiences.

Vulnerability and resilience

Not all children exposed to traumatic events develop PTSD. A major research focus has been identifying factors (mediating factors) that are associated with increased (vulnerability) or decreased (resilience) risk for developing PTSD following exposure to traumatic stress [19]. Factors previously demonstrated to be related to risk can be summarized in these broad categories: 1) characteristics of the child (e.g., subjective perception of threat to life or limb, history of previous traumatic exposures, coping style, general level of anxiety, gender, age); 2) characteristics of the event (e.g., nature of the event, direct physical harm, proximity to threat, pattern and duration); 3) characteristics of family/social system (e.g., supportive, calm, nurturing vs. chaotic, distant, absent, anxious) [18,22,23]. Each of these mediating factors can be related to the degree to which they either prolong or attenuate the child’s stress-response activation resulting from the traumatic experience. Factors that increase stress-related reactivity (e.g., family chaos) will make children more vulnerable while factors that provide structure, predictability, nurturing and sense of safety will decrease vulnerability. Persistently activated stress-response neurophysiology in the dependent, fearful child will predispose to a ‘use-dependent’ changes in the neural systems mediated the stress response, thereby resulting in post-traumatic stress symptoms.

Adolescents with cancer who developed PTSD rated their families as more chaotic than adolescents with cancer that did not develop PTSD [17]. Most interesting in this study, however, was that 85% of mothers of the PTSD group also developed PTSD related to their child’s cancer. If the family is chaotic and the primary caregiver is traumatized by an event, their capacity to provide a consistent, predictable and nurturing environment is compromised.

There are apparent gender differences in the expression and development of PTSD. Clinical experience and recent studies suggest that females tend to exhibit more internalizing (i.e., anxiety, dysphoria, dissociation, avoidance) and males more externalizing (i.e., impulsivity, aggression, inattention, hyperactivity) post-traumatic symptoms [4,15]. In epidemiological studies of PTSD in the general adult population, females have higher rates of PTSD than males [24]. While lacking the extensive epidemiological data of these adult studies, a gender difference has been observed in several studies with children and adolescents [15]. There appear to be gender differences in adaptive response in the acute event (females disassociate more than males) that may be related to this observed difference in development and expression of trauma-related symptoms [4].
Long-term consequences of childhood trauma

PTSD is a chronic disorder. Untreated, PTSS and PTSD remit at a very low rate. Indeed the residual emotional, behavioral, cognitive and social sequelae of childhood trauma persist and appear to contribute to a host of neuropsychiatric problems throughout life [25] including attachment problems [26,27], eating disorders [28], depression [23,25], suicidal behavior [29], anxiety [25], alcoholism [25,30], violent behavior [25,31], mood disorders [32] and, of course, PTSD [33,34].

Childhood trauma impacts other aspects of physical health throughout life, as well [35,36]. Adults victimized by sexual abuse in childhood are more likely to have difficulty in childbirth [37], a variety of gastrointestinal and gynecological disorders and other somatic problems such as chronic pain, headaches and fatigue [37]. The Adverse Childhood Experiences study [38] examined exposure to seven categories of adverse events during childhood (e.g., sexual abuse, physical abuse, witnessing domestic violence: events associated with increase risk for PTSD). This study found a graded relationship between the number of adverse events in childhood and the adult health and disease outcomes examined (e.g., heart disease, cancer, chronic lung disease, and various risk behaviors). With four or more adverse childhood events, the risk for various medical conditions increased 4- to 12-fold.

Special concerns for pediatrics

Pediatricians should be aware that children with PTSD or PTSS might have altered sensitivity and functioning of neuroendocrine and autonomic nervous systems [6,35,39,40,41]. This altered sensitivity may predispose to the development of various medical conditions such as asthma, hypertension, cardiac arrhythmias, endocrine disorders, gastrointestinal disorders and various other somatic complaints [36]. Furthermore, PTSD complicates the treatment of various medical conditions [42]. In children with diabetes, for example, the PTSD-related hyper-reactivity of the counter-regulatory hormones such as adrenaline may complicate or prevent effective control of blood sugar. History of sexual or physical abuse can complicate the medical examination of traumatized children, manifesting as resistance to medical examination or procedures [43,44]. In a variation of PTSS adaptation, excessive compliance, ‘numbing’ and insensitivity to pain may also be seen in children with histories of chronic exposure to traumatic violence in the home. Addressing post-traumatic stress symptoms within a multidisciplinary approach is an important component of improved outcomes following childhood injuries [45].
Treatment approach

To date, few treatment outcome studies in children with PTSS and PTSD have been published. Despite this dearth of objective data, a wealth of clinical experience and subjective treatment approaches has been published [1]. The nature of these reported clinical approaches depends upon the theoretical perspective of the author. At present the mechanism-based conceptual frameworks explaining the development of PTSD fall into four main categories: 1) psychoanalytic; 2) cognitive-behavioral; 3) psychodevelopmental and 4) neurodevelopmental. Each of these offers certain insights but none provides a complete and unambiguous treatment approach. Therefore, the treatment of children with PTSD varies greatly depending upon the specific clinician’s training, perspective and experience. Most typically, the nature and severity of specific symptoms (e.g., impulsivity, withdrawal, hypervigilance, dissociation, dysphoria, and aggression) dictate treatment approach rather than the diagnosis. Another major consideration in treatment is distinguishing between a single discreet traumatic event (e.g., car accident or witnessing an assault) and chronic or pervasive trauma (e.g., chronic abuse). Symptoms following a single event (e.g., motor vehicle accident) tend to be fewer and less treatment-resistant compared to the more complex symptom clusters associated with chronic or pervasive traumatic stress (e.g., a combination of physical and sexual abuse). There are a host of clinical treatments used with traumatized children including family therapy, group therapy, EMDR (eye-movement desensitization and re-programming), music and movement therapies, “play” therapy and art therapy among many others. Four of the major therapeutic approaches used alone or in combination are discussed below.

Acute post-traumatic interventions: secondary prevention

In the immediate post-traumatic period, several models of intervention have been used to diminish the acute distress and improve post-traumatic outcome [46]. One of the most important is psychoeducation. Telling the family and child what the expected signs and symptoms are following a traumatic event can help diminish anxiety, increase sense of competence and provide a baseline from which parents and children can be aware of abnormally intense or prolonged symptoms requiring further clinical attention. Several modifications of a critical incident stress-debriefing paradigm have been reported though efficacy has not yet been determined. In some cases, clinicians have used anti-anxiety agents or clonidine to decrease the level of physiological hyperarousal and distress in the acute post-traumatic period [47]. While clinically helpful during this period, it is not yet clear that any of these post-acute interventions actually alter the development, course or severity of PTSD.
Pharmacotherapy

There are very few published trials with psychotropic medications in childhood PTSD [1,5]. Without the benefit of clinical outcome studies, the selection of psychotropic agents has been guided by empirical clinical judgment and the clinical observations that primary symptoms in PTSD appear to respond to psychotropic agents proven to be useful for those symptoms in other neuropsychiatric disorders (e.g., depakote and lithium for aggressive behavior; fluoxetine for depressive symptoms).

Many of the symptoms of PTSD can be traced to the core symptoms of physiological hyperarousal such as sleep problems (including difficulties following asleep, early night awakening, nightmares, night terrors), generalized anxiety, behavioral impulsivity or hyper-reactivity of the sympathetic nervous system including tachycardia, hypertension, increased muscle tone, respiratory problems and body temperature dysregulation. Clonidine, an alpha-2 adrenergic partial agonist, which modulates the reactivity of the locus coeruleus and decreases the physiological hyper-reactivity associated with PTSD, has been shown to be an effective agent in children with PTSD [6]. Other agents altering the biogenic amines (i.e., serotonin, dopamine, and norepinephrine) may also modulate the symptoms of PTSD. In this regard, preliminary reports support the efficacy of propranolol and fluoxetine in children with anxiety and PTSD [5].

Individual psychotherapy

The core hyperarousal symptoms result in a cascade of secondary, interrelated problems. Inability to engage in appropriate intimacy leads to difficulties with peer and adult relationships, inability to perform adequately in school leads to poor self-esteem, resulting in a variety of learned behaviors which both mask and defend against these core deficits driven by their physiological hyper-reactivity. The resulting vicious cycle of poor performance, poor self-esteem, development of maladaptive problem-solving styles, in turn, are difficult to treat as long as the underlying physiological hyper-reactivity impairs the ability to modulate anxiety, concentrate on academic or social learning tasks, and contain behavioral impulsivity. Successful treatment, therefore, often requires ‘containing’ or modifying this core physiological dysregulation with medications and using other psychotherapeutic interventions to address issues related to self esteem, competence, social skills and mastery of specific fears.

Cognitive-behavioral therapies
Cognitive-behavioral therapy (CBT) is the most studied and, likely the most effective, therapeutic intervention in adults with single-event related PTSD. The few CBT studies in children and adolescents are very promising [48]. March and colleagues examined a standard CBT protocol in school-age children following a single traumatic event [49**]. After the course of treatment, significant improvement was noted in all main dependent measures. CBT, unfortunately, is difficult to apply in the same fashion to very young children or to children with chronic pervasive trauma.

Conclusions and future directions

Despite the progress of the last few years, childhood PTSD remains a woefully understudied disorder. Conservative estimates of the frequency of traumatic events (more than 5 million children traumatized per year) and the well-documented incidence rates of more than 30% following a trauma suggests that there may be as many as 1.5 million children developing PTSD each year. Further, based upon the documented incidence from high-risk populations, another 1.5 million may have clinically significant post-traumatic stress symptoms that do not meet full PTSD criteria. PTSD and PTSS are chronic problems. Available data show only moderate rates of remitted symptoms over time; in contrast, adolescents and adults with childhood trauma appear to more vulnerable to a host of medical and neuropsychiatric problems. More characterized clinical phenomenology, outcome studies examining a variety of therapeutic modalities and mechanism-focused neurophysiological studies are necessary to better characterize PTSD and the other sequelae of childhood trauma.

Reference List


This contributed volume summarizes the current state of clinical, research and policy related issues in the area of childhood traumatic stress. Several of the primary theoretical constructs guiding research and treatment are
outlined. Excellent summaries of clinical experience and reviews of current clinical research are included.


This review examines the available neurodevelopmental and neurophysiological studies related to childhood trauma. The authors revise previously stated neurodevelopmental theoretical constructs used to guide clinical research and practice. This synthesis focuses on memory and neural systems involved in the stress response.


13. Scheeringa, M. S. and Zeanah, C. H. *Symptom Expression an*


This study examined PTSD and other neuropsychiatric disorders in over 200 maltreated children. This study used excellent structured interviewing methods for diagnostic assessment. While the total sample was small, this study is important because of the rigor used in determining co-morbid diagnoses. Of interest is the demonstration of the symptoms and outcome differences between physical and sexual abuse, the increased risk with both types of abuse and the gender differences in trauma-related outcomes.


This study is the second cycle of a longitudinal epidemiological study. In this cycle the authors examined a population sample of 490 adolescents (age 16-22) and used a semi-structured interview to elicit PTSD symptoms and related factors. Of interest was the demonstration of a gender difference in (females 3 % vs males 1 %) in the prevalence of PTSD. Being raped, witnessing a medical emergency and witnessing an accident were associated with increased risk for developing PTSD. In this study, most of the children experiencing a traumatic event developed PTSD.


This study compared 23 adolescents with cancer against 27 physically abused and 23 healthy, non-abused adolescents. Of primary interest was the rate of lifetime PTSD was 35 % in the cancer group compared to only 7 % in the abused group. In the PTSD positive sub-group of children 85 % of the mother's developed PTSD. This study is very important for practicing pediatricians. The rate of PTSD in life-threatening pediatric illness is high for both the child and for caregivers. This had profound implications for creating a multi-dimensional clinical approach for children with cancer.


19. Kilpatrick, K. L. and Williams, L. M. Potential mediators of post-


This is a report from an 18 year longitudinal study of a birth cohort of 1,265 New Zealand children. Retrospective reports of exposure to interparental violence were obtained as well as a host of measures of mental, social physical, anti-social and criminal behavior. The adolescents and adults reporting the highest levels of exposure were at the greatest risk for mental health problems, substance abuse and criminal offending. This study is well conceived and the methods are very sound. The value of this study is in demonstrating the multiple adverse sequelae of domestic violence. The pervasive nature of domestic violence and the recurring issues of “how damaging” exposure to interparental violence is will be addressed by studies of this sort. Exposure to domestic violence may be as potentially traumatic and abusive as physical or sexual abuse.


This investigative team has pioneered study of trauma-related neurophysiological changes using standard psychophysiological methods. In this study, 29 women with chronic PTSD following childhood sexual abuse showed larger physiologic responses (heart rate, skin conductance EMG) than women experiencing sexual abuse but no PTSD. This responsivity was specific to the conditions involving sexual imagery and was not seen in the stressful, non-abusive related situation. These preliminary studies illustrate some of the physiological hyper-reactivity that may underlie some of the documented long term medical and psychosomatic problems following childhood trauma. Studies such as these are required to elaborate mechanism-related models of trauma-related neuropsychiatric and medical problems.


This study was conducted by mailing questionnaires about adverse childhood experiences to 13,494 adults in a large HMO. The response rate was 70.5%. The responses were studied along with the results of a standard medical evaluation and measures of adult risk behavior, health status and related issues. At least half of the respondents reported at least one and more than one-fourth reported more than two categories of adverse childhood experience. A graded relationship between the number of categories of childhood exposure and the high-risk behaviors and diseases was demonstrated. This study reinforces the observations of many other studies using different methods and drawing on different specific childhood stressors. The relationships between "health" throughout the lifecycle and stress/distress during development are very strong.


This study tested a group-administered cognitive-behavioral treatment protocol with a single case across time and setting design. The children (n=17) were selected from two elementary and two junior high schools and screened for single-event related PTSD. Neuropsychiatric symptoms were measured using state of the art instruments. Fourteen of the seventeen children completed treatment. Significant improvement was observed, such that 57% no longer met diagnostic criteria for PTSD. Despite the small numbers, this is one of the few well-designed and controlled treatment outcome studies in the area of childhood PTSD.

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