A Developmental Psychopathology Model of Childhood Traumatic Stress and Intersection with Anxiety Disorders

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Empirical findings regarding childhood traumatic stress are placed within a developmental life-trajectory model that incorporates a tripartite etiology of posttrauma distress. This approach recognizes an intricate matrix of child-intrinsic factors, developmental maturation and experience, life events, and evolving family and social ecologies. Of central developmental importance in the field of traumatic stress is the ontogenesis of appraisal, emotional response, emotional and physiological regulation, and consideration of protective action with regard to danger. The complexity of traumatic situations and their aftermath suggests the relevance of multiple stress diatheses in understanding individual variability in proximal and distal effects. Neurobiological systems that subserve danger mature over childhood and adolescence. Neurophysiological and neurohormonal studies among traumatized children and adolescents suggest potential neurodevelopmental stage-related vulnerabilities within these systems. Advances in child development and traumatic stress provide tools for investigating proximal and distal interplay of psychopathology, disturbances in the acquisition and maintenance of developmental competencies, and life-trajectory outcomes. A developmental psychopathology model suggests different avenues by which dangerous circumstances, childhood traumatic experiences, and posttraumatic stress disorder (PTSD) can intersect with other anxiety disorders over the life span. Biol Psychiatry 1999;46:1542–1554 © 1999 Society of Biological Psychiatry

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Introduction

Danger, trauma, fear and anxiety are embedded in the human condition. There is a wide spectrum of appraisal, response, and adaptation to danger within the lifecycle of the individual, family, group, and society. A developmental psychopathology approach recognizes the intricate matrix of intrinsic factors, developmental maturation and experience, life events, and evolving familial and social ecologies that contribute to proximal and distal outcomes. A developmental psychopathology framework recognizes the intimate theoretical relationship between adaptive and maladaptive outcomes and between pathology and normality (Cicchetti and Cohen 1995). Figure 1 presents an updated developmental life-trajectory schema (Pynoos et al 1995; Steinberg and Ritzmann 1990), organizing selected current clinical and research knowledge about childhood traumatic stress.

This schema indicates that there are multiple sources of acute posttrauma distress, falling into three major categories. Whereas the contribution of traumatic experience(s) has been well recognized, both associated proximal secondary adversities and proximal trauma and loss reminders introduce additional stress diathesis. Aspects of the appraisal and response to danger and resistance and vulnerability mediate acute distress. Resilience refers to early effective efforts at adjustment and recovery. A developmental psychopathology model places equal importance on proximal development, proximal psychopathology, and their interactions as outcomes of early adjustment. Ongoing adjustment takes place in an interactive matrix encompassing distal trauma reminders, distal secondary stresses, distal development and distal pathology. Child-intrinsic factors and the ecology of the child operate throughout the schema. This model suggests a revision of the acute-chronic typology to a more developmentally sound approach. Repeated or sequential traumatic experiences should be analyzed in regard to emerging developmental contexts. These contexts generate new sources of traumatic distress, situation-specific reminders, secondary stresses, and new efforts at adjustment, which carry additional implications at each occurrence for acquisition of developmental competencies and prolongation or new onset of psychopathology.

Advances in the developmental epidemiology of traumatic stress support the adoption of such a complex developmental perspective. This literature points to several important con-
siderations. First, by using refined typologies of exposure, there is evidence of differential exposure rates through the course of childhood and adolescence. Age, sex, and child-intrinsic factors interact with evolving ecologies of the family, school, peer group, community, and society. Second, careful review of rates of exposure across age groups suggests that children or adolescents may experience a highly variable series of exposures occurring at different developmental periods (Boney-McCoy and Finkelhor 1995). Third, studies of the impact of different forms of exposure are becoming more interdependent as we document, for example, the interaction of extrafamilial and intrafamilial violence, and their respective environments of chronic danger and pathogenic family disturbance (Foy et al 1996; Lynch and Cicchetti 1998).

**Traumatic Stress**

Empirical studies among acutely traumatized school-age children and adolescents have found that their traumatic experiences involve complex sensory, physiological, emotional, and cognitive experiences of multiple moments with different vantage points of concern (Pynoos et al 1997a).

There may be different moments and types of physiological alarm and serial or simultaneous onset of extreme negative emotions, as well as frightening accelerations in physiological and emotional reactions. Emotional reactions can range from terror over the external danger, to extreme helplessness over failure of protective action, to extreme shame over loss of bodily function. Cognitions can include sudden shifts in alertness and attention; radical challenges to expectancy sets; extreme uncertainty about event parameters, including confusions and misappraisals; attributions of intent, responsibility, and efficacy of actions by self or others; and catastrophic intraevent cognitions regarding personal consequence. Witnessing of threat to significant others may be accompanied by suppression of one’s fear for self and unalleviated empathic distress, whereas immediate threat or injury to a child may engender moments of estrangement. Radical shifts in attention may occur after injury or sexual violation, away from vigilance to external threat toward concern for the extent and personal consequences of injury or violation.

Children often experience the alarm and fear expressions, agitated behavior, cries of distress, and ineffective or potentially endangering behavior of adult caretakers. They may witness mutilating injuries and grotesque death of family members and friends, experiencing horror and acute grief reactions, even while the threat to the child continues. There may also be intense worry about the well-being of a significant other whose whereabouts or safety are unknown. After the cessation of threat, additional traumatic moments can include efforts to assist the injured, emergency medical procedures and surgery, abrupt separations from family members, and reunion with agitated or terrified parents or school personnel.

**Appraisal and Response to Danger**

This theoretical framework assigns a prominent role to the ontogenesis of human appraisal, reaction, and response to danger. A modern approach to the theory of anxiety must recognize three interrelated mental operations: 1) estimation of the nature and magnitude of external and internal dangers, 2) emotional and physiological reaction and their regulation, and 3) estimation of the type, degree, and efficacy of protective intervention. These operations are strongly rooted in neurobiological development, experiential history, and, for children in particular, availability of and reliance on adults as auxiliary agents with regard to danger and tolerance of anxiety. Over time, these basic processes become modified or rigidified, related to secondary reappraisals, secondary efforts at regulating renewed or new emotional and physiological reactions, and reconsideration, planning, and enactment of preventive and protective intervention for the future.

Early life corresponds to a period when contextual estimation of danger and protective intervention rests with parent(s) or caretakers. The infant is equipped with alarm reactions, relatively uninhibited defensive mechanisms, and evolved care-eliciting behaviors. Ontogenesis of ambulatory exploratory behavior in toddlers coincides with increasing maturation of the hippocampus and orbitofrontal cortex that relates to spatial mapping and contextual discrimination. The early stages of appraisal of danger rely on social referencing to attachment figures (Klinnert et al 1983) and an amygdala-related capacity for recognizing facial expression of emotion. The preschool child responds to limited natural clues that elicit fearful responses, relies on a protective shield provided by others, and utilizes emerging catastrophic emotions that enable him or her to act more self-protectively against threats of bodily injury. Preschool children begin to consciously include safety of parents in their schemas of danger and their own self-protection. School age children develop an increasing appreciation of dangerous circumstances, envision more self-efficacy (with conscious themes of courage and cowardliness), are engaged in skill and safety training, and experience a sense of culpability and ineffectualness when protective action fails. By midadolescence, there is predominant reliance on self and peer appraisal of threat, motivation, consequence, and protection, with accompanying struggles over decisions to directly intervene and
themes of hero and antihero. Throughout these stages of development, false alarms, under-estimations of danger, and narrow escapes are mediated by child-parent interactions. Major parent-child transitions that occur over these periods include renegotiations of risk parameters and authority over decision making.

Emotional and physiological responses not only serve to warn of external danger or initiate protective action, but also may constitute a perceived internal threat. Children often report becoming frightened by the intensity, acceleration, and duration of alarm reactions, physiological arousal, somatic sensations, and extreme negative emotions, for example, a 7-year-old child who says, “My heart was beating so fast I thought it was going to break.” Disturbing bodily sensations associated with traumatic experiences can lead to enduring responses to trauma reminders due to interoceptive conditioning (Craske 1997), for example, a 10-year-old boy’s renewed nausea at olfactory reminders of witnessing his mother’s rape. The metacognition of emotions, the emergence of self-conscious negative emotions, and an increased motivational understanding add new dimensions to the appraisal of threat over childhood and adolescence (Saarni and Harris 1991).

Secondary appraisals, emotional and physiological regulation, and considerations of prevention and protective intervention extend over years and are typically highly interactional social processes in childhood (Fivush 1991). They rely on co-construction and assistance from parents, siblings, school personnel, and peers; new information; and subsequent experience. Appropriate assistance can facilitate recovery from failed developmental expectancies, readdressing issues of accountability and integrating the complex experience into veridical memory representations for use in future appraisals and response to danger.

In humans, there is a long developmental delay in achieving inhibitory modulation of some basic defensive mechanisms. For example, it takes approximately 8 years for children to reach mature prepulse inhibition of the startle reflex, passing through a preschool period during which there is instead an exaggerated prepulse facilitation.
(Pynoos et al 1997b). At this age, we have found that children begin to actively entertain thoughts of personally addressing, disarming, or directly harming the source of danger. This is in contrast to the preschool child’s intervention thoughts of escaping from danger and searching for external protection.

**Proximal Trauma and Loss Reminders**

Trauma reminders derive from trauma-specific features of the child’s experience. They are ubiquitous in the aftermath of trauma. Because of the complexity of a traumatic experience and its occurrence in a natural setting, there may be a large number of cues, whose previous more neutral or even positive associations are now superseded by associations with the traumatic experience(s). There may be widely different patterns of frequency among types of reminders, ranging from relatively infrequent to daily, with diminished or increased recurrence over the life span, depending on alterations in family circumstances and social ecology, and future developmental transitions. The media may serve as an unrecognized source of trauma reminders (Nader et al 1993). Compounding posttrauma distress, there may be an additional set of loss reminders that evoke a different range of negative emotions, including extreme sadness, anger over the loss, separation anxieties, and worries about the future.

Psychological and physiological reactivity to reminders contributes to the periodic or phasic nature of renewed traumatic anxiety and avoidant behavior and, perhaps, to a transition from phasic to tonic physiological arousal. The unexpected nature and often-unrecognized occurrence of reminders may re evoke a sense of unpreparedness and lack of control. Features of one-trial aversive learning (Garcia et al 1986), fear-conditioning (Armony and LeDoux 1997), and context-related anxiety (Davis et al 1997) have been proposed to explain different mechanisms underlying the longevity, fear, and anxiety-provoking
nature of reminders. These paradigms point to different aspects of the response, corresponding to extreme catastrophic expectancies (in regard to naturalistic dangers and noxious physical states), bouts of fear, and chronic apprehensions over recurrence and associated dangers. Our report demonstrating time-dependent sensitization of the acoustic startle reflex, bidirectional abnormal behavior in a fear-provoking environment, and dysregulation of aggression in mice after weekly exposures to a situational reminder (Pynoos et al 1996) indicates the powerful multidimensional impact of reminders.

**Proximal Secondary Stresses**

There is a striking increase in risk of psychiatric disorder among children associated with accumulation of adverse life events (Tiet et al 1998). Traumatic events are commonly associated with a cascade of secondary stresses. They constitute additional sources of distress and increase the risk of comorbidity of posttraumatic stress reactions with other adverse reactions. They complicate efforts at adjustment and may interfere with normal opportunities for developmental maturation, or initiate maladaptive coping responses that, over time, may be associated with chronic psychopathology other than posttraumatic stress disorder (PTSD). Secondary adversities or stresses may substantially interfere with the availability of support to the child from parents, family, school, and community. Parental loss is associated with risk of impaired caretaking, disruption of the school community is associated with lost educational opportunities, and community disorganization and unemployment are associated with increases in intrafamilial violence, parental substance abuse, and juvenile delinquency (Pynoos et al 1998).

**Distress**

Distress is the acute subjective registration of the effects of a traumatic experience or reactivity to reminders and challenges of secondary stresses. There is compelling evidence that by school age, children experience the full range of acute posttraumatic stress and grief reactions (for review see Pfefferbaum 1997). In addition, posttrauma distress may include fears of recurrence, guilt and shame, ongoing worries about a significant other, and reactivation of posttraumatic reactions associated with previous adverse life experiences. Distress encompasses 1) the registration of personal consequences, 2) causal attributions to self and other (including introduction of fear into a primary attachment relationship), and 3) failure of developmental expectancies arising from physical helplessness at moments of irreversible harm, of social referencing of catastrophic emotions to prevent injury, and of beliefs in a socially modulated world.

**Resistance, Vulnerability, Resilience, and Adjustment**

This schema discriminates between resistance and resilience, concepts that are often confused in the child stress literature. Resistance may entail positive or negative mental health attributes that check the production of acute posttrauma reactions. For example, a lack of empathy related to conduct disorder when witnessing the distress of others may be protective. Resilience, on the other hand, refers to the capacity to respond to different levels of distress with effective efforts at recovery. Resistance and vulnerability factors mediate or moderate the impact of trauma, proximal reminders, and proximal secondary stresses on the type and severity of acute posttrauma distress. Different aspects of child-intrinsic factors may mediate the impact of these three components. The strength and reliance on affiliative attachment represent a critical developmental vulnerability in childhood to witnessing threat or harm to a parent or family member, to being without parental protection, or to being the victim of a violent betrayal of affiliative expectancies when the parent is the agent of the trauma. In young children, there is also vulnerability to fear acquisition by witnessing parental response during the event or upon reunion. Temperament and anxiety sensitivity may be especially relevant with regard to trauma reminders, including reactivity, attributions of controllability, catastrophizing of bodily sensations, cognitive discrimination, ability to calm down, or capacity to be comforted by efforts at safety improvements or parental reassurances. Intrinsic factors that mediate childhood stress in general are particularly relevant with regard to secondary adversities (Rutter 1985). These include a positive relationship with a competent adult, skill at learning and problem solving, engaging personality, competence and perceived efficacy by self or society, high IQ score, positive school experience, mastery motivation, and previous successful coping experiences (Masten et al 1990).

With regard to child-extrinsic factors, different aspects of parent behavior and family, school, and social ecology may moderate each of the three components (Pynoos et al, in press). In situations of imminent danger, parental overreaction, uncertainty, or conflict may exacerbate children’s anxiety over appropriate protective action. Adult or parental decisions that result in separation of children from parents can measurably increase children’s posttrauma distress. Responding to the distress of a traumatized child requires parental skills, for example, to address reactivity to reminders and behavioral regressions. Parental responsiveness can be mediated by parent-intrinsic factors, especially anxiety sensitivity, prior trauma and loss experiences, and reactivity to reminders. Maternal trauma-related avoidance and overt parental anxious responses to trauma reminders and fears of recurrence increase young children’s posttrauma distress.
Variations in parental proactive interventions, such as securing a bookcase that fell in the child’s room during an earthquake, can be critical to alleviate a child’s ongoing apprehensions and sleep disturbance.

Adjustment refers to the child’s ability to tolerate, manage, or alleviate ongoing psychological, physiological, behavioral, and developmental disturbances. Effective adjustment includes the achievement of adequate understanding of the experience and subsequent reactions and, as two outcome measures, resumption of age-related developmental progression and acquisition of developmental competencies, as well as recovery from traumatic-stress-related symptoms. We would emphasize the importance of adjustment to veridical reappraisals of danger, renewed efforts at emotional and physiological regulation, and evolving thoughts and plans of future protective intervention.

Several elements of these adjustment processes rely on the maturation of key neurobiological mechanisms. Animal studies suggest that decreased conditioned-fear responses rely on active new learning to achieve conditioned inhibition and modulation of contextual reactivity. Such new learning is, in part, governed by evolving functions of the prefrontal cortex that permit more complex stimulus representation and greater capacity for stimulus analysis (Armory and LeDoux 1997). A recent report suggests that fear conditioning and escape behavior may operate through different anatomical pathways within the amygdala (Amorapanth et al 1999), introducing considerations of the role of maturing capacities for protective intervention in mediating ongoing emotional regulation and reactivity to reminders. Considerations of protective intervention rely on maturing capacities for information processing and motor behavior. As pointed out by Korn and Faber (1996), escape behaviors have short latencies, which leave minimal time for complex treatment of sensory information and analysis of environmental parameters, paralleling the preschool child’s limited use of appraisal and consideration of intervention other than escape.

Parents can play a critical role in facilitating the use of more advanced cognitive strategies in children’s future review of past traumatic experiences. Alternatively, parents may contribute to disruption of this process because of their own anxious preoccupations or, at the extreme, by misleading explanations or a conspiracy of silence. The adjustment and recovery in adolescence may rely much more critically on opportunities provided by parents and society for constructive means to address their intervention preoccupations, including career opportunities.

**Proximal Psychopathology**

Figure 1 includes a list of the range of child and adolescent psychiatric disorders that have been reported after traumatic exposures and loss. ICD 10 includes an attachment disorder secondary to intrafamilial abuse and violence (World Health Organization 1990). There is a dose of exposure association in which the severity of traumatic exposure is strongly correlated with the risk for PTSD (Foy et al 1996; Goenjian et al 1995), with preexisting anxiety increasing the severity of PTSD within exposure groups (La Greca et al 1998). Continuous ratings rather than categorical diagnosis have proven to be more sensitive to dose of exposure relationships and in identifying mediating and moderating factors. Subjective appraisal of threat to self and others, intensity of internal arousal, and appropriateness of behavior of self and others further contribute to risk. There is also evidence of an additive effect of multiple and multimodal exposures to violence among adolescents (Kilpatrick et al 1995). There is evidence of an interplay of PTSD and grief in childhood, leading to complicated bereavement, identified as a risk factor among adults for psychiatric and physical morbidity (Prigerson et al 1997). Bereavement carries its own independent risks of subsequent depression and anxiety.

Multiple stress diatheses following traumatic experiences are needed to understand the prevalence of psychiatric comorbidity. High rates of comorbid PTSD and depression have been found among preadolescents and adolescents after catastrophic natural or transportation disasters and violence (Goenjian et al 1995; Yule and Udwin 1991). Brent et al (1996) demonstrated that after adolescent peer suicide, risk of depression among friends is most associated with a family or personal history of depression, while PTSD, the incidence of which increased over the 3-year follow-up, is associated with features of exposure to the suicide. Our studies after the earthquake in Armenia found a dose of exposure-related chronic separation anxiety disorder among a significant percentage (7.4%) of early adolescent youth (Goenjian et al 1995), an age group where this disorder is quite uncommon. Studies of the contribution of trauma-specific features, prior experiences, and anxiety sensitivity to the persistence of separation anxiety or new-onset anxiety disorders, especially phobias, are needed.

**Proximal Development**

Proximal development encompasses the achievement of proximal developmental tasks that contribute to the ontogenesis of developmental competencies (Cicchetti 1989), successful navigation of interpersonal and intrafamilial developmental transitions (Rutter 1988), and normal biological maturation. Recently acquired developmental achievements are particularly vulnerable to disruption (Rutter 1988), including periods of relative neurobiological cortical restructuring and neurophysiological consoli-
dation (Pynoos et al 1997b). Selected aspects of proximal development are highlighted below.

There can be general effects on allocation of attentional resources and selective impact on age-related cognitive developmental tasks. Selective attention can be skewed toward trauma-related new information or incident-specific new fears (Yule et al 1992). Early childhood confrontations with violence can interfere with preschool achievement of narrative coherence (Osofsky 1993). Sleep disturbances may interfere with daytime learning (Pynoos et al 1987) and potentially with sleep-related consolidation of learning. Sleep disturbances associated with child physical abuse appear to persist over many years (Clod et al 1997). Specific interference with learning may have quite different proximal developmental impact, with the marginal student at greatest academic risk (Yule and Udwin 1991) and school failure increasing the risk of secondary psychiatric morbidity.

The generation of multiple intense negative emotions can challenge maturing mechanisms of emotional regulation, including the preschool task of increasing differentiation of basic emotions, school-age elaboration on affective expression, and adolescent efforts to achieve a more sophisticated understanding of the origins and consequences of negative emotions (Saarni and Harris 1991). In adolescence, trauma-related negative self-attributions and painful emotions may contribute to excessive concerns about social evaluation and social avoidance. Dysregulation of aggression and hostile emotions, including revenge, can disrupt the maturing capacity for restraint of aggression, appropriate use of instrumental aggression, and assertiveness (Atkins et al 1993). Autonomous strivings may be subverted by trauma-related avoidance, leading to lost developmental opportunities, or be accelerated by trauma-generated adventurous pursuits that lie beyond the child or adolescent’s developmental capabilities. The latter may increase risk of subsequent traumatic exposures. Changes in future expectancies and perceived narrowing of developmental opportunities can adversely effect adolescent emerging ambition, initiative, and motivation.

Critical parent-child transitions can be accelerated or impeded, as, for example, the chronic separation among the Armenian adolescents is likely to interfere with their age-appropriate adjustment in the balance of independence and dependence. Posttrauma irritability, anxious, avoidant, or withdrawn behavior, physical disability or disfigurement, and preoccupation with trauma-related material may profoundly affect current peer interactions. Peer rejection, in part mediated by school milieu, carries its own independent risk for disturbed social adjustment and subsequent psychopathology (Asher and Coie 1992).

A recent study of the dimension of moral development illustrates the inherent opposition of constructive and detrimental contributions of massive trauma in adolescence. After the Armenia earthquake, adolescents manifested an acceleration in their understanding of morality and communal values, and increased empathic understanding and depth of pride and remorse over moral behavior. At the same time, these adolescents demonstrated profound disturbances in conscience functioning, including loss of moral willpower and negative moral expectancies of self, other, and social institutions (Goenjian et al 1999).

The investigation of the developmental neurobiology of traumatic stress is in its infancy, with only a few isolated studies among children. The interpretation of findings will need to placed in the context of three broad areas of neurodevelopment: 1) maturation of brain structures, 2) functional physiological correlates, and 3) associated maturing cognition, emotional regulation, and behavioral responses (Pynoos et al 1997b). Studies of early childhood maltreatment, especially physical abuse and neglect (Galvin et al 1997; Perry et al 1995; Teicher et al 1997) have focused on early alterations in structure of brain regions and modification of neurotransmitter systems, such as catecholamine systems, that are functional early in life and may have trophic effects on brain development. Quantitative EEG findings of increased left hemispheric coherence and MRI findings of volumetric reduction in the corpus collosum (Teicher et al 1997) raise questions about the effects of early abuse on cortical differentiation and lateralization. Perry et al (1995) have proposed that childhood trauma, by differentially effecting maturation of brain subsystems, through use-dependent modifications, sets these subsystems’ relative contributions to future appraisal and response to danger.

Studies that have examined the effects of school-age and preadolescent trauma have begun to document neurohormonal and neurophysiological alterations. De Bellis et al (1994) found low basal and CRF-stimulated ACTH levels among sexually abused girls. Goenjian et al (1996) reported low basal cortisols and hypersuppression after dexamethasone among adolescent survivors of the Armenian earthquake. Perry et al (1995) have reported posttrauma bidirectional autonomic changes, primarily in heart rate. Tachycardia appears to be most related to witnessing and direct threat without physical violation, while lowered heart rate is associated with sexual abuse, physical penetration, and dissociative phenomena. Ornitz and Pynoos (1989) found a significantly reduced level of normal prepulse inhibition of startle response among school-aged children exposed to catastrophic violence. We are currently evaluating the influence of trauma-related alterations in startle modulation on information processing, an investigation that needs to consider the complex developmental course of endogenous event-related potentials (Pynoos et al 1997b).
These findings point to a number of critical questions in the developmental neurobiology of traumatic stress. Do danger-related changes in neurotransmitters have a neurotrophic influence on cortical development in infancy and early childhood? How, when, and by what means do phasic autonomic reactions become more tonic? Are volumetric changes in brain regions attributable to a stress-related “toxicity” or to diminishment in trophic factors, such as stress-related changes in BDNF mRNA activity (Rasmussen and Charney 1997)? To what extent do neurohormonal alterations represent vulnerability to adaption to danger, trauma, and other life stresses? Our preliminary startle modulation studies raise the issue of varying impacts of traumatic exposures during periods of relative neural plasticity or consolidation, including the possibility of neurophysiological regression, in addition to lack of maturation. Furthermore, the slow developmental progression in the acquisition of startle modulation underscores the prolonged neurodevelopmental maturation and vulnerability of major inhibitory pathways that relate to the human capacity to appraise and respond to danger.

Distal Development

Prospective longitudinal studies tracking the distal developmental outcome of child and adolescent traumatic experiences have yet to appear. One important personality axis affected by trauma is that of fear, courage, and fearlessness (Rachman 1980). The child literature includes reports of oscillations toward each of the extremes among severely traumatized children (Gislon and Call 1982). The incorporation of shifts on this axis into character can result in enduring personality traits, including chronic fearfulness, compulsive heroism, or under reactivity to high-risk situations.

Traumatic experiences can skew expectancies about the world, the safety and security of interpersonal life, and forecasts about the future. Such expectancies conceptually map onto a schema of risk, danger, injury, loss, safety, security, protection, and intervention. Especially in childhood, these expectancies, once organized, tend to operate outside of conscious awareness and resist dramatic change (Cicchetti and Cohen 1995).

Negative self-attributions that arise out of the original experience(s), may, if uncorrected, also become embedded in character. Adult studies suggest that these negative self-images are vulnerable to reactivation after future traumatic exposure (Foa and Riggs 1994) and compromise efforts at adjustment. These attributions may also influence the degree to which one is willing to rely on others for danger appraisal, support with emotional regulation, and protective intervention. Intervention themes can remain relatively fixed or evolve with maturity, new information, and experience. They have the capacity to powerfully influence future career choices, preferences for geographical residence, and parenting behavior. Lack of adequate schematization of protective intervention may compromise self-preservative and self-caring functions in children (Hartman and Burgess 1989) and interfere with adult protective behavior (Wyatt et al 1992).

Distal Trauma Reminders and Secondary Stresses

The influence of distal trauma reminders may depend on the extent to which they are embedded in the circumstances of everyday life. The more they involve intricacies of interpersonal interactions, bodily sensations, and internal affective states, the more difficult they are to identify as sources of renewed arousal, anxiety, or avoidance. Distal reminders may appear during parenthood, leading to overly anxious, protective, or authoritarian behavior. Distal secondary stresses may be a continuation of stresses that occurred in the immediate aftermath of the trauma or may arise out of new developmental challenges or life circumstances. They range from the need for future medical treatment and accommodation to disability, contact of an abusive parent or relative with children of the next generation, or the challenge of self-revelation to explain trauma-related behavior to intimate persons in one’s later life.

Distal Pathology

A developmental psychopathology model of PTSD underscores the complex iterative impact on developmental progression and distal pathology of repeated victimization in childhood, a review of which is beyond the scope of this paper. Nonetheless, even among heterogeneous outcomes, there is a role for systematic review of trauma history and determination of comorbid PTSD. A residential treatment study, for example, showed that history of earlier trauma, diagnosis of PTSD, and current reactivity to trauma reminders explained otherwise unexplained aggressive and avoidant behaviors among adolescents with mood and disruptive behavioral disorders (Doyle and Bauer 1989). A prospective study following adolescent Cambodian refugees into young adulthood found a waxing and waning course of PTSD, continuity of PTSD related to traumatic exposure, and current depression associated with current secondary stresses (Sack et al 1996). Clark and Kirisci (1996) found significant detrimental effects of chronic PTSD on the quality of life among adolescents, with disturbances in health functioning, social competence, and school performance. A recent HMO retrospective study among adults suggests that witnessing family violence,
childhood victimization, and childhood exposure to severe household dysfunction are risk factors for the leading causes of death in adults (Felitti et al 1998).

Retrospective studies have suggested the importance of a developmental path analysis in understanding the association of child and adolescent traumatic experiences, child and adolescent PTSD, and adult PTSD. Findings include the association of childhood physical abuse with increased risk of chronic PTSD after late-adolescent or young-adulthood combat exposure (Zaidi and Foy 1994), the chronicity of PTSD into adulthood associated with sequential childhood physical abuse and sexual abuse (Rodriguez et al 1998), and the greater risk of developing PTSD in adulthood associated with a history of multiple traumatic events (Robin et al 1997; Yehuda et al 1995).

There is suggestive evidence of potential neurobiological changes extending into adulthood. These include tonic autonomic and catecholamine activity alterations (Perry et al 1995); HPA axis alterations, including increased glucocorticoid receptor numbers in adult survivors of childhood sexual abuse (Stein et al 1997); a pattern of low cortisol response to adult sexual trauma after earlier sexual assault history (Resnick et al 1995); and reduced left hippocampal volume in adults with histories of childhood physical, sexual abuse, or both (Bremner et al 1997; Stein et al 1997). It will be important to prospectively study the effects of these changes on the appraisal and response to danger and future traumatic experiences.

Intersection of Childhood Traumatic Stress, PTSD, and Other Anxiety Disorders

This developmental model suggests different avenues by which dangerous circumstances, childhood traumatic experiences, and PTSD can intersect with other anxiety disorders over the life span. Recent adult studies have begun to describe how difficult it is to ascertain the impact of prior trauma and chronic PTSD among patients presenting with predominant Panic, OCD, or other primary anxiety profiles. Given the emerging developmental epidemiology of child and adolescent traumatic exposures and the prevalence of anxiety disorders in childhood (Costello and Angold 1994), it is important to begin to better characterize their potential points of intersection. Last et al (1992) have suggested that the age-of-onset data of childhood anxiety disorders points to a developmental progression (simple phobia followed by separation anxiety, overanxious or general anxiety disorder, obsessive-compulsive disorder, social phobia, and panic, with or without agoraphobia), which others have mapped against a normative progression in fears and anxieties, age-related repetitive behaviors, and play and mental activities (Carter et al 1995; Craske 1997). The field of childhood traumatic stress would suggest that a more comprehensive model would place the intersection of these two lines of progression within the psychology and developmental neurobiology of maturing capacities to appraise, emotionally regulate, and respond to real dangers in the world.

As more epidemiological information about age- and gender-related traumatic exposures becomes available, it would be fruitful to map the epidemiology of anxiety disorders against a background of this information. Traumatic experiences and losses have been considered, among nonshared environments, as being potentially salient in explaining variance in childhood and adolescent psychopathology (Pike and Plomin 1996). Family and twin studies have suggested an important role for nonshared environments in the etiology and course of anxiety disorders (Kendler et al 1992a, 1992b). Prospective population studies of child and adolescent anxiety disorders need to incorporate ongoing systematic screening for traumatic exposures, using typologies congruent with developmental and environmental risks. For example, the peak incidences (and surprisingly high prevalence) of serious near-drowning, burns, and dog bites are between infancy and five years of age, the latter two exposures having been reported to be associated with PTSD and, over time, with childhood phobic disorder (Gislason and Call 1982; Stoddard et al 1989). Consistent with our model, the report of traumatic exposure should be complemented with information about secondary adversities and the ecology of trauma reminders.

As we incorporate more rigorous prospective information about trauma exposures, it will become possible to examine the concordance of specific traumatic features and symptom profile of later anxiety disorder, as well as to examine the mediating role of child-intrinsic factors including different forms of anxiety sensitivity (Stein et al 1999). For example, Bouwer and Stein (1997) reported that a significant subpopulation of adults with panic disorder had a history of traumatic suffocation experiences. These included school age and adolescent near-drowning and political torture by suffocation. Fear and symptom profiles included respiratory phenomena and nocturnal panic. The severity of the exposures presented in the case material would suggest the likelihood of acute traumatic reactions, reactivity to reminders, and ongoing interactions with proximal psychopathology and development prior to the onset of young adult panic disorder (Pynoos et al, in press). Such complex interactions may contribute to the development and maintenance of an increased alarm propensity.
Adult anxiety disorder research has continued to suggest the utility of a developmental psychopathology approach across the lifecycle. A significant subpopulation of young and middle-age adults with panic disorder report a history of childhood sexual abuse (Stein et al. 1996) in which the peak incidence is during preadolescence, for example. This life-trajectory approach is especially relevant in considering the findings of Prigerson et al. (1996) that childhood physical, sexual, and psychological abuse, as well as parental loss, are risk factors for the onset of late-life anxiety disorders, particularly after becoming a caretaker of an ill spouse.

Child-parent interaction is a critical dimension of non-shared environments (Pike and Plomin 1996). Many features of parent-child interactions that have been described as moderating the pathogenesis of anxiety disorders in children are also evident in dangerous circumstances and after children’s traumatic exposures. These features include reciprocation of avoidance responses; parental negative feedback, including being critical; and parental restriction, which exacerbates children’s anxious and avoidant behaviors (Barrett et al. 1996; Dadds et al. 1996; Hirshfeld et al. 1997). Costanzo et al. (1995) have postulated that outcome is mediated by mechanisms involved in the acquisition of developmental competencies, including disturbances in the child’s sense of control and self-efficacy and overdependence on others to master stimuli, leading to greater ambiguity in the child’s sense of agency and effectiveness. These resulting child- or adolescent-intrinsic factors may mediate responses to real danger and represent an axis of vulnerability to PTSD after traumatic experiences.

Fairbanks and McGuire (1993) have provided a powerful ethological demonstration of the nonshared environmental impact on siblings of the introduction of real danger into the group ecology, mediated by increases in maternal protective ness. Among vervet monkeys, all mothers, across a spectrum of baseline laissez-faire to high protective ness, became more protective toward their infants during years when a new male had been introduced into the group (new males pose a threat of infanticide), as compared with long-term resident males. Infants reared from the new male groups were more fearful and cautious when tested 1–3 years later, with longer latency to approach a novel object or enter a novel environment. Using principles of population genetics, these investigators are presently evaluating the relative contributions of genetics and nonshared environment to cohort population variance in behavioral inhibition. This ethological study suggests that there can be an interplay of danger and trauma and exaggerated parental protectiveness in the developmental course of behaviorally inhibited children and risk of anxiety disorder.

Research in childhood anxiety disorders is paralleling that of childhood traumatic stress in addressing the interplay among traumatic experiences, psychopathology, child-parent interactions, and developmental disturbance. For many children with anxiety disorders, including PTSD, the relationship between disorder and impairment is a reciprocal one, with impairment leading to continued exacerbation of anxiety symptoms, which in turn results in worse impairment. As an example, social phobia is often triggered by a traumatic or stressful event (Ost 1987) that can then lead to phobic avoidance and deterioration in the child’s level of social activity. Decreased peer performance may foster increased social discomfort, leading to further withdrawal and worsening impairment (Beidel and Morris 1994). A developmental psychopathology model suggests the mutual importance of lessening psychopathology and habilitating developmental competencies, especially in childhood, where lost developmental opportunities and impaired acquisition of skills carry significant independent risks for adverse life-trajectory outcomes.

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References


Korn H, Faber D (1996): Escape behavior—brain stem and


