

Addressing the Needs of Preschool Children in the Context of Disasters and Terrorism: Clinical Pictures and Moderating Factors

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Abstract

Purpose of Review This paper surveys the existent theoretical and research literature regarding the needs of preschool children in the context of disasters and terrorism with the aim of understanding (a) the consequences of such events for young children and (b) the main moderating variables influencing the event-consequence association to learn how to enhance their resilience. **Recent Findings** Consequences include a variety of emotional, behavioral, and biological outcomes. Implications for refugee children are discussed. Main moderating variables were mother's sensitivity and mother's PTSD symptoms. **Summary** Exposure to disasters and terrorism may have severe effects on the mental health and development among preschool children. Future research should explore the implications of different levels of exposure and the effects of moderating psychosocial and biological variables, including the parent-child triad, on the event-consequence relationship.

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Introduction

Today, preschool children are exposed to an increasingly wide variety of disasters and terrorist incidents, either directly or indirectly through their parents or their surroundings [1]. Over one billion children under the age of 18 live in countries affected by armed conflict [2]. Moreover, forced migration, a byproduct of armed conflict and famine, is at its highest since World War II, and by the end of 2015, some 41 million people (an estimated 17 million children) worldwide were newly displaced due to violence and conflict within their own countries [3]. Additionally, estimates suggest that worldwide terrorism has increased fivefold since 2000 [4], and modern warfare is now aimed at heavily populated civilian locations. Indeed, the contemporary battlefield has no clear boundaries, and citizens and children no longer have a safe haven.

Trauma as a result of terrorism and disasters, whether natural, technological, or human-made, imposes incalculable physical, psychological, and economic hardships on survivors and their surroundings, thereby impacting multiple dimensions of children's lives. The literature distinguishes between traumas, disasters and terrorism. Traumas are personal incidents that threaten health and well-being and may render an individual helpless in the face of intolerable internal or external danger. For the traumatized individual, the present is interrupted by arbitrary, flashback-type memories of the traumatic incident [5]. Disasters are public incidents that cause extensive damage to property and lives and have a comprehensive and ongoing disruptive impact on child, family and social networks—their basic daily routines, and sense of safety and connectedness [6•]. Terrorism is the politically motivated creation of fear in

a target group by means of violence. Whereas trauma involves unintentional (re)experiencing of past violence, terrorism evokes fearful anticipation of future violence based on and initiated by past violence [5]. A growing number of articles have addressed the consequences of disasters and terrorism on children and adolescents [7, 8]. Yet only in recent years has evidence emerged showing the high risk associated with disasters and terrorism during preschool years [9•, 10•, 11, 12].

Development among infants and preschoolers is characterized by multiple, rapid, and complex physiological, cognitive, and emotional changes and can be profoundly affected by trauma [9•, 10•, 11–13]. Consequences range from posttraumatic stress symptoms to behavioral and emotional disorders, psychosomatic symptoms, sleep disorders, cognitive ramifications, and biological impairments [9•, 14–17, 18•].

The goal of this article—the first of two articles dealing with preschool children (ages 0–6) who have been exposed to terrorism and disaster—is to provide an updated review of the possible consequences of such events for this vulnerable group. Additionally, we describe the implications of such exposure for refugee children, as their experiences may generate different consequences and therefore may require different actions and treatment. Moreover, we explain the moderating and mediating variables that intervene in the event-consequence relationship. Finally, we discuss the research challenges in this field and future research directions that may help in understanding preschoolers' needs in the context of disasters and terrorism.

Consequences of Terrorism and Disaster for Preschool Children

To understand the needs of preschoolers in the context of disaster and terrorism, we first need to understand the possible consequences of such incidents. Although the effects of disasters on preschool children have been discussed since the middle of the twentieth century [19], researchers do not agree upon the severity of the consequences for preschoolers. Previously, it was assumed that preschoolers have only a mild response to severe traumas because their cognitive immaturity prevents them from understanding and remembering these traumas [20, 21]. However, developmental theories as well as clinical and empirical evidence have increasingly shown that in many ways the critical developmental stages of very young children make them more vulnerable to trauma than older children and adults [9•, 12, 22]. Preschoolers' cognitive, verbal, and emotional immaturity as well as their lack of autonomy may lead to limited comprehension and communication of emotions and thoughts. Moreover, preschoolers' worldview is organized by a set of self-centered beliefs leading them to assume that their actions cause things to happen [23].

Posttraumatic Stress Symptoms Slone and Mann [9•] reviewed 35 studies that examined the effects of exposure to war, conflict, and terrorism on preschool children (aged 0–6). They found that 17–44% of children exposed to these types of traumatic incidents show clinical or sub-clinical post-trauma outcomes depending on incident type and exposure.

The most well-defined psychological outcome of disasters and terrorism is PTSD, which is organized into four major symptom clusters: (1) intrusion (e.g., memories, dreams, flashbacks, cue-related prolonged psychological distress or physiological reactions); (2) avoidance of stimuli associated with the event (e.g., distressing memories, thoughts, or feelings, and reminders associated with the traumatic event); (3) negative alterations in cognition and mood associated with the traumatic event (e.g., inability to remember important aspects of the event; negative beliefs or expectations about the self, others, or the world; distorted cognitions about the causes or consequences of the traumatic event that lead to guilt; and inability to experience positive emotions); and (4) alterations in arousal and reactivity associated with the traumatic event (e.g., reckless or self-destructive behavior, hypervigilance, exaggerated startle response, problems with concentration, or sleep disturbances) [24, 25]. To note, PTSD is expressed differently in children of different ages and, therefore, is characterized by specifically different criteria in the DSM-5 [24].

These symptoms reflect children's inner state of distress as a result of traumatic exposure. Most children, however, will not develop full-blown PTSD. Instead, most will display one or more of the following: specific fears and dependent behavior [26], sensorimotor disorganization and disruption of biological rhythms (e.g., prolonged crying, unresponsiveness to soothing, muscular flailing, rigidity, agitation and restlessness, feeding disturbances, sleeping disorders), lack of interest in the environment, and somatic problems with no detectable organic cause, as well as aggressive symptomatology [9•, 22]. Play patterns can also be affected, as manifested in the use of morbid themes and less fantasy play, increased inhibition, negative affect, aggression, anxiety, and reduced social interaction [27, 28].

Several studies examined the long-term influence of exposure to trauma among preschoolers. For instance, 5 years after a SCUD missile attack on preschool children in Israel, Laor, Wolmer and Cohen found a significant decrease in severity in most symptom domains and an increase in avoidant symptoms [29]. A recent study found that war-exposed preschool children had more comorbid psychopathologies and that the number of comorbidities increased with age into middle (5–8 years) and late (9–11 years) childhood [10•]. These findings indicate the changing symptomatology at different times and emphasize the need for constructing individual dynamic interventions appropriate for different developmental stages.

Cognitive Outcomes Pfefferbaum, Noffsinger, Jacobs, and Varma [14] reviewed cognitive functioning among children

exposed to disasters and terrorism. Appraisals were found to be critical to the content encoded into memory during a traumatic incident and were associated with certain emotions likely to resurface as intrusive images are recalled. The review emphasized the need for extended research on the attention and concentration ability of exposed children and on their academic achievement and executive function. After September 11, Chemtob et al. [30] found a significant dose-response relationship (measured as the number of high intensity incidents) with clinically significant attention problems among preschool children.

Biological Outcomes Biological outcomes in the context of preschool childhood stress may have neurological, neuroendocrinological, physiological and genetic aspects. Preschool children who experience trauma are at particular risk due to the vulnerability of their rapidly developing brains [16]. Early childhood trauma has been associated with reduced size of the brain cortex, the area responsible for complex functions including memory, attention, perceptual awareness, thinking, language, and consciousness. These changes may affect IQ and emotional regulation ability [17]. Moreover, early life stress has been associated with structural differences in the amygdalae and hippocampus, two important medial temporal lobe structures involved in emotion processing and regulation that play a central role in psychopathology later in life [16]. Preliminary evidence indicates that early stress disrupts development of social reciprocity and empathy by influencing neural regions, including the superior temporal sulcus, insula, medial and orbitofrontal cortices, amygdala and anterior cingulate cortex [31].

Additionally, early stress was found to initiate a cascade of physiological processes that alter the development of children's physiological stress systems. Neuroendocrine markers of stress in war-exposed children differed from those found in non-exposed preschool children, changes that were associated with a diagnosis of PTSD [15]. A study of children in foster care emphasized the importance of age at the time of exposure. The study showed effects on both the peripheral nervous system (PNS) and hypothalamic pituitary adrenal (HPA) axis among children exposed to severe stress before age 24 months, suggesting the existence of a sensitive period during which stress response systems are most strongly influenced by environmental inputs [32].

Genetic background may contribute to children's reaction to early life events, but DNA function can also be modified by exposure to these events through epigenetic pathways [33••, 34, 35••]. The first evidence of such modification was found in maltreated rat infants. Maltreatment induced changes in the DNA methylation of *BDNF* DNA, which in turn altered *BDNF* gene expression in the adult prefrontal cortex. Moreover, researchers found altered *BDNF* DNA methylation in the offspring of females that had previously experienced the

maltreatment regimen [34]. Later research findings showed the glucocorticoid receptor gene (*NR3C1*) to be susceptible to epigenetic modification, specifically DNA methylation, in the context of environmental stress such as early life trauma, an established risk for depression later in life [18••, 35••]. Moreover, alterations in *NR3C1*-1F promoter methylation were found to reflect enduring changes among combat veterans with PTSD, compared to combat-exposed veterans who did not develop PTSD [33••]. The question concerning epigenetic influence on the vulnerability to anxiety and or post-trauma is still open.

Political Attitude Outcome/Influence A somewhat different influence of continued terrorism and armed conflict concerns the development of political attitudes and readiness for personal sacrifice for the sake of ideology [36] in young children or adolescents having been exposed to disasters or terrorism. It has been found that children and adolescents develop their political attitudes as part of their socio-political context and nationhood [37]. Research has found that for children and adolescents living in war zones and experiencing war situations, violent situations become part of their political socialization through the years [38]. A study conducted on Israeli preschool children exposed to war showed that an increase in externalizing and posttraumatic symptoms and more immature defenses were associated with very negative attitudes towards the enemy [39]. These results illustrate that trauma experienced as a result of political conflict may be a prominent factor in the development of stereotypes and hatred possibly contributing to the cycle of violent conflicts.

The Case of Preschool-Aged Refugees

In recent years, the number of people who have been forcibly displaced has increased tremendously, reaching a peak in 2015. More than half of these refugees were children [3]. Refugees often arrive at their destination after experiencing traumatic events in their home country as well as during their escape and relocation. While their traumatic experiences will likely affect their lives, the most prominent issues of their resettlement process have yet to be delineated [40].

A significant body of research has begun addressing the traumatic experiences of child and adolescent refugees who have experienced war, famine, and political conflict in their home countries [41]. Many child refugees suffer from severe psychiatric disorders (e.g., PTSD, depression, anxiety, and conduct disorder) and symptoms (e.g., somatic complaints, over-dependency, and restlessness), social life disruptions, learning difficulties and loss of family and friends [39, 42–44]. Despite the lack of research on preschool-aged refugees [43], they are known to develop different kinds of behavioral disorders, including PTSD [44].

Objective and Subjective Moderating Factors Affecting the Exposure-Consequence Association

It is important to map the objective factors and the subjective moderating components of preschoolers exposed to disaster and terrorism for understanding children's resilience and developing prevention programs.

Objective Factors These factors include type and number of incidents and level of exposure. The literature emphasizes the importance of exposure level in understanding an incident's effects [45]. Exposure levels range from (a) the child himself being directly exposed to the disaster or the terrorist incident, through (b) the death or injury of his caretakers, to (c) the effects on the child's surroundings (community, neighborhood). In a study of Israeli infants and toddlers exposed to missile attacks during the Gulf War, significantly more children residing in the target zone displayed adjustment disturbances than children residing in a non-target zone [46].

Other studies examined the consequences of preschool children's personal exposure to disasters or terrorist incidents. A study conducted in the Gaza Strip found that level of personal exposure to violence was not associated with children's mental health, but was strongly associated with their mothers' mental health [47]. However, the majority of these children were born and raised in an atmosphere of political violence, thus limiting the ability to detect an association between exposure and children's mental health.

Personal exposure also predicted PTSD diagnosis [48] and parental help seeking [49]. Wang et al. demonstrated that being directly exposed to terrorism is significantly associated with increased risk of internalizing and externalizing behavior problems in preschool children [45]. Importantly, the term direct exposure in their paper, referred to preschoolers that were present during a terrorist attack with or without injury, were near a terrorist attack, or knew someone close to the child who was injured or killed during a terrorist attack.

A further level of exposure that merits consideration is the media, which provides sensational coverage of disasters and terrorism, including intensely graphic visual material [50]. For instance, exposure to media coverage on September 11 among preschoolers predicted PTSD symptoms [51] and sleep problems [45, 52]. However, despite the impact of exposure, a study in children 8–12 years old following a devastating tornado found that beliefs and attributions about disasters predicted long-term posttraumatic distress stronger than degree of exposure or coping strategies [53].

Incident number and severity is related to posttraumatic symptoms and behavioral and emotional problems in various settings [6•, 52, 54]. Displacement due to natural disasters or political conflicts is a form of stressful exposure. Pfefferbaum, Jacobs, Van Horn, and Houston reviewed the effects of displacement among children exposed to disasters [55•]. Their

findings revealed that social effects such as loss of jobs, schools, places of worship, access to usual medical care, and sometimes all or part of their social networks lead to loss of security, comfort, traditions, and familiar living conditions. These changes profoundly affect parental reactions, parenting styles, and family interactions, which in turn can influence post-disaster functioning among children. In some studies, displacement correlated with symptoms of posttraumatic stress, depression, and post-disaster trauma, while others showed that relocated children had lower rates of serious emotional disturbance than those who did not relocate. A study on Israeli preschoolers under missile attacks found that displaced children and mothers showed higher externalizing and stress symptom levels compared with nondisplaced and threatened children [56]. No additional research on the effect of displacement on preschoolers was found.

Subjective Moderating Variables The literature often refers to the parent-child relationship as the most essential moderator affecting children's tendency to psychopathologies in general and specifically to their reaction to trauma exposure [57, 58]. This understanding has been evident since Freud and Burlingham showed that during WWII young children displayed more symptoms of distress when they were separated from their parents [19]. Subsequent research has consistently emphasized the correlations between parental and child distress, especially among preschool children [59]. In this context, maternal reaction to stress and maternal mental health (e.g., PTSD) have been found to predict children's responses to trauma (e.g., posttraumatic stress symptoms, behavioral problems, and somatic complaints) [13, 58, 59].

A mother's ability to provide emotional availability, empathic responsiveness, [60] and sensitive containment, the cornerstone of attachment theory [61], provides a regulatory framework for the development of bio-behavioral stress-management systems. Indeed, attachment has been found to be a crucial mechanism in posttraumatic resilience. A study that examined Israeli preschool children who lived near the Gaza Strip and were exposed to war-related trauma on a daily basis found that preschoolers who developed PTSD increased their attachment-related avoidant behavior when traumatic memories were evoked. Under the same conditions, however, secure attachment-related behavior increased among children who did not develop PTSD [13]. Hence, they concluded that attachment patterns and mother's sensitivity serve as resilient factors in the exposure consequence association. The child-father relationship and the triadic relation have yet to be thoroughly researched.

A 2-year prospective study on preschool children who experienced life-threatening trauma offers another way of understanding the mother-child symptom relationship [62•]. The study assessed the outcome of these children's PTSD symptoms, as well as of seven maternal factors examined as mediators or moderators 2 years after the experienced event.

Significant mediator variables included maternal symptoms (PTSD, depression), maternal escape/avoidance coping, and emotional sensitivity. The study showed that greater maternal emotional sensitivity appeared to mediate the development of more PTSD symptoms among their children. The authors speculated that the child's symptoms may influence those of the parents, supporting bidirectional effects between parent-child dyads [63, 64]. Also, parents may carry a genetic susceptibility for developing PTSD, transmitted to their children.

Research regarding genetic involvement suggests that PTSD risk is determined by the interaction of genetic dispositions and early experiences [65]. Feldman, Vengrober, and Ebstein found that a biological, oxytocin-vasopressin genotype and mothers' sensitive caregiving during evocation of a traumatic incident jointly contribute to the propensity to develop PTSD among preschool children [66•].

Home environment is another ecological factor moderating the exposure-consequence association [9•, 55•, 66•, 67, 68]. For instance, a study of families exposed to the 9/11 attacks found that negative changes in parenting, increased tension between couples, and increased parental anxiety regarding parenting were correlated with the number of posttraumatic symptoms in children [67]. Social support also affects family resilience during periods of extended trauma [68]. Greater perceived social support is associated with lower levels of maternal depression and fewer posttraumatic symptoms and PTSD diagnoses in children [13, 69].

The child's temperament is a critical factor impacting the exposure-consequence association [5, 10•, 15]. Individual differences in children's temperamental reactivity were found to predispose or facilitate children's self-regulation development and have been consistently associated with children's overall adjustment to their environment [70]. A combination of temperamental negativity and low parental support places maltreated preschool children at greater risk for poor inhibitory control [71]. Notably, temperamental reactivity among preschool children under conditions of ongoing war does not necessarily indicate higher risk, as it may be an adaptive response to the stressful context [72]. Although these findings do not refer to preschoolers' reactions to disasters or terrorism, they could offer some insight into similar processes following other traumatic incidents.

Child's age and developmental status at the time of exposure seem to be an additional moderating factor. Feldman and Vengrober examined symptom manifestations and risk and resilience factors among preschoolers exposed to wartime trauma. Their results showed that PTSD was diagnosed in 37.8% of exposed children. Symptoms observed in these children included nonverbal representation of trauma in play. Children with PTSD showed increased behavioral avoidance that was correlated with mother's degree of trauma exposure and maternal PTSD. Moreover, the researchers found that exposed children aged 3–5 were nearly twice as likely to develop PTSD compared to exposed infants aged 1.5–3 [13]. Age 3–5 seems to be an

especially vulnerable period due to the linguistic, symbolic, and executive skills that children have acquired and that enable them to project to the future. Accordingly, these children's anxiety may increase and regressions may be more notable. On the other hand, compared to their older schoolmates, children aged 3–5 have not yet developed operative thought, self-regulatory strategies, or the ability to lean on and be helped by their social surroundings. As a result, it seems that 3–5-year-olds may be at especially high risk. In this context, a group of studies examining Israeli preschoolers during the Gulf War revealed interesting findings [11, 55•, 73]. In one study, the correlation between PTSD symptoms in mother and child was strongest when the age of the child was 3, weaker when the child was 4, and non-existent at age 5 [11]. However, it seems that the risks for the 0–3 age group have not yet been properly understood.

An additional moderator is the child's history of stressful life events. Considerable evidence indicates that accumulated stress, such as divorce, birth of a sibling, death in the family, migration, or violence in the home, increases a child's vulnerability [29, 36, 74]. For example, a study that examined the effects of traumatic exposure and stressful life events 3 months after daily exposure to rocket attacks on Israel's southern border found that the accumulation of stressful life events in the 2 years prior to the war and severity of exposure accounted for 30% of the variance of PTSD symptoms and 16% of the variation in the child's adaptive behavior [75••].

Conclusions

The consequences of exposure to disasters and terrorism among preschool children can be severe and profound. These children are at critical stages in their development, making them more vulnerable than older children. The effects of exposure range from posttraumatic stress symptoms to emotional and behavioral outcomes, as well as biological outcomes that may be neurological, neuro-endocrinal, physiological, or epigenetic.

Notably, very little research discusses the cognitive outcomes of such exposure in preschoolers. Moreover, more longitudinal research is needed regarding the long-term consequences. Studies have found a significant decrease in severity in most symptom domains 5 years after exposure [29], more comorbid psychopathologies among war-exposed preschool children, and a growing number of comorbidities with age, as comorbidity was found to increase from middle childhood to late childhood [10••].

Posttraumatic growth has been lately studied among children and adolescents, indicating a negative association with mental health problems among other positive outcomes [76]. Although it has been suggested that posttraumatic growth may not develop among preschool children [76], this assumption has yet to be validated in future studies.

Emotional sensitivity and regulation, attachment style and PTSD symptoms of mothers are central moderators in the relation between disaster or terrorism exposure and consequences for preschoolers. Moreover, genetic dispositions, home environment, the child's temperament, and the preschooler's history of stressful events are also important variables in the exposure-consequence relationship.

Research on preschoolers' exposure to disasters and terrorist incidents faces several challenges. One of the most common challenges involves measurement of exposure type. As Slone and Mann conclude in their review, some studies did not measure the type and severity of exposure, and even when measured, exposure was not always related to a specific outcome [9••]. Categorizing the different types of traumatic exposure was challenging due to the large variation in exposure measures. In addition, many measures were not sufficiently discriminating or sensitive to each type of traumatic event. Moreover, recent research highlights the need for differentiation between profiles of traumatic life event exposure to complement the cumulative risk perspective [77].

Additionally, as the studies involved mostly mothers, the impact of the child-father and the triadic relationship, which are significant for preschoolers' development [78], has yet to be examined. Finally, research regarding preschool refugees is needed in order to understand their special needs arising from the complex circumstances they encounter.

This paper reviewed the literature describing the consequences of disasters and terrorism for preschool children. Additionally, it described the mediating and moderating variables that influence the event-consequence relationship. Further understanding the psychosocial and biological variables may help us enhance resilience and preparedness for disasters and terrorism as well as assist in constructing adequate child-oriented preparedness and intervention programs [79, 80].

In our subsequent article, we review the existing literature regarding assessment methods, preparedness programs, and intervention models that have been designed for preschoolers in the context of disasters and terrorist incidents [81]. Integrating the existing knowledge regarding preschool children into the context of disasters and terrorism is necessary for us to prepare the coming generation to contend with the challenges of the present.

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Compliance with Ethical Standards

Conflict of Interest Daniel Hamiel, Leo Wolmer, Lee Pardo-Aviv, and Nathaniel Laor declare that they have no conflict of interest.

Human and Animal Rights and Informed Consent This article does not contain any studies with human or animal subjects performed by any of the authors.

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References

Papers of particular interest, published recently, have been highlighted as:

- Of importance
 - Of major importance
1. Aitsi-Selmi A, Blanchard K, Al-Khudhairy D, Ammann W, Basabe P, Johnston D, et al. UNISDR STAG 2015 report: science is used for disaster risk reduction.; 2016. http://www.unisdr.org/files/42848_stag2015.pdf. Accessed 9 Jan 2017.
 2. Bhutta ZA, Black RE. Global maternal, newborn, and child health—so near and yet so far. *N Engl J Med*. 2013;369:2226–35.
 3. World at war; UNHCR global trends: forced displacement in 2014. Geneva: United Nations High Commissioner for Refugees; 2015. http://unhcr.org/556725e69.html#_ga=1.57518634.1082092447.1439460767. Accessed 16 Dec. 2016.
 4. Institute for Economics & Peace. Global terrorism index 2015. <http://economicsandpeace.org/reports/>. Accessed 22 Dec. 2016.
 5. Frank MC. Conjuring up the next attack: the future-orientedness of terror and the counterterrorist imagination. *Critical Studies on Terrorism*. 2015;8(1):90–109.
 - 6•• Laor N, Wolmer L. Children exposed to mass emergency and disaster: the role of the mental health professionals. In: Martin A, Bloch MH, Volkmar FR, editors. *Lewis's child and adolescent psychiatry: a comprehensive textbook*. 5th ed. Philadelphia: Wolters-Kluwer; 2017. **The chapter provides a thorough review of the consequences of children's exposure to disasters and of the risk and resilient factors affecting their responses. Moreover, the authors survey the assessment measures existing for children and the different prevention and intervention models and their empirical support.**
 7. Masten AS, Narayan AJ. Child development in the context of disaster, war, and terrorism: pathways of risk and resilience. *Annu Rev Psychol*. 2012;63:227–57.
 8. Tol WA, Song S, Jordans MJD. Annual research review: resilience and mental health in children and adolescents living in areas of armed conflict—a systematic review of findings in low and middle-income countries. *J Child Psychol Psychiatry*. 2013;54(4):445–60.
 - 9•• Slone M, Mann S. Effects of war, terrorism and armed conflict on young children: a systematic review. *Child Psychiatry Hum Dev*. 2016;47(6):950–65. **The first review to present systematic evidence of the consequences of war and terrorism for preschoolers.**
 - 10•• Halevi G, Djalovski A, Vengrober A, Feldman R. Risk and resilience trajectories in war-exposed children across the first decade of life. *J Child Psychol Psychiatry*. 2016;57(10):1183–93. **One of the first studies that tracked risk and resilience trajectories in war-exposed preschool children over lengthy periods of time and charted predictors of individual pathways. War-exposed children showed significantly higher rates of psychopathology and more comorbid psychopathologies.**
 11. Laor N, Wolmer L, Mayes LC, Gershon A, Weizman R, Cohen DJ. Israeli preschool children under scuds: a 30-month follow-up. *J Am Acad Child Adolesc Psychiatry*. 1997;36(3):349–56.
 12. Simpson JA, Griskevicius V, Kuo SI, Sung S, Collins WA. Evolution, stress, and sensitive periods: the influence of unpredictability in early versus late childhood on sex and risky behavior. *Dev Psychol*. 2012;48(3):674–86.

13. Feldman R, Vengrober A. Posttraumatic stress disorder in infants and young children exposed to war-related trauma. *J Am Acad Child Adolesc Psychiatry*. 2011;50(7):645–58.
14. Pfefferbaum B, Noffsinger MA, Jacobs AK, Varma V. Children's cognitive functioning in disasters and terrorism. *Curr Psychiatry Rep*. 2016;18(5):48. doi:10.1007/s11920-016-0685-2.
15. Feldman R, Vengrober A, Eidelman-Rothman M, Zagoory-Sharon O. Stress reactivity in war-exposed young children with and without posttraumatic stress disorder: relations to maternal stress hormones, parenting, and child emotionality and regulation. *Dev Psychopathol*. 2013;25(4 Pt 1):943–55.
16. Hanson JL, Nacewicz BM, Sutterer MJ, Cayo AA, Schaefer SM, Rudolph KD, et al. Behavioral problems after early life stress: contributions of the hippocampus and amygdala. *Biol Psychiatry*. 2015;77(4):314–23.
17. National Scientific Council. Excessive stress disrupts the development of brain architecture. *J Child Serv*. 2014;9(2):143–53.
18. Smart C, Strathdee G, Watson S, Murgatroyd C, McAllister-Williams RH. Early life trauma, depression and the glucocorticoid receptor gene—an epigenetic perspective. *Psychol Med*. 2015;45(16):3393–410. **A recent review that discusses the progress made by studies that investigated the relationship between depression, early trauma, the HPA axis, and the NR3C1 gene. Findings showed potential mechanistic and biomarker roles for differential DNA methylation patterns in NR3C1.**
19. Freud A, Burlingham D. *Children and war*. New York: Ernst Willard; 1943.
20. Benedek EP. Children and psychic trauma: a brief review of contemporary thinking. In: Eth S, Pynoos RS, editors. *Post-traumatic stress disorder in children*. Washington: American Psychiatric Publishing, Inc; 1985. p. 1–16.
21. Bjorklund DF, Green BL. The adaptive nature of cognitive immaturity. *Am Psychol*. 1992;47(1):46–54.
22. Lieberman AF, Knorr K. The impact of trauma: a developmental framework for infancy and early childhood. *Pediatr Ann*. 2007;36(4):209–15.
23. Piaget J. *The language and thought of the child*. London: Routledge & Kegan Paul; 1959.
24. APA. *Diagnostic and statistical manual of mental disorders*. 5th ed. Arlington: American Psychiatric Publishing; 2013.
25. Scheeringa MS, Salloum A, Arnberger RA, Weems CF, Amaya-Jackson L, Cohen JA. Feasibility and effectiveness of cognitive-behavioral therapy for posttraumatic stress disorder in preschool children: two case reports. *J Trauma Stress*. 2007;20(4):631–6.
26. Sullivan MA, Saylor CF, Foster KY. Post-hurricane adjustment of preschoolers and their families. *Adv Behav Res Ther*. 1991;13:163–71.
27. Cohen E, Chazan S, Lerner M, Maimon E. Posttraumatic play in young children exposed to terrorism: an empirical study. *Inf Mental Hlth*. 2010;31(2):159–81.
28. Smith EL. *The play behaviors of young children exposed to a traumatic event* (Doctoral Dissertation). Columbia University; 2011. Retrieved from ProQuest Dissertations & Theses Global: Social Sciences, publication no. 3450239.
29. Laor N, Wolmer L, Cohen DJ. Mothers' functioning and children's symptoms 5 years after a SCUD missile attack. *Am J Psychiatry*. 2001;158(7):1020–6.
30. Chemtob CM, Nomura Y, Abramovitz RA. Impact of conjoined exposure to the World Trade Center attacks and to other traumatic events on the behavioral problems of preschool children. *Arch Pediatr Adolesc Med*. 2008;162(2):126–33.
31. Decety J. The neurodevelopment of empathy in humans. *Dev Neurosci*. 2010;32(4):257–67.
32. McLaughlin KA, Sheridan MA, Tibu F, Fox NA, Zeanah CH, Nelson CA. Causal effects of the early caregiving environment on development of stress response systems in children. *Proc Natl Acad Sci*. 2015;112(18):5637–42.
33. Yehuda R, Flory JD, Bierer LM, Henn-Haase C, Lehrner A, Desarnaud F, et al. Lower methylation of glucocorticoid receptor gene promoter 1 F in peripheral blood of veterans with posttraumatic stress disorder. *Biol Psychiatry*. 2015;77(4):356. **The study examines the molecular mechanisms of glucocorticoid receptor (GR) sensitivity that is present in people with PTSD. Findings showed that alterations in NR3C1-1F promoter methylation may reflect enduring changes resulting from combat exposure, which lead to functional neuroendocrine alterations.**
34. Roth TL, Lubin FD, Funk AJ, Sweatt JD. Lasting epigenetic influence of early-life adversity on the BDNF gene. *Biol Psychiatry*. 2009;65(9):760–9.
35. Romens SE, McDonald J, Svaren J, Pollak SD. Associations between early life stress and gene methylation in children. *Child Dev*. 2015;86(1):303–9. **Epigenetic changes in the glucocorticoid receptor gene, a critical component of stress regulation, were examined in children. Children exposed to physical maltreatment had greater methylation within exon 1F in the NR3C1 promoter region of the gene, compared to nonmaltreated children, including the putative NGFI-A (nerve growth factor) binding site.**
36. Laor N, Wolmer L, Alon M, Siev J, Samuel E, Toren P. Risk and protective factors mediating psychological symptoms and ideological commitment of adolescents facing continuous terrorism. *J Nerv Ment Dis*. 2006;194(4):279–86.
37. Flanagan CA. Volunteerism, leadership, political socialization, and civic engagement. In: Lerner RM, Steinberg L, editors. *Handbook of adolescent psychology*. Hoboken: John Wiley & Sons; 2004. p. 721–45.
38. Braun-Lewensohn O, Abu-Kaf S, Sagy S. Attitudes toward war and peace and their relations with anxiety reactions among adolescents living in a conflictual area. *J Youth Stud*. 2015;18(1):68–79.
39. Laor N, Wolmer L, Cohen D. Attitudes toward Arabs of Israeli children exposed to missile attacks: the role of personality functions. *Israel J Psychiat*. 2004;41:23–39. 40
40. Myers CE. Neglected child refugees: undiscovered issues and suggestions for services. *The Journal of Counseling in Illinois*. 2014;3(1):48–59.
41. Rothe EM. A psychotherapy model for treating refugee children caught in the midst of a catastrophic situation. *J Am Acad Psychoanal*. 2008;36(4):625–42.
42. Wiese EBP, Burhorst I. The mental health of asylum-seeking and refugee children and adolescents attending a clinic in the Netherlands. *Transcult Psychiatry*. 2007;44(4):593–613.
43. Graham HR, Minhas RS, Paxton G. Learning problems in children of refugee background: a systematic review. *Pediatr*. 2016;137(6). doi:10.1542/peds.2015-3994 e20153994.
44. Almqvist K, Brandell-Forsberg M. Refugee children in Sweden: post-traumatic stress disorder in Iranian preschool children exposed to organized violence. *Child Abuse Negl*. 1997;21(4):351–66.
45. Wang Y, Nomura Y, Pat-Horenczyk R, Doppelt O, Abramovitz R, Brom D, et al. Association of direct exposure to terrorism, media exposure to terrorism, and other trauma with emotional and behavioral problems in preschool children. *Ann N Y Acad Sci*. 2006;1:363–8.
46. Rosenthal MK, Levy-Shiff R. Threat of missile attacks in the Gulf war: mothers' perceptions of young children's reactions. *Am J Orthop*. 1993;63(2):241–54.
47. Massad S, Javier Nieto F, Palta M, Smith M, Clark R, Thabet AA. Mental health of children in Palestinian kindergartens: resilience and vulnerability. *Child Adolesc Ment Health*. 2009;14(2):89–96.
48. Cohen E, Gadassi R. Posttraumatic stress disorder in young children exposed to terrorism: validation of the alternative diagnostic criteria. *J Child Adolesc Trauma*. 2009;2(4):229–41.
49. Devoe ER, Bannon WM, Klein TP. Post-9/11 helpseeking by New York City parents on behalf of highly exposed young children. *Am J Orthop*. 2006;76(2):167–75.

50. Bonanno GA, Brewin CR, Kaniasty K, La Greca AM. Weighing the costs of disaster: consequences, risks, and resilience in individuals, families, and communities. *Psychol Sci Public Interest*. 2010;11(1):1–49.
51. Otto MW, Henin A, Hirshfeld-Becker DR, Pollack MH, Biederman J, Rosenbaum JF. Posttraumatic stress disorder symptoms following media exposure to tragic events: impact of 9/11 on children at risk for anxiety disorders. *J Anxiety Disord*. 2007;21(7):888–902.
52. Conway A, McDonough SC, MacKenzie MJ, Follett C, Sameroff A. Stress-related changes in toddlers and their mothers following the attack of September 11. *Am J Orthop*. 2013;83(4):536–44.
53. Lack CW, Sullivan MA. Attributions, coping, and exposure as predictors of long-term posttraumatic distress in tornado-exposed children. *J Loss Trauma*. 2007;13(1):72–84.
54. Scheeringa MS. Untangling psychiatric comorbidity in young children who experienced single, repeated, or hurricane Katrina traumatic events. *Child Youth Care Forum*. 2015;44(4):475–92.
55. Pfefferbaum B, Jacobs AK, Van Horn RL, Houston JB. Effects of displacement in children exposed to disasters. *Curr Psychiatry Rep*. 2016;18(8):1–5. **Reviews the emotional and behavioural effects of internal displacement on children and adolescents and describes their educational adjustment in terms of both academic achievement and school behaviour. Family effects on children's function are also described**
56. Laor N, Wolmer L, Mayes LC, Golomb A, Silverberg DS, Weizman R, et al. Israeli preschoolers under Scud missile attacks: a developmental perspective on risk-modifying factors. *Arch Gen Psychiatry*. 1996;53(5):416–23.
57. Lieberman AF, Chu A, Van Horn P, Harris WW. Trauma in early childhood: empirical evidence and clinical implications. *Dev Psychopathol*. 2011;23(2):397–410.
58. Chemtob CM, Nomura Y, Rajendran K, Yehuda R, Schwartz D, Abramovitz R. Impact of maternal posttraumatic stress disorder and depression following exposure to the September 11 attacks on preschool children's behavior. *Child Dev*. 2010;81(4):1129–41.
59. Nomura Y, Chemtob CM. Effect of maternal psychopathology on behavioral problems in preschool children exposed to terrorism: use of generalized estimating equations to integrate multiple informant reports. *Arch Pediatr Adolesc Med*. 2009;163(6):531–9.
60. Lieberman AF, Padrón E, Van Horn P, Harris WW. Angels in the nursery: the intergenerational transmission of benevolent parental influences. *Infant Ment Health J*. 2005;26(6):504–20.
61. Bowlby J. Attachment and loss: attachment, vol. vol. 1. New York: Basic Books; 1969.
62. Scheeringa MS, Myers L, Putnam FW, Zeanah CH. Maternal factors as moderators or mediators of PTSD symptoms in very young children: a two-year prospective study. *J Fam Violence*. 2015;30(5):633–42. **The study measured the long-term outcome of preschool children's PTSD symptoms, as well as seven maternal factors that were examined as mediators or moderators. Significant mediator variables were maternal symptoms (PTSD, depression), maternal escape/avoidance coping, and emotional sensitivity. Greater maternal emotional sensitivity was associated with more severe PTSD symptoms among children.**
63. Kuppens S, Grietens H, Onghena P, Michiels D. Relations between parental psychological control and childhood relational aggression: reciprocal in nature? *J Clin Child Adolesc Psychol*. 2009;38(1):117–31.
64. Neece CL, Green SA, Baker BL. Parenting stress and child behavior problems: a transactional relationship across time. *Am J Intellect Dev Disabil*. 2012;117(1):48–66.
65. Mehta D, Binder EB. Gene X environment vulnerability factors for PTSD: the HPA-axis. *Neuropharmacology*. 2012;62(2):654–62.
66. Feldman R, Vengrober A, Ebstein RP. Affiliation buffers stress: cumulative genetic risk in oxytocin–vasopressin genes combines with early caregiving to predict PTSD in war-exposed young children. *Transl Psychiatry*. 2014;4(3):e370. **A prospective longitudinal design with real-time observations and assessment of genetic liability along the axis of vasopressin–oxytocin gene pathways to test G × E contributions to PTSD among preschool children and their parents exposed to continuous war. Research findings emphasize the saliency of both genetic and behavioral facets of the human affiliation system in shaping vulnerability to PTSD and in providing an underlying mechanism of post-traumatic resilience.**
67. DeVoe ER, Klein TP, Bannon WM, Miranda-Julian C. Young children in the aftermath of the world trade center attacks. *Psychol Trauma*. 2011;3(1):1–7.
68. Pynoos RS, Steinberg AM, Piacentini JC. A developmental psychopathology model of childhood traumatic stress and intersection with anxiety disorders. *Biol Psychiatry*. 1999;46(11):1542–54.
69. Dybdahl R. Children and mothers in war: an outcome study of a psychosocial intervention program. *Child Dev*. 2001;72(4):1214–30.
70. Rothbart MK, Bates JE. Temperament. In: Damon W, Lerner R, Eisenberg N, editors. *Handbook of child psychology: social, emotional and personality development*, vol. Vol. 3. 6th ed. New York: Wiley; 2006. p. 99–166.
71. Cipriano-Essel E, Skowron EA, Stifter CA, Teti DM. Heterogeneity in maltreated and non-maltreated preschool children's inhibitory control: the interplay between parenting quality and child temperament. *Infant Child Dev*. 2013;22(5):501–22.
72. Belsky J. War, trauma and children's development: observations from a modern evolutionary perspective. *Int J Behav Dev*. 2008;32:260–71.
73. Wolmer L, Laor N, Gershon A, Mayes LC, Cohen DJ. The mother-child dyad facing trauma: a developmental outlook. *J Nerv Men Dis*. 2000;188(7):409–15.
74. Udwin O, Boyle S, Yule W, Bolton D, O'Ryan D. Risk factors for long-term psychological effects of a disaster experienced in adolescence: predictors of post-traumatic stress disorder. *J Child Psychol Psychiatry*. 2000;41(8):969–79.
75. Wolmer L, Hamiel D, Versano-Eisman T, Slone M, Margalit N, Laor N. Preschool Israeli children exposed to rocket attacks: assessment, risk, and resilience. *J Trauma Stress*. 2015;28(5):441–7. **The study describes the effects of 4 weeks of daily exposure to rocket attacks among preschoolers in terms of PTSD symptoms, general adaptation, traumatic exposure, and stressful life events. Stressful life events and exposure to traumatic experiences accounted for 32% of the variance in PTSD and 19% of the variance in the adaptation scale.**
76. Meyerson DA, et al. Posttraumatic growth among children and adolescents: a systematic review. *Clin Psychol Rev*. 2011;31(6):949–64.
77. Hagan MJ, Sulik MJ, Lieberman AF. Traumatic life events and psychopathology in a high risk, ethnically diverse sample of young children: a person-centered approach. *J Abnorm Child Psychol*. 2016;44:833–44.
78. Hedenbro M, Rydelius PA. Early interaction between infants and their parents predicts social competence at the age of four. *Acta Paediatr*. 2014;103(3):268–74.
79. Hamiel D, Wolmer L, Spirman S, Laor N. Comprehensive child-oriented preventive resilience program in Israel based on lessons learned from communities exposed to war, terrorism and disaster. *Child Youth Care For*. 2013;42(4):261–74.
80. Laor N, Wolmer L, Spirman S, Wiener Z. Facing war, terrorism, and disaster: toward a child-oriented comprehensive emergency care system. *Child Adol Psych Clin N Am*. 2003;12:343–61.
81. Wolmer L, Hamiel D, Pardo-Aviv L, Laor N. Addressing the needs of preschool children in the context of disasters and terrorism: assessment, prevention and intervention. *Curr Psychiatry Rep*. 2017 (in press).