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Developmental trauma: Conceptual framework, associated risks and comorbidities, and evaluation and treatment

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Children exposed to adverse childhood experiences (ACEs) and pervasive interpersonal traumas may go on to develop PTSD and, in most cases, will further undergo a significant shift in their developmental trajectory. This paper examines contemporary research on Developmental Trauma (DT), which is inextricably linked to disruptions in social cognition, physiological and behavioral regulation, and parent-child attachments. Developmental trauma associated with early experiences of abuse or neglect leads to multi-faceted and longstanding consequences and underscores critical periods of development, complex stress-mediated adaptations, and multilevel, trans-theoretical influences in the diagnostic formulation and treatment of traumatized children, adolescents, and adults. Psychological and medical correlates of Developmental Trauma Disorder are considered, and directions for future research are discussed.

KEYWORDS

developmental trauma disorder, complex trauma, adverse childhood experiences, PTSD, Bronfenbrenner's

There has been much interest in understanding the prevalence and impact of adverse childhood experiences (ACEs), which refer to potentially traumatic events that occur in childhood and adolescence (e.g., abuse, rejection, and abandonment by caregivers; loss of a caregiver; interpersonal violence exposure). Recent developments suggest that multiple, repeated experiences of ACEs and interpersonal traumas have broad, cumulative, and lasting effects [e.g., (1, 2)]. Children are more likely than adults to lack the cognitive and behavioral capacities to understand and respond to traumatic circumstances effectively. Children affected by interpersonal trauma often experience more global and profound changes than adults who conceivably have more developed adaptations to stress and more cognitive resources to mitigate risks and promote resiliency. The current article provides discussion of how early, repeated interpersonal traumas can interrupt the development of secure attachment and precipitate the emergence of chronic and severe traumatic adaptations, followed by an analysis of contemporary research, conceptual and diagnostic issues, and assessment and treatment. The paper concludes with a discussion about future directions for research and practice.

Trauma and PTSD

Children and adults who have experienced trauma and developed measurable mental health symptoms associated with the trauma may present with indications of posttraumatic stress disorder (PTSD) that warrant careful diagnostic evaluation. PTSD is a psychiatric disorder brought on by exposure to a highly stressful and potentially life-threatening event such as a natural disaster, motor vehicle accident, witnessing family or community violence, experiencing abuse and neglect, or losing a loved one. The symptoms of PTSD, as defined by the fifth version of the Diagnostic and Statistical Manual of Mental Disorders (DSM-5) criteria, are characterized by persistent and intrusive thoughts, hyperarousal (i.e., heightened startle in response to unexpected sounds or movements), deliberate avoidance of trauma reminders, and alterations to conscious awareness (i.e., dissociation, derealization, and depersonalization). Persistent trauma symptoms (i.e., that last longer than a month after the traumatic event(s) and are accompanied by social, behavioral, and academic impairments) indicate the presence of PTSD and differentiate it from other psychiatric disturbances [e.g., (3)]. Healthcare providers widely use the DSM-5 to determine whether a person's symptoms are severe enough to warrant a diagnosis of PTSD.

However, individuals exposed to ACEs, pervasive interpersonal traumas, and polyvictimization [multiple, repeated ACEs; (4–8)] may not only go on to develop PTSD, but may also undergo significant shifts in their developmental trajectories. The changes are often widespread, adversely affecting their biological, social, cognitive, emotional, and spiritual/existential development (1, 9–11). Moreover, these experiences tend to threaten core beliefs and assumptions, including their self-esteem as well as their sense of lovability, vulnerability, and faith in family, friendships, and a higher power. Trauma survivors often face lifelong challenges in developing and maintaining trusting relationships; building and utilizing healthy coping strategies; and adjusting to school and, eventually, the workplace (12–14). For example, ACEs positively predict PTSD, recurrent depression, and repeated suicide attempts (15–17), and findings from several meta-analyses consistently link ACEs to enduring and debilitating psychiatric and physical health disorders (1, 18). It has been suggested that individuals who have experienced ACEs often view the world as unfair and to blame for their circumstances, resulting in reoccurring helplessness and hopelessness about life and relationships, including their ability to make a positive and meaningful impact. Indeed, retrospective studies with adults reveal that 50–60% of adults have a history of childhood abuse or neglect that has impacted their emotional development, their core assumptions about themselves and their worlds, and their functioning as adults (19, 20).

Children and PTSD

Research suggests that children and adolescents who experienced significant early interpersonal trauma often receive inaccurate or incomplete diagnoses later in life [thereby leading to various treatments for co-occurring psychiatric disorders that may not be effective; (21, 22)]. Scholars spanning a broad range of scientific disciplines have asserted that this is due to significant limitations in the DSM's PTSD classification system (23–28). Repeatedly traumatized children and adolescents share overlapping symptoms of PTSD; however, experiences of prolonged trauma during sensitive periods of development are more detrimental to children, given their age, limited cognitive capacities, and dependency on caregivers. A new conceptualization of trauma—specifically the construct of complex trauma—was developed for repeatedly traumatized children and adolescents who often have high comorbidities between trauma and other disorders, which are underestimated by PTSD diagnostic criteria (29–31).

From this perspective, the diagnosis of PTSD only accounts for a limited portion of the symptoms experienced by individuals who have experienced childhood trauma. These individuals often demonstrate broader and more severe health problems, social and economic adversity (including poverty and homelessness, psychiatric hospitalization, incarceration), and medical and psychiatric comorbidities as well as persistent negative views of themselves, others, and their life circumstances (32–34). In addition, they may re-enact their traumas through defensive (protective) expressions of anger and aggression (because they fear emotional vulnerability and experiencing additional traumas) and by coping with alcohol, drugs, and self-inflicted injuries to numb their emotional pain and suffering (35).

The differing presentations of trauma-related disorders that span a wide range of medical and psychological comorbidities frequently go unnoticed with classical PTSD diagnostic approaches, and, therefore, are often underreported and, in turn, untreated (36). Individuals who have experienced prolonged, repeated interpersonal traumas often present with overlapping symptoms of PTSD and a multiplicity of mental health conditions such as attention deficit hyperactive disorder (ADHD, including late-onset in adulthood), autism spectrum disorders (ASD, including social-communication disturbances), psychosis, and mood and personality disorders (37–42).

Complex post-traumatic stress disorder

The conceptualization of complex trauma emphasizes prolonged and unavoidable circumstances, regardless of one's age. Compared to those with PTSD, patients with complex PTSD (c-PTSD) consistently report cumulative traumas, including interpersonal violence exposure and sexual abuse (30, 43–50).

c-PTSD has been studied extensively in diverse samples, including racial and sexual minorities as well as human trafficking victims who have experienced repeated physical and sexual assault (51–54). Nevertheless, more studies of children with c-PTSD are needed [i.e., (55)].

Adolescents and adults who have experienced trauma and developed measurable mental health symptoms, as a result, may present with indications of c-PTSD that warrant careful diagnostic evaluation. As defined by ICD-11 criteria, the symptoms of c-PTSD are characterized by three PTSD symptom clusters: (1) persistent and intrusive thoughts, (2) hyperarousal (i.e., heightened startle in response to unexpected sounds or movements), and (3) deliberate avoidance of trauma reminders. c-PTSD is differentiated by a second higher-order measurement factor, characterized by disturbances in self-organization (DSO), which encompasses affective dysregulation, negative self-concept, and pervasive disturbances in relationships (56–58).

DSO is also highly prevalent in patients with borderline personality disorder [BPD; (59)]. More specifically, c-PTSD and BPD have overlapping symptoms of anxiety sensitivity, low psychological distress tolerance, dissociation, and relational problems originating from attachment insecurities and, in clinical contexts, parataxic distortions whereby patients re-enact interpersonal behaviors with healthcare providers that mirror past relationships (60–63). However, empirical findings suggest that BPD only accounts for a limited portion of the symptoms reported by individuals who have experienced childhood trauma and that characteristics of c-PTSD and BPD correlate with, and are distinct from, several other psychiatric disorders such as unipolar and bipolar depression, substance abuse, and functional neurological disorders [e.g., (59, 64–68)].

Developmental trauma: An overview

Developmental Trauma (DT) refers to the complex and pervasive exposure to life-threatening events that (1) occurs through sensitive periods of infant and child development, (2) disrupts interpersonal attachments, (3) compromises an individual's safety and security operations, (4) alters foundational capacities for cognitive, behavioral, and emotional control, and (5) often contributes to the development of complex PTSD in adulthood (69–74). DTD emerges from prolonged and cumulative interpersonal trauma that disrupts the development of secure attachments to caregivers and dramatically alters core assumptions and beliefs about one's vulnerability to danger in the world. DTD is theorized to develop from early interpersonal trauma. However, DTD may also result from the lack of a secure attachment relationship, which would have protected the developing individual during early trauma events. For example, a child who, within the context of a securely attached relationship with their caregiver, is exposed to abuse is likely to fare more positively than one who is exposed to the same abuse, yet lacks a secure attachment. The diagnosis of DTD was proposed for inclusion in the DSM-5 as an alternative to PTSD to better address the timing in which traumatic events occur (e.g., during sensitive periods of brain development) and the impacts on children's self-regulation skills and relational capacities (75). DTD attempts to provide this differentiation by underscoring experiences of pervasive, complex traumas that occurred early in life for children, and for adults whose physical, psychological, social and emotional disturbances originated from these experiences, which may be repeatedly interfering with their relationships, quality of life, self-identity, and life satisfaction.

DT has been postulated to result in symptoms that extend beyond those of PTSD and that often occur when traumatized children and adolescents are exposed to developmental trauma(s). These symptoms may complicate or, in some cases, account for the mental health problems that lead to the diagnosis of several childhood/adolescent psychiatric disorders. This has been confirmed in a number of large-scale field trials, cross-sectional and longitudinal investigations, and comparative studies spanning diverse psychiatric groups (24, 31, 76, 77). It has been suggested that DTD is set apart from PTSD in that the former is precipitated by toxic stress, referring to prolonged activation of the stress response system, particularly the hypothalamic-pituitary-adrenal (HPA) axis, in the absence of treatments and supportive peers and adults (78, 79). In addition, attachment disturbances associated with DTD originate at the *beginning* of an individual's lifespan development (e.g., parental neglect and abandonment, parents addicted to alcohol and drugs, separation from caregivers. By comparison, the causal events that lead to PTSD can occur at any point (or points) in one's life cycle.

Investigations of individuals with DTD suggest that developmental trauma is often characterized by (1) poor self-identity development, (2) interpersonal sensitivity and consistent problems in relationships, including with peers, adults, and primary caregivers, (3) high rates of exposure to family and community violence, (4) high rates of psychiatric comorbidities, and (5) chronic and debilitating medical/neurological illnesses (24, 28, 34, 36, 80–82). Indeed, several studies have confirmed high comorbidities between PTSD and other disorders including depression, anxiety and panic/agoraphobia, psychotic disorders, and functional medical syndromes that might warrant differentiated assessment procedures and treatments (83–85). Studies of children living in pervasively abusive and neglectful circumstances indicate that children with characteristics of DTD commonly (often exclusively) rely on behavioral inhibition and cognitive dissociation; these responses are mediated by conditioned fear and physiological hypoarousal [i.e., the freezing adaptation of the stress response system; (86)].

Numerous studies suggest that individuals with complex traumas and DTD tend to cope with their traumas by

deliberately evading reminders of the original trauma and by denying that such events occurred, including on self-report trauma symptom measures (87, 88), thereby conferring additive risks (i.e., dissociation and traumatic amnesia, undermining mental health needs). These traumatic stress adaptations, in turn, can contribute to experiences of emotional numbing and low frustration tolerance and precipitate behavioral outbursts that result in refractory (treatment-resistant) mood disturbances, long-term psychiatric hospitalizations (and re-hospitalizations), removal from school, and placement in foster care and juvenile justice treatment centers (89–93).

The DSM-5 indicates that the sequelae of "prolonged, repeated, and severe traumatic events (e.g., child abuse)" include symptoms that are consistent with DTD: "difficulties in regulating emotions or maintaining stable interpersonal relationships, or dissociative symptoms" (p. 276). However, there is vigorous debate regarding the viability of this alternative designation, given that the criteria for other specified trauma and stress-related disorders are broad, lack specificity, include interpersonal and non-interpersonal antecedents, and require that providers first consider alternative-mainstream taxonomies. For example, DTD must be differentiated from PTSD, reactive and disinhibited attachment disturbances, and borderline personality disorder, the latter of which is marked by pervasive mood instability, impaired self-identity, dissociation, and provocative and confrontational interpersonal behaviors [often at extremes of the idealization and devaluation continuum; (60, 66, 68, 94)]. As such, several different approaches are used to diagnose persons who have experienced early, recurring stressors and are displaying indications of developmental trauma disorder.

Developmental trauma: Diagnostic issues

Researchers have developed objective procedures to diagnose children with indications of DTD (e.g., standardized interviews and psychometric instruments specifically designed to assess for trauma-mediated interpersonal and attachment disturbances). The Developmental Trauma Disorder - Semi-structured Interview (DTD-SI) is one such tool. DTD expert consensus guidelines and psychometric studies on the validity and reliability of the DTD criteria and the DTD-SI suggest that three factors differentiate DTD from other psychiatric disorders, including PTSD (24, 28, 34, 95, 96). These factors include emotion and physiological dysregulation (e.g., alexithymia, sensitivity to touch, functional neurological disorders), cognitive processing and behavioral problems (e.g., traumatic re-enactments, self-mutilation, dissociation, impaired attention, learning, memory), and poor self-other awareness (characterized by low self-esteem and self-hatred, insecure attachment, experiences of interpersonal betrayal and persistent states of anger, resentment, and revenge).

PTSD preschool adaptation

Another approach to diagnosing children with trauma, especially for those who fail to meet the criteria for PTSD, is to revise the requirements of the DSM so that it is more developmentally sensitive to children. The American Psychiatric Association conferred a preschool subtype PTSD diagnosis for children between the ages of 0–6, as an alternative to the standard PTSD classification that originated from work with adults (3). The alternative set of criteria used for the preschool subtype PTSD includes several changes to the standard DSM PTSD criteria, ranging from adjustments to clinical thresholds (e.g., lowered from three to one avoidance symptom) to the removal of items deemed inappropriate for children (e.g., expression of immediate distress following the trauma; nightmares that necessarily include traumatic content; a sense of a foreshortened future, which requires complex cognitive skills). DSM-5 criteria for the preschool PTSD subtype require that the "duration of the disturbance [referring to trauma symptoms] is more than 1 month" (3, p. 273). The DSM preschool subtype is also more developmentally sensitive to children in that it emphasizes symptoms of trauma that are unique to younger individuals (e.g., traumatic reenactments in interactions with peers during playtime) and focuses more on trauma that is particularly relevant for children, such as harm to the wellbeing of caregivers or disruptions to the quality of the parent-child relationship (e.g., having a caregiver who is medically ill and unable to care for the child, foster care placement, loss of a primary caregiver). These revised criteria were designed with both assessment and treatment in mind, underscoring the recognition that symptoms of PTSD may naturally present themselves in children's play behaviors and not necessarily in their verbal responses to the myriad of questions posed by assessors in standard clinical interviews. This revised DSM-5 taxonomy conceptualizes children with trauma as a single (or homogenous) group. In other words, it implies that children with trauma differ from adults with trauma and, at the same time, that they reliably differ from children who have not experienced trauma (or do not present with clinical symptoms as a result of trauma). Studies suggest that providers can identify and treat traumatized children more effectively using this revised classification (97–99).

The development of DTD: Bronfenbrenner's multiple levels of analysis framework

As a multifactorial neurobehavioral disturbance, developmental trauma causes significant alterations to children's

cognitive, emotional, physiological, and relational capacities, and as a result, they experience widespread disruptions to their academic, social, and occupational functioning (100–102). At the same time, mental health disturbances linked to the development of trauma are mediated and/or moderated by a broad range of factors, all of which have the potential to mitigate the longitudinal course of developmental trauma, associated psychiatric comorbidities, and functional impairments. This notion is supported by Bronfenbrenner's Socio-Ecological Model [SEM; (103)], which asserts that multiple levels of influence, specifically individual, interpersonal, organizational, community, and public policies, are needed to understand the diverse range of adaptations associated with interpersonal trauma, in that they can confer additive risks or, conversely, potentiate positive and resilient transformations in response to adverse childhood experiences.

The physiological, attachment, and meta-cognitive disturbances seen in traumatized children intersect at multiple levels of Bronfenbrenner's model. More specifically, children and adolescents who have experienced severe trauma and ACEs experience high rates of poverty, legal problems, and violence exposure (89, 104–106). Abusive parents often have experienced their own traumas and attachment disturbances (107–109), which are often compounded by high rates of substance abuse, depression, financial stress, and unemployment (12, 110–113). Racial, ethnic, sexual, and neurodiverse minorities are affected by developmental trauma at very high rates (114, 115), suggesting that systemic factors such as state and national policies, allocation of resources for prevention and intervention, discrimination, and stigma exert influence over, and significantly impact responses to, trauma and recovery.

Children with trauma live in persistent states of fear and terror, and recurring traumas become transformative developmental experiences that alter their global appraisals and future responses to stress (14, 49, 61, 116). This heightened fear propensity disrupts self-awareness, information processing, interpersonal communication, and mastery of age-appropriate developmental competencies [e.g., establishing healthy relationship parameters, identifying and expressing feelings appropriately, and tolerating ambiguity; (43, 90)] and causes individuals to have problems learning, making friends at school, and appreciating their strengths and unique abilities, which are often overshadowed by their social and behavioral difficulties.

Researchers have described several adverse physiological alterations underlying cognitive disturbances in children who have experienced early traumas (13, 117–124). These include, for example, stress-mediated changes to the organization and functioning of the amygdala, hippocampus, and prefrontal cortex, which exert influence over fear processing, including automatic (impulsive) behavioral responses to perceived threats (125–130), learning and memory [fear memories override attention, concentration, and, in turn, inhibit learning of new information; (72, 131, 132)], and higher-order (complex) cognitive operations [e.g., problem-solving and learning from experience, stress appraisal and reappraisal, perceived controllability; (133–135)]. As an illustration of this, reinforcement and contingency learning studies indicate that children who had experienced severe adversity or developmental trauma are not able to adjust their behavior effectively to shifting environments or demands, regardless of threatening and non-threatening circumstances (136, 137). These findings suggest that individuals who have endured significant stress in their lives, especially during early childhood or adolescence, are at increased risk of experiencing avoidance, anger, frustration, and anxiety as primary ways of being in the world, regardless of their circumstances (138–140). These types of responses can be damaging to an individual's development and ability to function, particularly if their safety needs are undermined. Repeatedly traumatized children and adolescents become habituated to evaluating their surroundings for indications of threat that might render them vulnerable to additional traumas, given that they had limited opportunities to recover from the early and repeated abuse and neglect.

Researchers speculate that the mechanisms involved in the development of traumatic stress adaptations correlate with diverse, interrelated psychiatric symptoms and comorbidities often reported in studies of individuals who have experienced repeated abuse and neglect. This notion is consistent with a socio-ecological framework, the developmental trauma diagnosis, and trans-theoretical models that focus on far-reaching (cross-diagnostic) effects from critical and sensitive periods, attachment and social cognition (e.g., mentalizing and perspective taking), sleep, physiological stress, systemic inflammation, and mood and personality (141–143).

The role of attachment

Prolonged and cumulative interpersonal trauma disrupts the development of secure attachments to caregivers. According to attachment theorists, securely attached infants seek proximity to their caregivers to minimize anxiety and to form goal-directed partnerships, and/or interactional synchrony, where they mirror each other's communication patterns and learn to anticipate, express, and meet each other's needs. Through these interactions, children develop internal working models, which encompass individuals' core beliefs about their self-worth and lovability as well as their general expectations of others in relationships (144). Insecure attachment styles (e.g., anxious, avoidant, and disorganized) are frequently associated with interpersonal trauma (145–147). Studies have consistently linked attachment disturbances to the emergence (and maintenance) of developmental trauma symptoms, which may remain latent until interpersonal interactions later in life (e.g., peer conflicts, inadequate institutional responses to

trauma, workplace challenges) give rise to memories of early trauma (148). The combination of repeated childhood trauma and the absence of parental nurturing, support, and protection (e.g., parents who are addicted to alcohol and/or drugs, are homeless, or are living in severe poverty; family violence; parental incarceration) can be particularly devastating and can potentiate DT (34, 145, 149, 150).

Social cognition

Cognitive science researchers have expanded upon attachment concepts to include the construct of mentalizing, which is defined as the capacity to consider the mental states of others (e.g., inferring their needs, goals, interests, and intersubjective experiences) as distinct from one's own. Mentalizing has been described in the literature as reflective functioning, theory of mind, metacognition, insight, and perspective-taking (151). Mentalizing deficits have been reported in several clinical populations, including individuals diagnosed with borderline personality disorder, schizophrenia, autism, and more recently, developmental traumas (152–155).

Children and adolescents with DT demonstrate impaired mentalizing (i.e., reflecting functioning), referring to the capacity to effectively understand oneself (needs, strengths, and limitations) and others (e.g., that others may have worldviews that differ from one's own). Early interpersonal trauma and insecure attachment correlate with low reflective functioning (154, 156–158).

Scholars have surmised that these children are likely dissociating (and therefore undermining their intra/interpersonal awareness), fearful and anxious, and preoccupied with maintaining compulsive and highly ritualistic behaviors (41, 159). For example, in response to sexual trauma, victims often report experiencing contamination anxiety such as body shame and disgust and overwhelming fear, that being near others will result in contact contamination (160–162). These individuals, in turn, engage in social avoidance, excessive cleansing, handwashing, and relentless reassurance-seeking to make sure they don't increase the likelihood of illness or misfortune in others.

Executive functions and self-regulation capacities

Executive functions refer to diverse cognitive abilities including working memory, mental flexibility, and information processing that regulate attention, mood, and behavior; enable adaptive, goal-focused actions; and are instrumental to effective coping, problem solving, and success in school, work, and relationships (163). Traumatic stress is known to cause measurable adverse effects on executive functions (121, 134, 164). For example, recent studies, including several meta-analyses, have found that trauma negatively correlates with working memory, inhibition, and mental flexibility; the adverse effects are often higher for children exposed to multiple traumas compared to those reporting isolated events (93, 165, 166). These executive functioning challenges often result in significant shifts in mood and energy that interfere with concentration, decision-making, and social-interpersonal functioning. Children and adolescents with symptoms consistent with DTD whose symptoms include reckless, disinhibited, and destructive behaviors are likely to have multiple and intersecting psychiatric disturbances, such as conduct disorder and antisocial personality traits, which are known to predict high incarceration rates and recidivism. In turn, these children may grow up feeling stigmatized, unprotected, and personally flawed, which further perpetuates their depression, anger, low self-esteem, and existential despair as well as their increased risk of learning disorders, vocational problems, and criminal records (12, 13, 167, 168).

Clinical assessment

Patients with DT present with signs of mood disturbances (e.g., poor frustration tolerance, emotional numbing, anger, rage), behavior disturbances (e.g., inflexible routines, self-injurious behaviors, impulsivity), and cognitive disturbances (e.g., inattention, disorganized thinking, poor problem solving), as well as sensory processing problems such as sensitivity to sound and touch as well as limited time and body awareness (169, 170). They often show signs of a heightened startle reflex, dissociation, fear, and anxiety and are often unable to be soothed by others (171–173). For example, studies of children who have experienced trauma and polyvictimization suggest that these children display greater physiological reactivity to threats such as traumatic reminders than children who have not experienced trauma (174–177).

Clinical signs and symptoms of DTD

Children and adolescents with DTD may react with either over-modulated or under-modulated behaviors. Over-modulated children appear hyperactive and aggressive, whereas under-modulated children appear depressed, withdrawn, and possibly dissociative. Children and adolescents with DTD may be highly reactive to their environment (e.g., hypersensitive to sounds, touch, lights) or appear to be relatively indifferent to their immediate surroundings (80, 178). They may react to perceived threats with avoidance, tantrums, or anger, especially when they feel emotionally vulnerable or disempowered.

When children or adolescents with symptoms consistent with DTD appear distractible, impulsive, and/or highly

aggressive, these children are likely to be classified with ADHD (hyperactive and impulsive or combined subtype), conduct disorder, bipolar disorder, and/or oppositional defiant disorder (179–182). These individuals may indeed meet diagnostic criteria for several of these psychiatric disorders, however, they may be secondary to DTD, and, as such, require different clinical evaluation and treatment approaches.

On the other hand, individuals with DTD who are anxious, withdrawn, dissociative, and rigid (adhering to strict behavioral routines) are more likely to be diagnosed (and sometimes misdiagnosed) with neurodevelopmental conditions such as autism spectrum disorders (ASD) because trauma symptoms such as emotional numbing, difficulty socializing with others, obsessive-compulsive behaviors, poor mentalizing (perspective taking), and poor verbal expression mirror characteristics of children with ASD (39, 41). Likewise, studies suggest that, when controlling for comorbid PTSD, individuals with DTD have higher rates of ADHD, social and separation anxiety disorders, panic disorders, severe mood and behavior disturbances, depression, and suicide (28, 183).

Children and adolescents with indications of DTD, such as those with multiple ACEs (i.e., polyvictimization), are more likely to display suicidal behaviors and make suicide attempts than individuals without early interpersonal traumas (16). Likewise, these children may have higher rates of school absenteeism and learning disorders due to DTD (184, 185). Children with DTD are affected across cognitive (e.g., learning, attention, and information processing), physiological (e.g., fight-or-flight, susceptibility to infections including from common colds and flu), emotional (e.g., depression and suicide, anger), and behavioral domains that span the continuum of internalizing and externalizing disturbances. Behavioral displays (or traumatic reenactments) that signal fear, emotional dysregulation, and vulnerability interfere with children's academic achievement, self-efficacy, and classroom behaviors.

When individuals with DTD move into young adulthood, they may struggle to manage independently and experience difficulty adjusting to new settings. If they attend college or university, they may find it hard to self-regulate and map out the steps needed to complete assignments and tasks successfully. They may question the value of education, learning, or effort, given persistent feelings of sadness, hopelessness, and existential despair. Some may drop out of school, experience inconsistent employment, or hold employment positions that are not satisfying (167, 186), likely because their vocational identity development was interrupted by chronic depression and anxiety (16, 187, 188) resulting from reoccurring abuse and neglect. Their lack of confidence and low self-esteem, along with high rates of addiction (189–191), can also lead to further increased anxiety, anger and hostility, and job instability (192, 193). They may feel worried about re-traumatization or being stigmatized because of their challenges. As a result, some will choose not to disclose personal information to others who might help them, believing that the vulnerability could put them at a disadvantage for recruitment or advancement.

Clinicians and care supporters working with individuals who have experienced significant childhood trauma should be aware that DTD symptoms differ depending on the specific traumas experienced, the characteristics of the individuals involved, and the level of discordance between the individuals and their environments. Symptoms will also vary depending on each individual's degree of environmental support, perceived controllability of the stressful events, access to socioeconomic resources, and effective evaluations and treatments (194). Medical problems and somatic complaints may actually be the result of childhood trauma and a sign of DTD. In fact, a number of chronic, non-specific, or unexplained medical illnesses are associated with DTD (13, 56). In addition, lowered immunity, cardiac symptoms, and neurological disorders such as migraines and chronic fatigue are also signs to look for in patients who could potentially have DTD (195).

Clinicians working with early trauma survivors should also consider relational patterns corresponding to substantive behavioral changes, particularly personality disturbances. Individuals exposed to severe abuse, neglect, and violence may go on to develop long-lasting negative schemas about themselves and the world, including deep feelings of inferiority, fear, self-hatred, and distrust, all of which can give rise to maladaptive personality styles and, in some cases, clinically significant characterological disturbances (196). As adults, individuals with DTD may develop a broad range of personality and emotional disorders (60, 68, 197), which are associated with high rates of emergency room visits and inpatient hospitalizations (17, 198).

Treatment

Empirically validated treatments for children and adolescents with DTD are limited in scope. However, there is growing evidence for integrative treatment approaches and relationally focused interventions as effective treatments for DTD [e.g., (4, 199)]. Two such approaches include the Attachment, Regulation, and Competency (ARC) model and dyadic-developmental psychotherapy, which include individual and family counseling sessions designed to enhance interpersonal communication, attachment security, and emotion regulation, and co-regulation between the parent and child; (200, 201).

Concerning adolescents and adults with trauma, findings from recent systematic investigations and meta-analyses (202–204) suggest that a combination of psychotherapy (e.g., Trauma-Focused Cognitive Behavior Therapy) and antidepressant medication (205) are beneficial. However, more studies are needed as treatment effects were heterogeneous. Likewise, more studies are required to establish the long-term efficacy

and risk-to-benefit tradeoff for the use of antipsychotic agents (risperidone, quetiapine), especially for children and adolescents, as well as anticonvulsant drugs (206), which are limited in use due to their side effects.

Conclusions and future directions

While developmental trauma is commonly linked to PTSD, the DTD diagnosis captures a more chronic and pervasive form of trauma represented by a constellation of complex and interacting cognitive, emotional, and behavioral symptoms beyond that of PTSD alone. Several studies suggest that children, adolescents, and adults with DTD display a broad range of mental health symptom profiles [e.g., (30, 31, 178, 207, 208)]. These individuals demonstrate significant problems in many areas of their lives, but without accurate assessment, advocacy, and treatment, they may live in mental anguish, vacillating between self-injury, suicidal and antisocial behaviors, and a significant inability to cope with reality and enhance their strengths and resiliencies. The DTD diagnosis offers clinicians the opportunity to more comprehensively account for the multitude of what might otherwise be viewed as divergent symptoms and discrete mental health disorders.

The DTD diagnosis offers an all-encompassing conceptualization, within a single diagnostic, developmental syndrome, of the many different symptoms that may be experienced as a result of early trauma. The diagnosis may help limit the over-pathologizing of these individuals (i.e., they would receive a single diagnosis to capture their broad array of symptoms as opposed to three or more disparate diagnoses). More importantly, utilization of the DTD framework may increase the likelihood of more accurate assessment; appropriate symptom management; well-aligned, effective treatments; and better short- and long-term outcomes. Recognition of complex trauma may provide insights that could enhance the evaluation, treatment, and prognosis for these individuals and, at the same time, build or enhance their strengths (which are likely to be undermined if a positive psychology framework does not balance a traditional, deficit-driven approach). Application of the DTD diagnosis may help decrease inappropriate and inadequate treatment approaches by using multi-system and multidisciplinary approaches when working with individuals who have suffered repeated and severe early abuse.

Consistent with Bronfenbrenner's theoretical model, an appreciation of the pervasiveness and range of opportunities to reverse the adverse effects of DTD would allow for additional, coordinated efforts among educational, legal, medical, and political leaders and stakeholders. This type of understanding will be required for substantive change to occur for individuals diagnosed with this disorder. At the organizational level, systems must promote formal policies that acknowledge, respect, and de-stigmatize DTD. According to the Substance Abuse and Mental Health Services Administration's Trauma-Informed Approach, this can be accomplished by engendering principles of neurodiversity, implementing social justice frameworks, and acknowledging the multiplicity of trauma associated with various minority statuses (209). Recommended system-wide policies and procedures include enhanced and coordinated evaluation protocols, formal response training, long-term care initiatives, and community engagement aimed at recognizing, supporting, and treating those with DTD (210–212).

In sum, research studies have established that developmental trauma confers significant risks to the health and wellbeing of those who have experienced early, repeated interpersonal traumas. Disturbances in attachment, emotion regulation, self-perception, and worldview assumptions are precipitated by trauma and cause a broad range of correlated psychological and medical disorders. Future studies are needed to reconcile several outstanding questions related to ACEs. For example, psychometric investigations of individuals who have experienced ACEs raise the possibility that additional typologies may be present [e.g., borderline personality and resilient subgroupings; (66, 213)]. Another avenue for research concerns the possibility that complex trauma is correlated with multiple sensitive periods, particularly for individuals who have been subjected to prolonged violence exposure. Lastly, although ACEs have been widely studied and consistently predict traumatic responses in adults, the construct encompasses a broad range of adversities, such as parent divorce, sexual assault, and neglect, which may confer different traumatic adaptations.

Author contributions

DC was responsible for the conceptualization, organization, and final draft of the manuscript. All authors contributed to the literature review, writing of the manuscript, project management, and approved the final manuscript.

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Publisher's note

References

1. Hughes K, Bellis MA, Hardcastle KA, Sethi D, Butchart A, Mikton C, et al. The effect of multiple adverse childhood experiences on health: a systematic review and meta-analysis. *Lancet Public Health.* (2017) 2:e356–66. doi: 10.1016/S2468-2667(17)30118-4

2. Liming KW, Grube WA. Wellbeing outcomes for children exposed to multiple adverse experiences in early childhood: A systematic review. *Child Adolesc Soc Work J.* (2018) 35:317–35. doi: 10.1007/s10560-018-0532-x

3. American Psychiatric Association. *Diagnostic and Statistical Manual of Mental Disorders.* (2013). APA. doi: 10.1176/appi.books.9780890425596

4. Ford JD. Polyvictimization and developmental trauma in childhood. *Eur J Psychotraumatol.* (2021) 12:1866394. doi: 10.1080/20008198.2020.1866394

5. Ford JD. Why we need a developmentally appropriate trauma diagnosis for children: a 10-year update on developmental trauma disorder. *J Child Adolesc Trauma.* (2021) 2021:1–16. doi: 10.1007/s40653-021-00415-4

6. Haahr-Pedersen I, Ershadi AE, Hyland P, Hansen M, Perera C, Sheaf G, et al. Polyvictimization and psychopathology among children and adolescents: A systematic review of studies using the Juvenile Victimization Questionnaire. *Child Abuse Negl.* (2020) 107:104589. doi: 10.1016/j.chiabu.2020.104589

7. Lee N, Pigott TD, Watson A, Reuben K, O'Hara K, Massetti G, et al. Childhood polyvictimization and associated health outcomes: A systematic scoping review. *Trauma Violence Abuse.* (2022) 2022:15248380211073847. doi: 10.1177/15248380211073847

8. Wojciechowski TW. Early life poly-victimization and differential development of anxiety as risk factors for the continuity of substance dependence in adulthood. *Subst Use Misuse.* (2020) 55:1347–55. doi: 10.1080/10826084.2020.1741637

9. Hunt TKA, Slack KS, Berger LM. Adverse childhood experiences and behavioral problems in middle childhood. *Child Abuse Negl.* (2017) 67:391–402. doi: 10.1016/j.chiabu.2016.11.005

10. Le MTH, Holton S, Romero L, Fisher J. Polyvictimization among children and adolescents in low- and lower-middle-income countries: A systematic review and meta-analysis. *Trauma Violence Abuse.* (2018) 19:323–42. doi: 10.1177/1524838016659489

11. Scott JC, Matt GE, Wrocklage KM, Crnich C, Jordan J, Southwick SM, et al. A quantitative meta-analysis of neurocognitive functioning in posttraumatic stress disorder. *Psychol Bull.* (2015) 141:105–40. doi: 10.1037/a0038039

12. Copeland WE, Shanahan L, Hinesley J, Chan RF, Aberg KA, Fairbank JA, et al. Association of childhood trauma exposure with adult psychiatric disorders and functional outcomes. *JAMA Network Open.* (2018) 1:e184493. doi: 10.1001/jamanetworkopen.2018.4493

13. Herzog JI, Schmahl C. Adverse childhood experiences and the consequences on neurobiological, psychosocial, and somatic conditions across the lifespan. *Front Psychiatry.* (2018) 9:420. doi: 10.3389/fpsyt.2018.00420

14. VanMeter F, Handley ED, Cicchetti D. The role of coping strategies in the pathway between child maltreatment and internalizing and externalizing behaviors. *Child Abuse Negl.* (2020) 101:104323. doi: 10.1016/j.chiabu.2019.104323

15. Chang X, Jiang X, Mkandarwire T, Shen M. Associations between adverse childhood experiences and health outcomes in adults aged 18–59 years. *PLoS One.* (2019) 14:e0211850. doi: 10.1371/journal.pone.0211850

16. Choi NG, DiNitto DM, Marti CN, Segal SP. Adverse childhood experiences and suicide attempts among those with mental and substance use disorders. *Child Abuse Negl.* (2017) 69:252–62. doi: 10.1016/j.chiabu.2017.04.024

17. Gloger S, Martínez P, Behn A, Chacón MV, Cottin M, Diez de Medina D, et al. Population-attributable risk of adverse childhood experiences for high suicide risk, psychiatric admissions, recurrent depression in depressed outpatients. *Eur J Psychotraumatol.* (2021) 12:1874600. doi: 10.1080/20008198.2021.1874600

18. Petruccelli K, Davis J, Berman T. Adverse childhood experiences and associated health outcomes: A systematic review and meta-analysis. *Child Abuse Negl.* (2019) 97:104127. doi: 10.1016/j.chiabu.2019.104127

19. Merrick MT, Ford DC, Ports KA, Guinn AS. Prevalence of adverse childhood experiences from the 2011-2014 behavioral risk factor surveillance system in 23 states. *JAMA Pediatr.* (2018) 172:1038–44. doi: 10.1001/jamapediatrics.2018.2537

20. Sacks V, Murphey D. The prevalence of adverse childhood experiences, nationally, by state, and by race or ethnicity. *Child Trends.* (2018). Available online at: https://www.childtrends.org/publications/prevalence-adverse-childhood-experiences-nationally-state-race-ethnicity

21. Choi KR, Ford JD, Briggs EC, Munro-Kramer ML, Graham-Bermann SA, Seng JS. Relationships between maltreatment, posttraumatic symptomatology, and the dissociative subtype of PTSD among adolescents. *J Trauma Dissoc.* (2019) 20:212–27. doi: 10.1080/15299732.2019.1572043

22. Cogan CM, Paquet CB, Lee JY, Miller KE, Crowley MD, Davis JL. Differentiating the symptoms of posttraumatic stress disorder and bipolar disorders in adults: Utilizing a trauma-informed assessment approach. *Clin Psychol Psychother.* (2021) 28:251–60. doi: 10.1002/cpp.2504

23. D'Andrea W, Ford J, Stolbach B, Spinazzola J, van der Kolk BA. Understanding interpersonal trauma in children: why we need a developmentally appropriate trauma diagnosis. *Am J Orthopsychiatry.* (2012) 82:187–200. doi: 10.1111/j.1939-0025.2012.01154.x

24. Ford JD, Spinazzola J, van der Kolk B, Grasso DJ. Toward an empirically based developmental trauma disorder diagnosis for children: Factor structure, item characteristics, reliability, and validity of the developmental trauma disorder semi-structured interview. *J Clin Psychiatry.* (2018) 79:17m11675. doi: 10.4088/JCP.17m11675

25. Greene T. Blame, PTSD and DSM-5: an urgent need for clarification. *Eur J Psychotraumatol.* (2018) 9:1468709. doi: 10.1080/20008198.2018.1468709

26. Morelli NM, Villodas MT. A systematic review of the validity, reliability, and clinical utility of Developmental Trauma Disorder (DTD) symptom criteria. *Clin Child Family Psychol Rev.* (2021) 25:376–94. doi: 10.1007/s10567-021-00374-0

27. Stover CS, Keeshin B. Research domain criteria and the study of trauma in children: Implications for assessment and treatment research. *Clin Psychol Rev.* (2018) 64:77–86. doi: 10.1016/j.cpr.2016.11.002

28. van der Kolk B, Ford JD, Spinazzola J. Comorbidity of developmental trauma disorder (DTD) and post-traumatic stress disorder: Findings from the DTD field trial. *Eur J Psychotraumatol.* (2019) 10:1562841. doi: 10.1080/20008198.2018.1562841

29. Herman JL. Complex PTSD: A syndrome in survivors of prolonged and repeated trauma. *J Trauma Stress.* (1992) 5:377–91. doi: 10.1002/jts.2490050305

30. Hyland P, Murphy J, Shevlin M, Vallières F, McElroy E, Elklit A, et al. Variation in post-traumatic response: the role of trauma type in predicting ICD-11 PTSD and CPTSD symptoms. *Soc Psychiatry Psychiatr Epidemiol.* (2017) 52:727–36. doi: 10.1007/s00127-017-1350-8

31. DePierro J, D'Andrea W, Spinazzola J, Stafford E, van Der Kolk B, Saxe G, et al. Beyond PTSD: Client presentations of developmental trauma disorder from a national survey of clinicians. *Psychol Trauma.* (2019). doi: 10.1037/tra0000532

32. Grusnick JM, Garacci E, Eiler C, Williams JS, Egede LE. The association between adverse childhood experiences and personality, emotions and affect: Does number and type of experiences matter? *J Res Pers.* (2020) 85:103908. doi: 10.1016/j.jrp.2019.103908

33. Simon N, Roberts NP, Lewis CE, van Gelderen MJ, Bisson JI. Associations between perceived social support, posttraumatic stress disorder (PTSD) and complex PTSD (CPTSD): Implications for treatment. *Eur J Psychotraumatol.* (2019) 10:1573129. doi: 10.1080/20008198.2019.1573129

34. Spinazzola J, van der Kolk B, Ford JD. When nowhere is safe: Interpersonal trauma and attachment adversity as antecedents of posttraumatic stress disorder and developmental trauma disorder. *J Trauma Stress.* (2018) 31:631–642. doi: 10.1002/jts.22320

35. Carliner H, Keyes KM, McLaughlin KA, Meyers JL, Dunn EC, Martins SS. Childhood trauma and illicit drug use in adolescence: A population-based national comorbidity survey replication-adolescent supplement study. *J Am Acad Child Adolesc Psychiatry.* (2016) 55:701–8. doi: 10.1016/j.jaac.2016.05.010

36. Ford JD. Complex trauma and developmental trauma disorder in adolescence. *Adolesc Psychiatry.* (2017) 7:220–35. doi: 10.2174/2210676608666180112160419

37. Bernhard A, Martinelli A, Ackermann K, Saure D, Freitag CM. Association of trauma, posttraumatic stress disorder and conduct disorder: A systematic review and meta-analysis. *Neurosci Biobehav Rev.* (2018) 91:153–69. doi: 10.1016/j.neubiorev.2016.12.019

38. Craig SG, Bondi BC, O'Donnell KA, Pepler DJ, Weiss MD. ADHD and exposure to maltreatment in children and youth: A systematic review of the past 10 years. *Curr Psychiatry Rep.* (2020) 22:79. doi: 10.1007/s11920-020-01193-w

39. Dodds RL. An exploratory review of the associations between adverse experiences and autism. *J Aggression Maltreatment Trauma.* (2020) 30:1093–112. doi: 10.1080/10926771.2020.1783736

40. Grattan RE, Lara N, Botello RM, Tryon VL, Maguire AM, Carter CS, et al. A History of trauma is associated with aggression, depression, non-suicidal

self-injury behavior, and suicide ideation in first-episode psychosis. *J Clin Med.* (2019) 8:1082. doi: 10.3390/jcm8071082

41. Haruvi-Lamdan N, Horesh D, Golan O. PTSD and autism spectrum disorder: Co-morbidity, gaps in research, and potential shared mechanisms. *Psychol Trauma.* (2018) 10:290–9. doi: 10.1037/tra0000298

42. Oakley C, Harris S, Fahy T, Murphy D, Picchioni M. Childhood adversity and conduct disorder: A developmental pathway to violence in schizophrenia. *Schizophr Res.* (2016) 172:54–9. doi: 10.1016/j.schres.2016.01.047

43. Beal SJ, Wingrove T, Mara CA, Lutz N, Noll JG, Greiner MV. Childhood adversity and associated psychosocial function in adolescents with complex trauma. *Child Youth Care Forum.* (2019) 48:305–22. doi: 10.1007/s10566-018-9479-5

44. Dokkedahl S, Kristensen TR, Murphy S, Ask E. The complex trauma of psychological violence: cross-sectional findings from a Cohort of four Danish Women Shelters. *Eur J Psychotraumatol.* (2021) 12:1863580. doi: 10.1080/20008198.2020.1863580

45. Elliott R, McKinnon A, Dixon C, Boyle A, Murphy F, Dahm T, et al. Prevalence and predictive value of ICD-11 post-traumatic stress disorder and Complex PTSD diagnoses in children and adolescents exposed to a single-event trauma. *J Child Psychol Psychiatry.* (2021) 62:270–6. doi: 10.1111/jcpp.13240

46. Haselgruber A, Sölva K, Lueger-Schuster B. Symptom structure of ICD-11 Complex Posttraumatic Stress Disorder (CPTSD) in trauma-exposed foster children: examining the International Trauma Questionnaire - Child and Adolescent Version (ITQ-CA). *Eur J Psychotraumatol.* (2020) 11:1818974. doi: 10.1080/20008198.2020.1818974

47. Haselgruber A, Sölva K, Lueger-Schuster B. Validation of ICD-11 PTSD and complex PTSD in foster children using the international trauma questionnaire. *Acta Psychiatr Scand.* (2020) 141:60–73. doi: 10.1111/acps.13100

48. Haselgruber A, Knefel M, Sölva K, Lueger-Schuster B. Foster children's complex psychopathology in the context of cumulative childhood trauma: The interplay of ICD-11 complex PTSD dissociation, depression, emotion regulation. *J Affect Disord.* (2021) 282:372–80. doi: 10.1016/j.jad.2020.12.116

49. Wamser-Nanney R, Campbell CL. Children's coping following sexual abuse: The roles of abuse characteristics, abuse stress, maternal support. *J Child Fam Stud.* (2020) 29:514–25. doi: 10.1007/s10826-019-01540-3

50. Wong CF, Clark LF, Marlotte L. The impact of specific and complex trauma on the mental health of homeless youth. *J Interpers Violence.* (2016) 31:831–54. doi: 10.1177/0886260514556770

51. Ben-Ezra M, Karatzias T, Hyland P, Brewin CR, Cloitre M, Bisson JI, et al. Posttraumatic stress disorder (PTSD) and complex PTSD (CPTSD) as per ICD-11 proposals: A population study in Israel. *Depress Anxiety.* (2018) 35:264–74. doi: 10.1002/da.22723

52. Facer-Irwin E, Karatzias T, Bird A, Blackwood N, MacManus D. PTSD and complex PTSD in sentenced male prisoners in the UK: prevalence, trauma antecedents, psychiatric comorbidities. *Psychol Med.* (2021) 2021:1–11. doi: 10.1017/S0033291720004936

53. Moore JL, Houck C, Hirway P, Barron CE, Goldberg AP. Trafficking experiences and psychosocial features of domestic minor sex trafficking victims. *J Interpers Violence.* (2020) 35:3148–63. doi: 10.1177/0886260517703373

54. Wamser-Nanney R, Cherry KE, Campbell C, Trombetta E. Racial differences in children's trauma symptoms following complex trauma exposure. *J Interpers Violence.* (2021) 36:2498–520. doi: 10.1177/0886260518760019

55. Cloitre M, Brewin CR, Kazlauskas E, Lueger-Schuster B, Karatzias T, Hyland P, et al. Commentary: The need for research on PTSD in children adolescents—A commentary on Elliot et al. (2020). *J Child Psychol Psychiatry.* (2021) 62:277–9. doi: 10.1111/jcpp.13361

56. Kuhar M, Zager Kocjan G. Adverse childhood experiences and somatic symptoms in adulthood: A moderated mediation effects of disturbed self-organization and resilient coping. *Psychol Trauma.* (2021). doi: 10.1037/tra0001040

57. Shevlin M, Hyland P, Roberts NP, Bisson JI, Brewin CR, Cloitre M. A psychometric assessment of Disturbances in Self-Organization symptom indicators for ICD-11 Complex PTSD using the International Trauma Questionnaire. *Eur J Psychotraumatol.* (2018) 9:1419749. doi: 10.1080/20008198.2017.1419749

58. Villalta L, Khadr S, Chua KC, Kramer T, Clarke V, Viner RM, et al. Complex post-traumatic stress symptoms in female adolescents: the role of emotion dysregulation in impairment and trauma exposure after an acute sexual assault. *Eur J Psychotraumatol.* (2020) 11:1710400. doi: 10.1080/20008198.2019.1710400

59. Hyland P, Karatzias T, Shevlin M, Cloitre M. Examining the discriminant validity of complex posttraumatic stress disorder and borderline personality disorder symptoms: Results from a United Kingdom population sample. *J Trauma Stress.* (2019) 32:855–63. doi: 10.1002/jts.22444

60. Ehrenthal JC, Levy KN, Scott LN, Granger DA. Attachment-related regulatory processes moderate the impact of adverse childhood experiences on stress reaction in borderline personality disorder. *J Pers Disord.* (2018) 32:93–114. doi: 10.1521/pedi.2018.32.supp.93

61. Karatzias T, Jowett S, Begley A, Deas S. Early maladaptive schemas in adult survivors of interpersonal trauma: Foundations for a cognitive theory of psychopathology. *Eur J Psychotraumatol.* (2016) 7:30713. doi: 10.3402/ejpt.v7.30713

62. Niemantsverdriet M, Slotema CW, Blom JD, Franken IH, Hoek HW, Sommer I, et al. Hallucinations in borderline personality disorder: Prevalence, characteristics and associations with comorbid symptoms and disorders. *Sci Rep.* (2017) 7:13920. doi: 10.1038/s41598-017-13108-6

63. Wilde JL, Dozois DJA. A dyadic partner-schema model of relationship distress and depression: Conceptual integration of interpersonal theory and cognitive-behavioral models. *Clin Psychol Rev.* (2019) 70:13–25. doi: 10.1016/j.cpr.2019.03.003

64. Ford JD, Courtois CA. Complex PTSD and borderline personality disorder. *Borderline Personality Disord Emotion Dysregul.* (2021) 8:16. doi: 10.1186/s40479-021-00155-9

65. Gekker M, Coutinho E, Berger W, Luz M, Araújo A, Pagotto L, et al. Early scars are forever: Childhood abuse in patients with adult-onset PTSD is associated with increased prevalence and severity of psychiatric comorbidity. *Psychiatry Res.* (2018) 267:1–6. doi: 10.1016/j.psychres.2018.05.042

66. Jowett S, Karatzias T, Shevlin M, Albert I. Differentiating symptom profiles of ICD-11 PTSD complex PTSD, and borderline personality disorder: A latent class analysis in a multiply traumatized sample. *Personal Disord.* (2020) 11:36–45. doi: 10.1037/per0000346

67. Karatzias T, Hyland P, Bradley A, Cloitre M, Roberts NP, Bisson JI, et al. Risk factors and comorbidity of ICD-11 PTSD and complex PTSD: Findings from a trauma-exposed population based sample of adults in the United Kingdom. *Depress Anxiety.* (2019) 36:887–94. doi: 10.1002/da.22934

68. van Dijke A, Hopman J, Ford JD. Affect dysregulation, psychoform dissociation, and adult relational fears mediate the relationship between childhood trauma and complex posttraumatic stress disorder independent of the symptoms of borderline personality disorder. *Eur J Psychotraumatol.* (2018) 9:1400878. doi: 10.1080/20008198.2017.1400878

69. Cooke JE, Racine N, Plamondon A, Tough S, Madigan S. Maternal adverse childhood experiences, attachment style, and mental health: Pathways of transmission to child behavior problems. *Child Abuse Negl.* (2019) 93:27–37. doi: 10.1016/j.chiabu.2019.04.011

70. Jowett S, Karatzias T, Shevlin M, Hyland P. Psychological trauma at different developmental stages and ICD-11 CPTSD: The role of dissociation. *J Trauma Dissoc.* (2021) 2021:1–16. doi: 10.1080/15299732.2021.1934936

71. Karatzias T, Shevlin M, Ford JD, Fyvie C, Grandison G, Hyland P, et al. Childhood trauma, attachment orientation, and complex PTSD (CPTSD) symptoms in a clinical sample: Implications for treatment. *Dev Psychopathol.* (2021) 2021:1–6. doi: 10.1017/S0954579420001509

72. Lewis SJ, Koenen KC, Ambler A, Arseneault L, Caspi A, Fisher HL, et al. Unravelling the contribution of complex trauma to psychopathology and cognitive deficits: a cohort study. *Br J Psychiatry.* (2021) 219:448–55. doi: 10.1192/bjp.2021.57

73. van der Kolk BA, Roth S, Pelcovitz D, Sunday S, Spinazzola J. Disorders of extreme stress: The empirical foundation of a complex adaptation to trauma. *J Trauma Stress.* (2005) 18:389–99. doi: 10.1002/jts.20047

74. Zhang Y, Zhang J, Ding C. Investigating the association between parental absence and developmental trauma disorder symptoms. *J Trauma Stress.* (2019) 32:733–41. doi: 10.1002/jts.22446

75. van der Kolk B, Pynoos R, Cicchetti D, Cloitre M, D'Andrea W, Ford J, et al. *Proposal to Include a Developmental Trauma Disorder Diagnosis for Children and Adolescents in DSM-V*. (2009). Available online at: http://www.traumacenter.org/announcements/dtd_papers_oct_09.pdf

76. Rogel A, Loomis AM, Hamlin E, Hodgdon H, Spinazzola J, van der Kolk B. The impact of neurofeedback training on children with developmental trauma: A randomized controlled study. *Psychol Trauma.* (2020) 12:918–29. doi: 10.1037/tra0000648

77. Trabsa A, Llimona A, Vargas L, Casanovas F, Martín M, Valiente A, et al. Comparison of developmental trauma between immigrant and non-immigrant psychotic patients. *Eur Psychiatry.* (2021) 64:S733–4. doi: 10.1192/j.eurpsy.2021.1943

78. Joos CM, McDonald A, Wadsworth ME. Extending the toxic stress model into adolescence: Profiles of cortisol reactivity. *Psychoneuroendocrinology.* (2019) 107:46–58. doi: 10.1016/j.psyneuen.2019.05.002

79. Shonkoff JP, Slopen N, Williams DR. Early childhood adversity, toxic stress, and the impacts of racism on the foundations of health. *Annu Rev Public Health.* (2021) 42:115–34. doi: 10.1146/annurev-publhealth-090419-101940

80. Darnell D, Flaster A, Hendricks K, Kerbrat A, Comtois KA. Adolescent clinical populations and associations between trauma and behavioral and emotional problems. *Psychol Trauma.* (2019) 11:266–73. doi: 10.1037/tra0000371

81. Schimmenti A, Caretti V. Linking the overwhelming with the unbearable: Developmental trauma, dissociation, and the disconnected self. *Psychoanal Psychol.* (2016) 33:106–28. doi: 10.1037/a0038019

82. Storvestre GB, Jensen A, Bjerke E, Tesli N, Rosaeg C, Friestad C, et al. Childhood trauma in persons with schizophrenia and a history of interpersonal violence. *Front Psychiatry.* (2020) 11:383. doi: 10.3389/fpsyt.2020.00383

83. Blacker CJ, Frye MA, Morava E, Kozicz T, Veldic M. A review of epigenetics of PTSD in comorbid psychiatric conditions. *Genes.* (2019) 10:140. doi: 10.3390/genes10020140

84. Ford JD, Grasso D, Greene C, Levine J, Spinazzola J, van der Kolk B. Clinical significance of a proposed developmental trauma disorder diagnosis: results of an international survey of clinicians. *J Clin Psychiatry.* (2013) 74:841–9. doi: 10.4088/JCP.12m08030

85. Messman-Moore TL, Bhuptani PH. A review of the long-term impact of child maltreatment on posttraumatic stress disorder and its comorbidities: An emotion dysregulation perspective. *Clin Psychol: Sci Pract.* (2017) 24:154–69. doi: 10.1111/cpsp.12193

86. Bryant RA. A critical review of mechanisms of adaptation to trauma: Implications for early interventions for posttraumatic stress disorder. *Clin Psychol Rev.* (2021) 85:101981. doi: 10.1016/j.cpr.2021.101981

87. Church C, Andreassen OA, Lorentzen S, Melle I, Aas M. Childhood trauma and minimization/denial in people with and without a severe mental disorder. *Front Psychol.* (2017) 8:1276. doi: 10.3389/fpsyg.2017.01276

88. MacDonald K, Thomas ML, Sciolla AF, Schneider B, Pappas K, Bleijenberg G, et al. Minimization of childhood maltreatment is common and consequential: Results from a large, multinational sample using the Childhood Trauma Questionnaire. *PLoS ONE.* (2016) 11:e0146058. doi: 10.1371/journal.pone.0146058

89. Altintas M, Bilici M. Evaluation of childhood trauma with respect to criminal behavior, dissociative experiences, adverse family experiences and psychiatric backgrounds among prison inmates. *Compr Psychiatry.* (2018) 82:100–7. doi: 10.1016/j.comppsych.2017.12.006

90. Hébert M, Langevin R, Oussaïd E. Cumulative childhood trauma, emotion regulation, dissociation, and behavior problems in school-aged sexual abuse victims. *J Affect Disord.* (2018) 225:306–12. doi: 10.1016/j.jad.2017.08.044

91. Heleniak C, Jenness JL, Stoep AV, McCauley E, McLaughlin KA. Childhood maltreatment exposure and disruptions in emotion regulation: A transdiagnostic pathway to adolescent internalizing and externalizing psychopathology. *Cognit Ther Res.* (2016) 40:394–415. doi: 10.1007/s10608-015-9735-z

92. Parsaik AK, Abdelgawad N, Chotalia JK, Lane SD, Pigott TA. Early-life trauma in hospitalized patients with mood disorders and its association with clinical outcomes. *J Psychiatr Pract.* (2017) 23:36–43. doi: 10.1097/PRA.0000000000000202

93. Yoder J, Grady MD, Precht M. Relationships between early life victimization, antisocial traits, and sexual violence: Executive functioning as a mediator. *J Child Sex Abus.* (2019) 28:667–89. doi: 10.1080/10538712.2019.1588819

94. Parker G, McCraw S, Bayes A. Borderline personality disorder: does its clinical features show specificity to differing developmental risk factors? *Austr Psychiatry.* (2018) 26:410–3. doi: 10.1177/1039856218760732

95. Ford JD, Spinazzola J, van der Kolk B, Chan G. Toward an empirically based Developmental Trauma Disorder diagnosis and semi-structured interview for children: The DTD field trial replication. *Acta Psychiatrica Scand.* (2022) 2022:13424. doi: 10.1111/acps.13424

96. Foster AL, D'Andrea W, Fehertoi N, Healy CJ, Miller A. Assessing the validity and clinical utility of a developmental trauma diagnosis in ethnic minority adolescents. *J Child Adolesc Trauma.* (2019) 12:479–88. doi: 10.1007/s40653-019-00272-2

97. Danzi BA, La Greca AM. Optimizing clinical thresholds for PTSD: Extending the DSM-5 preschool criteria to school-age children. *Int J Clin Health Psychol.* (2017) 17:234–41. doi: 10.1016/j.ijchp.2017.07.001

98. De Young AC, Landolt MA. PTSD in children below the age of 6 years. *Curr Psychiatry Rep.* (2018) 20:97. doi: 10.1007/s11920-018-0966-z

99. Woolgar F, Garfield H, Dalgleish T, Meiser-Stedman R. Systematic review and meta-analysis: Prevalence of posttraumatic stress disorder in trauma-exposed preschool-aged children. *J Am Acad Child Adolesc Psychiatry.* (2021) 61:366–77. doi: 10.1016/j.jaac.2021.05.026

100. Boyraz G, Granda R, Baker CN, Tidwell LL, Waits JB. Posttraumatic stress, effort regulation, and academic outcomes among college students: A longitudinal study. *J Couns Psychol.* (2016) 63:475–86. doi: 10.1037/cou0000102

101. Cotter J, Lin A, Drake RJ, Thompson A, Nelson B, McGorry P, et al. Long-term employment among people at ultra-high risk for psychosis. *Schizophr Res.* (2017) 184:26–31. doi: 10.1016/j.schres.2016.11.033

102. Topitzes J, Pate DJ, Berman ND, Medina-Kirchner C. Adverse childhood experiences, health, and employment: A study of men seeking job services. *Child Abuse Negl.* (2016) 61:23–34. doi: 10.1016/j.chiabu.2016.09.012

103. Kelley AN, Curtis MG, Wieling E. Expanding the traumatic stress framework to incorporate a socioecological family systems perspective. *Family Process.* (2021) 61:476–89. doi: 10.1111/famp.12682

104. Choi JK, Wang D, Jackson AP. Adverse experiences in early childhood and their longitudinal impact on later behavioral problems of children living in poverty. *Child Abuse Negl.* (2019) 98:104181. doi: 10.1016/j.chiabu.2019.104181

105. Wolff KT, Baglivio MT, Piquero AR. The relationship between adverse childhood experiences and recidivism in a sample of juvenile offenders in community-based treatment. *Int J Offender Ther Comp Criminol.* (2017) 61:1210–42. doi: 10.1177/0306624X15613992

106. Yoder JR, Hodge AI, Ruch D, Dillard R. Effects of childhood polyvictimization on victimization in juvenile correctional facilities: The mediating role of trauma symptomatology. *Youth Violence Juv Justice.* (2019) 17:129–53. doi: 10.1177/1541204018757038

107. Greene CA, Haisley L, Wallace C, Ford JD. Intergenerational effects of childhood maltreatment: A systematic review of the parenting practices of adult survivors of childhood abuse, neglect, and violence. *Clin Psychol Rev.* (2020) 80:101891. doi: 10.1016/j.cpr.2020.101891

108. Meulewaeter F, De Pauw S, Vanderplasschen W. Mothering, substance use disorders and intergenerational trauma transmission: An attachment-based perspective. *Front Psychiatry.* (2019) 10:728. doi: 10.3389/fpsyt.2019.00728

109. Montgomery E, Just-Østergaard E, Jervelund SS. Transmitting trauma: a systematic review of the risk of child abuse perpetrated by parents exposed to traumatic events. *Int J Public Health.* (2019) 64:241–51. doi: 10.1007/s00038-018-1185-4

110. Crouch E, Radcliff E, Brown M, Hung P. Exploring the association between parenting stress and a child's exposure to adverse childhood experiences (ACEs). *Child Youth Serv Rev.* (2019) 102:186–92. doi: 10.1016/j.childyouth.2019.05.019

111. Jensen SK, Sezibera V, Murray SM, Brennan RT, Betancourt TS. Intergenerational impacts of trauma and hardship through parenting. *J Child Psychol Psychiatry.* (2021) 62:989–99. doi: 10.1111/jcpp.13359

112. Liu Y, Merritt DH. Familial financial stress and child internalizing behaviors: The roles of caregivers' maltreating behaviors and social services. *Child Abuse Negl.* (2018) 86:324–35. doi: 10.1016/j.chiabu.2018.09.002

113. Vanderminden J, Hamby S, David-Ferdon C, Kacha-Ochana A, Merrick M, Simon TR, et al. Rates of neglect in a national sample: Child and family characteristics and psychological impact. *Child Abuse Negl.* (2019) 88:256–65. doi: 10.1016/j.chiabu.2018.11.014

114. Lehavot K, Beckman KL, Chen JA, Simpson TL, Williams EC. Race/ethnicity and sexual orientation disparities in mental health, sexism, and social support among women veterans. *Psychol Sex Orientation Gender Diversity.* (2019) 6:347–58. doi: 10.1037/sgd0000333

115. López CM, Andrews AR, Chisolm AM, de Arellano MA, Saunders B, Kilpatrick DG. Racial/ethnic differences in trauma exposure and mental health disorders in adolescents. *Cult Diversity Ethnic Minority Psychol.* (2017) 23:382–7. doi: 10.1037/cdp0000126

116. Herta D, Nemes B, Cozman D. Cognitive appraisal of exposure to specific types of trauma - a study of gender differences. *BMC Women's Health.* (2017) 17:111. doi: 10.1186/s12905-017-0468-x

117. Cisler JM. Childhood trauma and functional connectivity between amygdala and medial prefrontal cortex: A dynamic functional connectivity and large-scale network perspective. *Front Syst Neurosci.* (2017) 11:29. doi: 10.3389/fnsys.2017.00029

118. Cross D, Fani N, Powers A, Bradley B. Neurobiological development in the context of childhood trauma. *Clin Psychol: Sci Pract.* (2017) 24:111–124. doi: 10.1111/cpsp.12198

119. Danese A, Baldwin JR. Hidden wounds? Inflammatory links between childhood trauma and psychopathology. *Ann Rev Psychol.* (2017) 68:517–44. doi: 10.1146/annurev-psych-010416-044208

120. Kavanaugh BC, Dupont-Frechette JA, Jerskey BA, Holler KA. Neurocognitive deficits in children and adolescents following maltreatment: Neurodevelopmental consequences and neuropsychological implications of traumatic stress. *Appl Neuropsychol Child.* (2017) 6:64–78. doi: 10.1080/21622965.2015.1079712

121. Kira IA, Shuweikh H, Al-Huwailiah A, El-Wakeel SA, Waheep NN, Ebada EE, et al. The direct and indirect impact of trauma types and cumulative stressors and traumas on executive functions. *Appl Neuropsychol.* (2020) 2020:1–17. doi: 10.1080/23279095.2020.1848835

122. Lu S, Xu R, Cao J, Yin Y, Gao W, Wang D, et al. The left dorsolateral prefrontal cortex volume is reduced in adults reporting childhood trauma independent of depression diagnosis. *J Psychiatr Res.* (2019) 112:12–7. doi: 10.1016/j.jpsychires.2019.02.014

123. Luby JL, Tillman R, Barch DM. Association of timing of adverse childhood experiences and caregiver support with regionally specific brain development in adolescents. *JAMA Network Open.* (2019) 2:e1911426. doi: 10.1001/jamanetworkopen.2019.11426

124. van Rooij SJH, Cross D, Stevens JS, Vance LA, Kim YJ, Bradley B, et al. Maternal buffering of fear-potentiated startle in children and adolescents with trauma exposure. *Soc Neurosci.* (2017) 12:22–31. doi: 10.1080/17470919.2016.1164244

125. Cisler JM, Privratsky A, Smitherman S, Herringa RJ, Kilts CD. Large-scale brain organization during facial emotion processing as a function of early life trauma among adolescent girls. *NeuroImage Clin.* (2017) 17:778–85. doi: 10.1016/j.nicl.2017.12.001

126. Frijling JL. Preventing PTSD with oxytocin: Effects of oxytocin administration on fear neurocircuitry and PTSD symptom development in recently trauma-exposed individuals. *Eur J Psychotraumatol.* (2017) 8:1302652. doi: 10.1080/20008198.2017.1302652

127. Hambrick EP, Brawner TW, Perry BD. Timing of early-life stress and the development of brain-related capacities. *Front Behav Neurosci.* (2019) 13:183. doi: 10.3389/fnbeh.2019.00183

128. Norrholm SD, Jovanovic T. Fear processing, psychophysiology, and PTSD. *Harv Rev Psychiatry.* (2018) 26:129–41. doi: 10.1097/HRP.0000000000000189

129. Oh SJ, Nam KR, Lee N, Kang KJ, Lee KC, Lee YJ, et al. Developmental complex trauma induces the dysfunction of the amygdala-mPFC circuit in the serotonergic and dopaminergic systems. *Biochem Biophys Res Commun.* (2022) 605:104–10. doi: 10.1016/j.bbrc.2022.03.069

130. Thomason ME, Marusak HA. Toward understanding the impact of trauma on the early developing human brain. *Neuroscience.* (2017) 342:55–67. doi: 10.1016/j.neuroscience.2016.02.022

131. Kaczmarczyk M, Wingenfeld K, Kuehl LK, Otte C, Hinkelmann K. Childhood trauma and diagnosis of major depression: Association with memory and executive function. *Psychiatry Res.* (2018) 270:880–6. doi: 10.1016/j.psychres.2018.10.071

132. Vargas T, Lam PH, Azis M, Osborne KJ, Lieberman A, Mittal VA. Childhood trauma and neurocognition in adults with psychotic disorders: A systematic review and meta-analysis. *Schizophr Bull.* (2019) 45:1195–208. doi: 10.1093/schbul/sby150

133. Motsan S, Yirmiya K, Feldman R. Chronic early trauma impairs emotion recognition and executive functions in youth; specifying biobehavioral precursors of risk and resilience. *Dev Psychopathol.* (2021) 2021:1–14. doi: 10.1017/S0954579421000067

134. Peters AT, Ren X, Bessette KL, Goldstein BI, West AE, Langenecker SA, et al. Interplay between pro-inflammatory cytokines, childhood trauma, and executive function in depressed adolescents. *J Psychiatr Res.* (2019) 114:1–10. doi: 10.1016/j.jpsychires.2019.03.030

135. Philip NS, Sweet LH, Tyrka AR, Carpenter SL, Albright SE, Price LH, et al. Exposure to childhood trauma is associated with altered n-back activation and performance in healthy adults: Implications for a commonly used working memory task. *Brain Imaging Behav.* (2016) 10:124–35. doi: 10.1007/s11682-015-9373-9

136. McLaughlin KA, DeCross SN, Jovanovic T, Tottenham N. Mechanisms linking childhood adversity with psychopathology: Learning as an intervention target. *Behav Res Ther.* (2019) 118:101–9. doi: 10.1016/j.brat.2019.04.008

137. Rezaie R, Modaffar M, Jung P, Hindocha C, Bisby JA, Bloomfield MAP. The effects of developmental trauma on reinforcement learning and its relationship to psychotic experiences: A behavioural study. *bioRxiv.* (2020). doi: 10.1101/2020.11.18.20234112

138. Herzog S, DePierro J, D'Andrea W. Driven to distraction: Childhood trauma and dissociation, but not PTSD symptoms, are related to threat avoidance. *Eur J Trauma Dissoc.* (2018) 2:179–87. doi: 10.1016/j.ejtd.2018.03.001

139. Hosseini Ramaghani NA, Rezaei F, Sepahvandi MA, Gholamrezaei S, Mirderikvand F. The mediating role of the metacognition, time perspectives and experiential avoidance on the relationship between childhood trauma and post-traumatic stress disorder symptoms. *Eur J Psychotraumatol.* (2019) 10:1648173. doi: 10.1080/20008198.2019.1648173

140. Win E, Zainal NH, Newman MG. Trait anger expression mediates childhood trauma predicting for adulthood anxiety, depressive, and alcohol use disorders. *J Affect Disord.* (2021) 288:114–21. doi: 10.1016/j.jad.2021.03.086

141. McLaughlin KA, Colich NL, Rodman AM, Weismann DG. Mechanisms linking childhood trauma exposure and psychopathology: A transdiagnostic model of risk and resilience. *BMC Med.* (2020) 18:96. doi: 10.1186/s12916-020-01561-6

142. Andorko ND, Millman ZB, Klingaman E, Medoff D, Kline E, DeVylder J, et al. Association between sleep, childhood trauma and psychosis-like experiences. *Schizophr Res.* (2018) 199:333–40. doi: 10.1016/j.schres.2018.02.052

143. Pedrotti Moreira F, Wiener CD, Jansen K, Portela LV, Lara DR, Souza L, et al. Childhood trauma and increased peripheral cytokines in young adults with major depressive: Population-based study. *J Neuroimmunol.* (2018) 319:112–6. doi: 10.1016/j.jneuroim.2018.02.018

144. Bryant RA, Creamer M, O'Donnell M, Forbes D, Felmingham KL, Silove D, et al. Separation from parents during childhood trauma predicts adult attachment security and post-traumatic stress disorder. *Psychol Med.* (2017) 47:2028–35. doi: 10.1017/S0033291717000472

145. Giovanardi G, Vitelli R, Maggiora Vergano C, Fortunato A, Chianura L, Lingiardi V, et al. Attachment patterns and complex trauma in a sample of adults diagnosed with gender dysphoria. *Front Psychol.* (2018) 9:60. doi: 10.3389/fpsyg.2018.00060

146. Kong SS, Kang DR, Oh MJ, Kim NH. Attachment insecurity as a mediator of the relationship between childhood trauma and adult dissociation. *J Trauma Dissoc.* (2018) 19:214–31. doi: 10.1080/15299732.2017.1329772

147. Lin HC, Yang Y, Elliott L, Green E. Individual differences in attachment anxiety shape the association between adverse childhood experiences and adult somatic symptoms. *Child Abuse Negl.* (2020) 101:104325. doi: 10.1016/j.chiabu.2019.104325

148. Poole JC, Dobson KS, Pusch D. Do adverse childhood experiences predict adult interpersonal difficulties? The role of emotion dysregulation. *Child Abuse Neglect.* (2018) 80:123–33. doi: 10.1016/j.chiabu.2018.03.006

149. Charak R, Ford JD, Modrowski CA, Kerig PK. Polyvictimization, emotion dysregulation, symptoms of posttraumatic stress disorder, and behavioral health problems among justice-involved youth: a latent class analysis. *J Abnorm Child Psychol.* (2019) 47:287–98. doi: 10.1007/s10802-018-0431-9

150. Choi KR, Stewart T, Fein E, McCreary M, Kenan KN, Davies JD, et al. The impact of attachment-disrupting adverse childhood experiences on child behavioral health. *J Pediatr.* (2020) 221:224–9. doi: 10.1016/j.jpeds.2020.03.006

151. Luyten P, Campbell C, Allison E, Fonagy P. The mentalizing approach to psychopathology: State of the art and future directions. *Annu Rev Clin Psychol.* (2020) 16:297–325. doi: 10.1146/annurev-clinpsy-071919-015355

152. Berthelot N, Lemieux R, Garon-Bissonnette J, Lacharit,é C, Muzik M. The protective role of mentalizing: Reflective functioning as a mediator between child maltreatment, psychopathology and parental attitude in expecting parents. *Child Abuse Negl.* (2019) 95:104065. doi: 10.1016/j.chiabu.2019.104065

153. Euler S, Nolte T, Constantinou M, Griem J, Montague PR, Fonagy P. Interpersonal problems in borderline personality disorder: Associations with mentalizing, emotion regulation, and impulsiveness. *J Pers Disord.* (2021) 35:177–93. doi: 10.1521/pedi_2019_33_427

154. Huang YL, Fonagy P, Feigenbaum J, Montague PR, Nolte T. Multidirectional pathways between attachment, mentalizing, and posttraumatic stress symptomatology in the context of childhood trauma. *Psychopathology.* (2020) 53:48–58. doi: 10.1159/000506406

155. Hyatt CJ, Calhoun VD, Pittman B, Corbera S, Bell MD, Rabany L, et al. Default mode network modulation by mentalizing in young adults with autism spectrum disorder or schizophrenia. *NeuroImage Clin.* (2020) 27:102343. doi: 10.1016/j.nicl.2020.102343

156. Kristiansen VR, Handeland TB, Lau B, Søderstrøm K, Håkansson U, Øie MG. Trauma in childhood and adolescence and impaired executive functions are associated with uncertain reflective functioning in mothers with substance use disorder. *Add Behav Rep.* (2019) 11:100245. doi: 10.1016/j.abrep.2019.100245

157. Penner F, Gambin M, Sharp C. Childhood maltreatment and identity diffusion among inpatient adolescents: The role of reflective function. *J Adolesc.* (2019) 76:65–74. doi: 10.1016/j.adolescence.2019.08.002

158. Protic S, Wittmann L, Taubner S, Dimitrijevic A. Differences in attachment dimensions and reflective functioning between traumatized juvenile offenders

and maltreated non-delinquent adolescents from care services. *Child Abuse Negl.* (2020) 103:104420. doi: 10.1016/j.chiabu.2020.104420

159. Sibley MH, Ortiz M, Graziano P, Dick A, Estrada E. Metacognitive and motivation deficits, exposure to trauma, and high parental demands characterize adolescents with late-onset ADHD. *Eur Child Adolesc Psychiatry.* (2020) 29:537–48. doi: 10.1007/s00787-019-01382-w

160. Brake CA, Jones AC, Wakefield JR, Badour CL. Mental contamination and trauma: Understanding posttraumatic stress, risky behaviors, help-seeking attitudes. *J Obsessive Compuls Relat Disord.* (2018) 17:31–8. doi: 10.1016/j.jocrd.2017.08.010

161. Ojserkis R, McKay D, Lebeaut A. Associations between mental contamination, disgust, and obsessive-compulsive symptoms in the context of trauma. *J Obsessive Compuls Relat Disord.* (2018) 17:23–30. doi: 10.1016/j.jocrd.2017.09.002

162. Sambuco N, Bradley M, Herring D, Hillbrandt K, Lang PJ. Transdiagnostic trauma severity in anxiety and mood disorders: Functional brain activity during emotional scene processing. *Psychophysiology.* (2020) 57:e13349. doi: 10.1111/psyp.13349

163. Snyder HR, Friedman NP, Hankin BL. Transdiagnostic mechanisms of psychopathology in youth: Executive functions, dependent stress, and rumination. *Cognit Ther Res.* (2019) 43:834–51. doi: 10.1007/s10608-019-10016-z

164. Lund JI, Toombs E, Radford A, Boles K, Mushquash C. Adverse childhood experiences and executive function difficulties in children: A systematic review. *Child Abuse Negl.* (2020) 106:104485. doi: 10.1016/j.chiabu.2020.104485

165. Carvalho JN, Renner AM, Donat JC, de Moura TC, Fonseca RP, Kristensen CH. Executive functions and clinical symptoms in children exposed to maltreatment. *Appl Neuropsychol Child.* (2020) 9:1–12. doi: 10.1080/21622965.2018.1497989

166. Op den Kelder R, Van den Akker AL, Geurts HM, Lindauer RJ, Overbeek G. Executive functions in trauma-exposed youth: A meta-analysis. *Eur J Psychotraumatol.* (2018) 9:1450595. doi: 10.1080/20008198.2018.1450595

167. Blodgett C, Lanigan JD. The association between adverse childhood experience (ACE) and school success in elementary school children. *School Psychol Q.* (2018) 33:137–46. doi: 10.1037/spq0000256

168. Manyema M, Norris SA, Richter LM. Stress begets stress: the association of adverse childhood experiences with psychological distress in the presence of adult life stress. *BMC Public Health.* (2018) 18:835. doi: 10.1186/s12889-018-5767-0

169. John SG, Brandt TW, Secrist ME, Mesman GR, Sigel BA, Kramer TL. Empirically-guided assessment of complex trauma for children in foster care: A focus on appropriate diagnosis of attachment concerns. *Psychol Serv.* (2019) 16:120–133. doi: 10.1037/ser0000263

170. Spinazzola J, van der Kolk B, Ford JD. Developmental trauma disorder: a legacy of attachment trauma in victimized children. *J Trauma Stress.* (2021) 34:711–720. doi: 10.1002/jts.22697

171. Dackis MN, Rogosch FA, Cicchetti D. Child maltreatment, callous-unemotional traits, and defensive responding in high-risk children: An investigation of emotion-modulated startle response. *Dev Psychopathol.* (2015) 27:1527–45. doi: 10.1017/S0954579415000929

172. Gorka SM. Interpersonal trauma exposure and startle reactivity to uncertain threat in individuals with alcohol use disorder. *Drug Alcohol Depend.* (2020) 206:107727. doi: 10.1016/j.drugalcdep.2019.107727

173. Wamser-Nanney R, Cherry KE. Children's trauma-related symptoms following complex trauma exposure: Evidence of gender differences. *Child Abuse Negl.* (2018) 77:188–97. doi: 10.1016/j.chiabu.2018.01.009

174. Birkeland MS, Skar A-MS, Jensen TK. Understanding the relationships between trauma type and individual posttraumatic stress symptoms: a cross-sectional study of a clinical sample of children and adolescents. *J Child Psychol Psychiatry.* (2022). doi: 10.1111/jcpp.13602

175. Campbell AA, Wisco BE, Silvia PJ, Gay NG. Resting respiratory sinus arrhythmia and posttraumatic stress disorder: A meta-analysis. *Biol Psychol.* (2019) 144:125–35. doi: 10.1016/j.biopsycho.2019.02.005

176. Campbell AA, Wisco BE. Respiratory sinus arrhythmia reactivity in anxiety and posttraumatic stress disorder: A review of literature. *Clin Psychol Rev.* (2021) 87:102034. doi: 10.1016/j.cpr.2021.102034

177. Gray S, Lipschutz RS, Scheeringa MS. Young children's physiological reactivity during memory recall: Associations with posttraumatic stress and parent physiological synchrony. *J Abnorm Child Psychol.* (2018) 46:871–80. doi: 10.1007/s10802-017-0326-1

178. Ford JD, Spinazzola J, van der Kolk B. Psychiatric comorbidity of developmental trauma disorder and posttraumatic stress disorder: findings from the DTD field trial replication (DTDFT-R). *Eur J Psychotraumatol.* (2021) 12:1929028. doi: 10.1080/20008198.2021.1929028

179. Post RM, Altshuler LL, Kupka R, McElroy SL, Frye MA, Rowe M, et al. Verbal abuse, like physical and sexual abuse, in childhood is associated with an earlier onset and more difficult course of bipolar disorder. *Bipolar Disord.* (2015) 17:323–30. doi: 10.1111/bdi.12268

180. Siegfried CB, Blackshear K. *National Child Traumatic Stress Network, with Assistance from the National Resource Center on ADHD: A Program of Children and Adults with Attention-Deficit/Hyperactivity Disorder (CHADD) Is it ADHD or child traumatic stress? A Guide for Clinicians*. Los Angeles, CA; Durham, NC: National Center for Child Traumatic Stress (2016).

181. Stern A, Agnew-Blais J, Danese A, Fisher HL, Jaffee SR, Matthews T, et al. Associations between abuse/neglect and ADHD from childhood to young adulthood: A prospective nationally-representative twin study. *Child Abuse Negl.* (2018) 81:274–85. doi: 10.1016/j.chiabu.2018.04.025

182. Thompson R, Lewis T, Neilson EC, English DJ, Litrownik AJ, Margolis B, et al. Child maltreatment and risky sexual behavior: Indirect effects through trauma symptoms and substance use. *Child Maltreat.* (2017) 22:69–78. doi: 10.1177/1077559516674595

183. Castellini G, Lelli L, Cassioli E, Ciampi E, Zamponi F, Campone B, et al. Different outcomes, psychopathological features, and comorbidities in patients with eating disorders reporting childhood abuse: A 3-year follow-up study. *Eur Eating Disord Rev.* (2018) 26:217–29. doi: 10.1002/erv.2586

184. Crouch E, Radcliff E, Hung P, Bennett K. Challenges to school success and the role of adverse childhood experiences. *Acad Pediatr.* (2019) 19:899–907. doi: 10.1016/j.acap.2019.08.006

185. Stempel H, Cox-Martin M, Bronsert M, Dickinson LM, Allison MA. Chronic school absenteeism and the role of adverse childhood experiences. *Acad Pediatr.* (2017) 17:837–43. doi: 10.1016/j.acap.2017.09.013

186. Hardcastle K, Bellis MA, Ford K, Hughes K, Garner J, Ramos Rodriguez G. Measuring the relationships between adverse childhood experiences and educational and employment success in England and Wales: Findings from a retrospective study. *Public Health.* (2018) 165:106–16. doi: 10.1016/j.puhe.2018.09.014

187. Lee H, Kim Y, Terry J. Adverse childhood experiences (ACEs) on mental disorders in young adulthood: Latent classes and community violence exposure. *Prevent Med.* (2020) 134:106039. doi: 10.1016/j.ypmed.2020.106039

188. Pournaghash-Tehrani SS, Zamanian H, Amini-Tehrani M. The impact of relational adverse childhood experiences on suicide outcomes during early and young adulthood. *J Interpers Violence.* (2021) 36:8627–51. doi: 10.1177/0886260519852160

189. Felitti VJ, Anda RF, Nordenberg D, Williamson DF, Spitz AM, Edwards V, et al. Relationship of childhood abuse and household dysfunction to many of the leading causes of death in adults: The Adverse Childhood Experiences (ACE) study. *Am J Prev Med.* (2019) 56:774–86. doi: 10.1016/j.amepre.2019.04.001

190. Shin SH, McDonald SE, Conley D. Patterns of adverse childhood experiences and substance use among young adults: A latent class analysis. *Addict Behav.* (2018) 78:187–92. doi: 10.1016/j.addbeh.2017.11.020

191. Wang L, An CX, Song M, Li N, Gao YY, Zhao XC, et al. Evaluation of childhood traumatic experience as a risk factor for alcohol use disorder in adulthood. *BMC Psychiatry.* (2020) 20:15. doi: 10.1186/s12888-020-2428-5

192. McRae EM, Stoppelbein L, O'Kelley SE, Fite P, Smith SB. An examination of post-traumatic stress symptoms and aggression among children with a history of adverse childhood experiences. *J Psychopathol Behav Assessment*. (2021) 43:657–70. doi: 10.1007/s10862-021-09884-1

193. Metzler M, Merrick MT, Klevens J, Ports KA, Ford DC. Adverse childhood experiences and life opportunities: Shifting the narrative. *Child Youth Serv Rev.* (2017) 72:141–9. doi: 10.1016/j.childyouth.2016.10.021

194. Vaughn-Coaxum RA, Wang Y, Kiely J, Weisz JR, Dunn EC. Associations between trauma type, timing, and accumulation on current coping behaviors in adolescents: Results from a large, population-based sample. *J Youth Adolesc.* (2018) 47:842–58. doi: 10.1007/s10964-017-0693-5

195. Yirmiya K, Djalovski A, Motsan S, Zagoory-Sharon O, Feldman R. Stress and immune biomarkers interact with parenting behavior to shape anxiety symptoms in trauma-exposed youth. *Psychoneuroendocrinology.* (2018) 98:153–60. doi: 10.1016/j.psyneuen.2018.08.016

196. Crittenden PM, Heller MB. The roots of chronic posttraumatic stress disorder: Childhood trauma, information processing, self-protective strategies. *Chronic Stress.* (2017) 1:1–13. doi: 10.1177/2470547016682965

197. Ford JD. Understanding the intersection of borderline personality and somatoform disorders: A developmental trauma disorder framework. *Clin Psychol: Sci Pract.* (2018) 25:e12243. doi: 10.1111/cpsp.12243

198. Koball AM, Domoff SE, Klevan J, Olson-Dorff D, Borgert A, Rasmussen C. The impact of adverse childhood experiences on healthcare utilization

in children. *Child Abuse Negl.* (2021) 111:104797. doi: 10.1016/j.chiabu.2020.104797

199. Voorendonk EM, De Jongh A, Rozendaal L, Van Minnen A. Trauma-focused treatment outcome for complex PTSD patients: results of an intensive treatment programme. *Eur J Psychotraumatol.* (2020) 11:1783955. doi: 10.1080/20008198.2020.1783955

200. Hughes D. Dyadic Developmental Psychotherapy (DDP): An attachment-focused family treatment for developmental trauma. *Austr New Zealand J Family Therapy.* (2017) 38:595–605. doi: 10.1002/anzf.1273

201. Karatzias T, Murphy P, Cloitre M, Bisson J, Roberts N, Shevlin M, et al. Psychological interventions for ICD-11 complex PTSD symptoms: systematic review and meta-analysis. *Psychol Med.* (2019) 49:1761–75. doi: 10.1017/S0033291719000436

202. Bloomfield M, Yusuf F, Srinivasan R, Kelleher I, Bell V, Pitman A. Trauma-informed care for adult survivors of developmental trauma with psychotic and dissociative symptoms: a systematic review of intervention studies. *Lancet Psychiatry.* (2020) 7:449–62. doi: 10.1016/S2215-0366(20)30041-9

203. Coventry PA, Meader N, Melton H, Temple M, Dale H, Wright K, et al. Psychological and pharmacological interventions for posttraumatic stress disorder and comorbid mental health problems following complex traumatic events: Systematic review and component network meta-analysis. *PLoS Med.* (2020) 17:e1003262. doi: 10.1371/journal.pmed.1003262

204. McGuire A, Steele RG, Singh MN. Systematic review on the application of Trauma-Focused Cognitive Behavioral Therapy (TF-CBT) for preschool-aged children. *Clin Child Fam Psychol Rev.* (2021) 24:20–37. doi: 10.1007/s10567-020-00334-0

205. Cohen JA, Mannarino AP. Trauma-focused cognitive behavior therapy for traumatized children and families. *Child Adolesc Psychiatr Clin N Am.* (2015) 24:557–70. doi: 10.1016/j.chc.2015.02.005

206. Kameg BN, Fradkin D. Adverse childhood experiences in youth: Trauma-informed assessment, diagnosis, and management. *J Nurse Practitioners.* (2021) 17:87–92. doi: 10.1016/j.nurpra.2020.04.026

207. Cloitre M, Hyland P, Bisson JI, Brewin CR, Roberts NP, Karatzias T, et al. ICD-11 posttraumatic stress disorder and complex posttraumatic stress disorder in the United States: A population-based study. *J Trauma Stress.* (2019) 32:833–42. doi: 10.1002/jts.22454

208. Russell JD, Keding TJ, He Q, Li JJ, Herringa RJ. Childhood exposure to interpersonal violence is associated with greater transdiagnostic integration of psychiatric symptoms. *Psychol Med.* (2020) 2020:1–9. doi: 10.1017/S0033291720003712

209. Substance Abuse and Mental Health Services Administration. *Trauma-Informed Care in Behavioral Health Services. Treatment Improvement Protocol (TIP) Series 57. HHS Publication No. (SMA) 13-4801*. Rockville, MD: Substance Abuse and Mental Health Services Administration (2014).

210. Berger E. Multi-tiered approaches to trauma-informed care in schools: A systematic review. *School Ment Health.* (2019) 11:650–64. doi: 10.1007/s12310-019-09326-0

211. Branson CE, Baetz CL, Horwitz SM, Hoagwood KE. Trauma-informed juvenile justice systems: A systematic review of definitions and core components. *Psychol Trauma.* (2017) 9:635–46. doi: 10.1037/tra0000255

212. Matlin SL, Champine RB, Strambler MJ, O'Brien C, Hoffman E, Whitson M, et al. A community's response to adverse childhood experiences: Building a resilient, trauma-informed community. *Am J Community Psychol.* (2019) 64:451–66. doi: 10.1002/ajcp.12386

213. Achterhof R, Huntjens R, Meewisse ML, Kiers H. Assessing the application of latent class and latent profile analysis for evaluating the construct validity of complex posttraumatic stress disorder: cautions and limitations. *Eur J Psychotraumatol.* (2019) 10:1698223. doi: 10.1080/20008198.2019.1698223