



# Autism Spectrum Disorder and the Experience of Traumatic Events: Review of the Current Literature to Inform Modifications to a Treatment Model for Children with Autism

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Published online: 11 December 2018

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## Abstract

Children with autism incur trauma and have increased vulnerabilities for experiencing trauma. This paper summarizes the current literature in the study of trauma in typically developing children and those with autism. A treatment model for children with autism, drawing on components from cognitive behavior therapy (CBT), trauma-focused CBT, and CBT to teach emotion regulation and treat anxiety in children with autism is suggested. Components include: (a) Functional Behavior Assessment; (b) behavior plans and behavioral skills training; (c) teaching emotion regulation; (d) exposure therapy; (e) cognitive restructuring; (f) parent and child support between sessions; (g) safety plan; and (h) programming for generalization and maintenance. Future research should establish evidence-based treatment of trauma in this population by evaluating the modified treatment package.

**Keywords** Autism · Trauma · Treatment of trauma · Modified trauma-focused CBT

The study of traumatic events and their effects on individuals has received increased attention in the literature. For the purposes of this article, trauma is defined as a psychological injury that causes damage or harm to the person, and which varies in terms of its permanency, severity, and longevity (Kerns et al. 2015). A trauma may occur as a single event or can occur repeatedly, both of which can harm a child psychologically if the experience was perceived to be threatening. Traumas can be placed on a spectrum of severity of experience. On one end of the spectrum, a trauma can be minor and easily overcome. On the other end of the spectrum, trauma can be severe. The repercussions of severe trauma are alterations in one's life-functioning (Kerns et al. 2015), disease and morbidity in adulthood (Felitti et al. 1998). When psychological trauma occurs, feelings of helplessness, intense fear and horror (Sherin and Nemeroff 2011) can lead

to the development of post-traumatic stress disorder (PTSD) (Copeland et al. 2007), and Complex-Post Traumatic Stress Disorder (CPTSD) (Courtois 2008). A range of sequelae such as depression, anxiety, addiction, medical problems, difficulties with relationships and dissociation may develop (Copeland et al. 2007; Courtois 2008). As such, exposure to a single traumatic event or repeated traumatic events is a public health risk given the potential long-term consequences on the development and long-term functioning of the individual (Hibbard and Desch 2007; Kerns et al. 2015).

Children in general are more vulnerable to maltreatment as they are dependent on the care of adults. Individuals with developmental disabilities may be at a greater risk for being maltreated as compared to their typical peers (Hibbard and Desch 2007; Kerns et al. 2015). Children with developmental disabilities struggle with their communication skills, are more likely to be socially isolated, and are prone to experiencing high levels of familial stress. These factors are common in individuals with Autism Spectrum Disorder (ASD), and make them more susceptible to maltreatment (Sullivan and Knutson 2000). ASD is a developmental disorder characterized by social and communication deficits, restricted interests and behaviors, and intellectual disability in 40–50% of cases (Centers for Disease Control and Prevention 2016). Other common characteristics of children, youth, and adults

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with ASD are that they are socially naive and inappropriate, which may make them more prone to victimization (Berg et al. 2016; Hoover 2015; Kerns et al. 2015, 2017). All of these characteristics taken together potentiate the risk of maltreatment and exposure to traumatic life events in children with ASD. Despite the many factors that make children with ASD more prone to the experience of trauma, there is a paucity of research in the field. Accurate attribution of the symptoms of trauma to children with ASD is difficult to make due to the associated behavioral problems common in children on the spectrum. The observable behavior problems associated with some children with ASD, such as self-injury, also are common to individuals who have suffered from trauma, thereby making a diagnostic discrimination between ASD and the side-effects of trauma clinically challenging (Brenner et al. 2017). Additionally, evidence-based treatment of trauma in children with ASD has not been established (Brenner et al. 2017). The purpose of this paper is multifold. We will briefly review the literature regarding the effects of trauma on child development; examine why children with ASD may have an increased vulnerability to trauma and the present understanding of how symptoms of trauma and PTSD are expressed; provide an overview of the treatment of trauma in typically developing children; and suggest a modified treatment model for working with trauma in children with ASD.

## Trauma and Its Effects on Development

The age at which children are first traumatized, the frequency of the trauma, and the role of the caregiver in the event itself have an impact on the severity of the psychological damage (van der Kolk 2003). Trauma responses in children are most likely to occur within the context of intimate relationships, such as in cases of neglect and abuse (Koerner 2012; van der Kolk and Najavits 2013). The American Psychiatric Association (2013) holds that children suffering from PTSD experience intense feelings of fear, helplessness, or horror as a result of being exposed to a traumatic event, resulting in behavior that is disorganized and agitated. Behavior problems are a common feature of children who have suffered a trauma (American Psychiatric Association 2013). Generally speaking, exposure to traumatic events in childhood may have noxious effects on the child's neurobiological, emotional, and cognitive development (Perry et al. 1995).

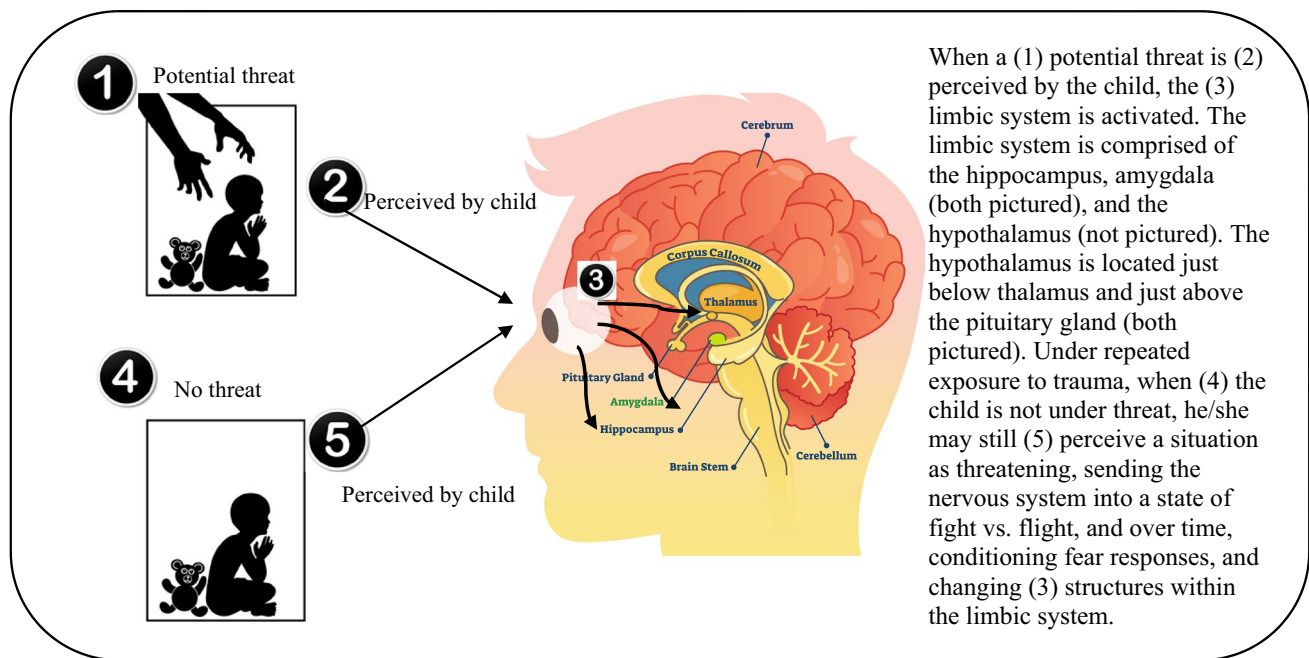
## Neurobiological Effects

Exposure to repeated traumatic events or chronic trauma can cause changes in a person's neural structures and sensory systems. Environmental threats are detected by the prefrontal cortex, amygdala, and hippocampus (McEwen 2007).

When a psychosocial stress is perceived, the hippocampus and prefrontal cortex activate the firing of the amygdala. The amygdala then triggers the locus coeruleus, which in turn activates the sympathetic nervous system (i.e., the fight vs. flight response) (Danese and McEwen 2012). These are the brain structures that are in turn affected in individuals with PTSD (Sherin and Nemeroff 2011). Systems most affected by traumatic stress are those that are critical for mediating arousal states, executive functioning, behavioral regulation, and memory.

The amygdala plays a role in emotional processing and in acquiring fear responses (Sherin and Nemeroff 2011). The amygdala evaluates whether stimuli are potentially threatening. For example, when one sees a potential aggressor and perceives what may be dangerous intention on his/her part, the amygdala initiates a series of behavioral, emotional and hormonal responses (Yehuda 2006). Thus, it initiates responses within the sympathetic and parasympathetic nervous systems (van der Kolk 2003; Yehuda 2006). Signals that are sent by the amygdala to the brain stem begin startle responses and initiate defensive behaviors. Therefore, when trauma occurs early in a child's development, or, as Courtois (2008) suggests, in unfavorable conditions throughout one's life, the repeated activation of the amygdala results in the conditioning of fear responses (van der Kolk 2003; Yehuda 2006).

When trauma occurs during development, the limbic system is affected. The limbic system is comprised of the hypothalamus, amygdala, and hippocampus (see Fig. 1). It ensures that the regulatory functions of the hypothalamus and brain stem are fine-tuned, and acts as a filter that helps to determine what sensory information requires further processing (Sherin and Nemeroff 2011; van der Kolk 2003). In infants, the hippocampus develops gradually in the first 5 years, resulting in the central nervous system (CNS) not being fully developed (van der Kolk 2003). Consequently, when a child experiences a threat, the limbic system is activated much faster than the prefrontal cortex is able to evaluate the nature of the stimulus (see Fig. 1). Although controversial, van der Kolk (2003) argues that the role of primary caregivers is to mediate threat within the infant's environment. If the amygdala is sending signals to the organism to activate the fight or flight response, the caregiver can act as mediator in the infant's response to threat by helping to calm the nervous system (van der Kolk 2003). Further adding to the debate, van der Kolk (2003) maintains that most functions are mediated by caregivers until the CNS is fully developed. For example, when children are not soothed when under extreme duress, they develop problems with impulse control, aggression, emotion regulation, and cognition. Additionally, research has demonstrated that reduced hippocampal volume is a feature of PTSD. The hippocampus plays a role in responses to stress, explicit memory, and



**Fig. 1** The limbic system when exposed to trauma or under threat as perceived by the child

fear conditioning (Sherin and Nemeroff 2011). Decreased hippocampal volume may both promote the onset and the failure to terminate stress responses. Additionally, reduced volume in the hippocampus may be contribute to conditioned fear responses, and difficulties with discriminating unsafe versus safe situations (Sherin and Nemeroff 2011).

### Emotion Regulation

Emotion regulation (ER) can be best understood within the framework of a biopsychosocial model. ER refers to a group of processes that work together so that the individual can appropriately react and modify one's emotional response to meet a variety of situational demands (Gross and Thompson 2007). Samson et al. (2015) describe two primary paths that individuals employ to regulate their emotions: (a) cognitive reappraisal, and (b) expressive suppression. Cognitive reappraisal is a strategy that involves cognitive changes and is adaptive. Expressive suppression occurs when the person modulates the expression of the emotional response. When used as a primary method of emotion regulation, it is believed to be maladaptive (Samson et al. 2015). In those who have experienced trauma, van der Kolk and Najavits (2013) describe a range of possible emotional responses on a spectrum from states of hypoarousal to hyperarousal. Living in a state of hypoarousal involves dissociation. Dissociation occurs when an individual is experiencing a traumatic event (e.g., victimization, abuse, crime), and leads to a disconnection between the person and his or her environment in

circumstances where the trauma is more than one can bear (APA 2013). An individual can dissociate the memory of the place in which the trauma occurred, the memory of the trauma, and the emotions about the event. The prolonged use of maladaptive emotion regulation strategies such as emotional arousal, emotional numbing, and rumination are believed to contribute to other negative life outcomes such as difficulties with social functioning, anxiety and depression (Mazefsky et al. 2014).

### Cognitive Development

Van der Kolk (2003) argues that a calm physiological state is required for optimal learning conditions. Given that neurobiologic systems are activated for survival even when children are safe (van der Kolk 2003), the heightened states can lead to learning challenges. Children who are traumatized may overly attend to sources of threat in their environment, leaving them in states of hyperarousal for extended periods of time (van der Kolk 2003), in turn leading to generalized learning problems and struggle with overall academic achievement (van der Kolk 2003). At times, novel information can lead to physiological arousal, leaving the child overstimulated, feeling threatened, and dissociated, incapable of learning (Streek-Fischer and van der Kolk 2000). From the perspective of the traumatized child, the world is a terrifying place, and as such, there is little desire to explore it, resulting in inflexibility and an insistence on sameness (Streek-Fischer and van der Kolk 2000).

Enlow et al. (2012) conducted the first longitudinal study measuring the long-term effects of interpersonal trauma (IPT) on cognitive functioning experienced by children from birth to 5 years of age. They defined IPT as being witness to maternal partner violence, or, experiencing physical, emotional, sexual abuse or neglect. The study included 206 participants from the Minnesota Longitudinal Study of Parents and Children. Measures of exposure to IPT occurred via home observations, maternal interviews, laboratory visits, reviews of child protection records and medical records (Enlow et al. 2012). At 24, 64, and 96 months of age, child intelligent quotient (IQ) scores were measured. IPT, particularly during the first 2 years of life was found to have had significant and long-lasting effects on cognitive development (Enlow et al. 2012).

## Autism and Trauma

What we know of typical development in children who have experienced trauma tells us that there are detrimental effects on their neurobiological, emotional, and cognitive development. Children diagnosed with ASD may be at increased risk for exposure to traumatic life events (Berg et al. 2016; Hoover 2015; Kerns et al. 2017, 2015; Rigles 2017). Yet what may be an increased predisposition to trauma, how children with ASD may be more vulnerable to trauma(s), and the associated symptoms or the development of PTSD in this population is not well understood. The literature is in its infancy, leaving more questions than answers (Brenner et al. 2017; Kerns et al. 2015). For example, is the sudden emergence of self-injury in a child with ASD a symptom of his/her ASD or a result of exposure to trauma? Kerns et al. (2015) point out that the symptoms of traumatic stress and ASD are behaviorally defined, resulting in potential diagnostic overlap with one another. This may lead to difficulties in discriminating the effects of trauma on individuals with ASD. They ask, are hyperarousal, flattened affect, difficulties with attention, self-injury, and inflexibility the resulting effects of ASD or trauma? Are the core symptoms of ASD made worse in children who have incurred trauma or who have a comorbid diagnosis of PTSD (Brenner et al. 2017)? Are the preexisting symptoms of ASD exacerbated in cases where the individual has suffered trauma(s)? What are the vulnerabilities or effects on neurobiology, cognitive development and processes, emotion regulation, and behavioral symptoms? Below we discuss some of what is presently known in the literature regarding vulnerability to trauma and how the symptoms associated with trauma or PTSD may be expressed in with ASD.

## Neurobiology

The limbic-hypothalamic-pituitary-adrenal (LHPA) axis, whose role it is to regulate stress and other bodily functions such as emotion, mood, immune responses, and digestion, has been shown to be dysregulated in individuals with ASD and those who have experienced trauma (Danese and McEwen 2012). Children with ASD have higher levels of salivary cortisol in response to novel and threatening stimuli (Corbett et al. 2008). Examples of stimuli that may cause elevated cortisol levels are psychosocial stress or sensory stimuli (Corbett et al. 2008). Additionally, children with ASD exhibit elevations in salivary cortisol levels when anticipating re-exposure to perceived stressors (Corbett et al. 2008). These pre-existing, inherently weak stress responses, may increase vulnerability to the future experience of trauma, or increase traumatic responses to environmental stimuli in individuals with ASD. Such responses may in turn initiate a cycle of biological and behavioral dysregulation (Kerns et al. 2015).

As has been demonstrated in the literature with typically developing children exposed to trauma, the stress imposed on the amygdala leads to the emergence of conditioned fear responses, and increased perceptions of threat (Courtois 2008; van der Kolk 2003; Yehuda 2006). In individuals with ASD, the prefrontal cortex and amygdala, areas associated with emotion regulation, have been shown to have alterations in the functional connectivity (Mazefsky et al. 2013). Kerns et al. (2015) suggest that these correlates may offer understanding into the particular vulnerabilities of children with ASD and the development of trauma-related pathology.

## Cognitive Development and Processes

Another potential predisposition to the development of traumatic stress are differences in cognitive processes in individuals with ASD (Kerns et al. 2015). These differences may lead to a limited ability to use effective coping strategies such as cognitive reappraisal or problem solving to cope with trauma. The cognitive deficits of individuals with ASD such as impairments in the processing of information, emotional insight, and difficulties with goal-directed behavior may reduce the use of strategies that are adaptive in terms of ER. This can in turn lead to a heightened trauma response (Mazefsky et al. 2013; Wood and Gadow 2010). Kerns et al. suggest that individuals with ASD may struggle to shift their thoughts in relation to their traumatic experiences, ruminating on the memories of the trauma, or they may be unable to think flexibly about their experience.

Research pertaining to the long-term effects on cognitive functioning has yet to be extended to children with ASD. The emergent literature in typically developing children has demonstrated that IQ is significantly affected as a result of



being exposed to IPT in the first 5 years of life (Enlow et al. 2012). Given that children with ASD have a range of learning challenges, and in some cases, lower than average IQ's (Centers for Disease Control and Prevention 2016), it may too be the case that IPT, as well as other traumatic experiences could lead to significant changes in IQ in this population. Future research in this area is needed, as it may inform education and treatment of trauma in children with ASD.

## Emotion Regulation

Given that the experience of trauma(s) leads to difficulty with emotion regulation (Koerner 2012), it is surprising that so little is known in regard to emotion regulation in individuals with ASD who have been exposed to traumatic life events. Increasingly it is recognized that ASD involves problems with ER in terms of the frequency, duration, and intensity with which emotion is experienced (Samson et al. 2015). Gross (2013) suggests that some individuals with ASD fail to regulate their emotions altogether, whereas others use strategies that are not adaptive. Samson et al. (2015) found that participants with ASD, aged 8–20, were less likely to use cognitive reappraisal as an ER strategy, which in turn led to increases in negative emotion and higher levels of maladaptive behavior. Some research also suggests that individuals with ASD may have biological vulnerabilities that increases the likelihood of impaired ER, such as atypical neural reactivity (Pitskel et al. 2014) and heart rate variability that is atypical (Guy et al. 2014).

## Behavioral Symptoms

Brenner et al. (2017) conducted the first exploratory study, examining the behavioral symptoms of PTSD with a sample of children with ASD, with parent/caregiver reported histories of abuse. Results from their study found that children with ASD with a reported history of abuse and a co-morbid diagnosis of PTSD, reported more fear, tantrums, intrusive thoughts, and upsetting memories than their peers with a caregiver reported history of abuse, but without a diagnosis of PTSD (Brenner et al. 2017). The data suggest that children with ASD experience similar symptoms to those that meet the diagnostic criteria for PTSD, but that there is an overlap in symptoms in children with ASD who do and do not have reported histories of abuse, making the discrimination of symptoms challenging (Brenner et al. 2017). Additionally, it was found that some symptoms, commonly associated with PTSD (i.e., sleep difficulties, fear, anger, problems with attention, and irritability) did not differ significantly between children with and without abuse histories, possibly because these symptoms are also common in children with ASD (Brenner et al. 2017). Brenner et al. (2017) argue that diagnostic overshadowing may have been at play

in this population when diagnosing PTSD in this sample of children, as children with ASD in general present with complex emotional and behavioral symptoms. This in turn may have led clinicians to inadvertently impose a higher threshold for diagnosing PTSD (Brenner et al. 2017). Further research is needed in order to further develop a deeper understanding of vulnerabilities to trauma, the symptoms of traumatic stress, PTSD or complex trauma in children with ASD. This will in turn lead to the development of ASD specific assessments and treatments.

## Treatment of Trauma in Children

Historically, when treating trauma in children, therapies have relied on the use of language to make meaning of trauma or on the use of medication to regulate the neurobiological effects of trauma (van der Kolk 2003). Van der Kolk and Najavits (2013) argue that such treatments are insufficient for treating traumatic symptoms in children. As well, van der Kolk and Najavits (2013) note that there is a lack of treatments that address affective arousal, the ability to concentrate, and social engagement difficulties that develop. Memory research has shown that memories are like a quickly drawn sketch; imprecise stories that people tell themselves so that they can make meaning and create a narrative of their life experiences (van der Kolk 2014). Memories are not precise recollections of images, sensations in the body, odors or muscular actions. However, when individuals experience trauma resulting in the development of PTSD or CPTSD, the body and the brain form a “blueprint” of particular pictures, scents, body sensations, and muscular actions. Re-experiencing traumatic memories in the form of flashbacks can occur for years following the event itself (van der Kolk 2014). van der Kolk (2014) states that treatment approaches should ideally help individuals process the past without fully re-experiencing it. When treating trauma, the approach cannot exclude knowledge of neurobiology because of the effects trauma has on the brain and the body. van der Kolk and Najavits (2013) further assert that effective treatment must teach individuals to regulate their autonomic arousal system. Physiological arousal must be calmed before one can access one's executive functioning system to engage in adaptive emotional regulation and problem solving strategies (van der Kolk and Najavits 2013). Van der Kolk (2003) argues that children must develop the capacity to withstand trauma-related body sensations and their associated emotional states. It is not until the child has developed an internal state of control over his/her various arousal states that he/she can start to learn from novel experiences and to respond flexibly to new situations. Below we review two common evidence-based treatments for a range of mental illnesses such as anxiety, depression, and trauma

in typically developing children: (a) cognitive behavior therapy (CBT) and; (b) trauma-focused cognitive behavior therapy (TF-CBT).

### Cognitive Behavior Therapy

CBT is well established in the literature as an evidence-based practice for the treatment of a variety of mental health disorders including depression, anxiety, and obsessive–compulsive disorder in children and adults (Barrett et al. 2001; Kendall et al. 2004; Oar et al. 2017; Rapee et al. 2009). The aim of CBT is to teach individuals to change their thoughts and behaviors, so that they become more realistic and adaptive, resulting in improvements in quality of life (Coffey et al. 2015). CBT treatment packages typically include the following strategies: identification of problematic thoughts; challenge of thoughts and beliefs by the therapist; teaching of alternative adaptive thoughts; relaxation; problem solving; scheduling of fun events in order to increase positive reinforcement in the person's environment; and exposure to negative thoughts, physiological sensations, and situations to decrease the person's avoidance of and arousal associated with environmental stimuli (Coffey et al. 2015; Fréchette-Simard et al. 2018).

### Trauma Focused-CBT

CBT has been extended to the treatment of trauma in children in what is known as trauma focused-CBT (TF-CBT) with modifications (Coffey et al. 2015). The results of a recent meta-analysis, including 39 psychological treatments for symptoms of PTSD in children, indicated that TF-CBT interventions can effectively decrease PTSD symptomatology when compared to wait list and active control conditions (Morina et al. 2016). TF-CBT is a multi-component treatment model that includes a manualized treatment protocol (Cohen et al. 2010). The components of the model are ascribed in the acronym "P.P.R.A.C.T.I.C.E": (a) psycho-education, to teach about trauma and trauma responses; (b) positive parenting skills and behavior management skills; (c) relaxation skills, to teach management of physiological response to trauma; (d) affective modulation skills; (e) cognitive coping skills, to make clear the connection between one's thoughts, feelings, and behaviors; (f) trauma narrative and processing to correct cognitive distortions that are the result of trauma; (g) in vivo mastery of trauma triggers to reduce generalized fear; (h) conjoint sessions with child and parent; and (i) enhanced safety and plans for safety in the future (Cohen et al. 2010). Ideally, TF-CBT is provided in parallel child and parent/primary caregiver sessions, with conjoint child-parent sessions that are added on later in treatment. Additionally, Cohen et al. (2010) suggest that flexible implementation of the model, with early focus on the

positive parenting component, can accommodate cases that are complex and include externalizing behavior problems. Cohen et al. note that externalizing behaviors often are the reasons why parents initially seek treatment for their children; not for PTSD/C-PTSD symptomatology. Therefore, one of the benefits of the TF-CBT model is that it treats both behavior problems and trauma symptoms. As part of the treatment package, explicit behavior management plans and ongoing monitoring of behaviors are required. Behavioral rehearsal and practice between sessions is expected of clients. Research evaluating TF-CBT indicates that it can ameliorate the symptoms of children who have incurred trauma (e.g., Cohen et al. 2005; Morina et al. 2016). Although significant modifications may be needed to adapt TF-CBT for children with ASD, the approach has a number of components that are likely to be appropriate and efficacious for children with ASD. We will review these components in our model below.

### Treatment Modifications for Children with ASD

There is a scarcity of literature as it pertains to treatment of trauma in individuals with ASD. Presently, there is only one case study that reports treatment modifications made for an adolescent with ASD who suffered a trauma (King and Desaulnier 2011). Although there is a well established literature supporting the use of TF-CBT as an evidence based practice for treatment of trauma in children (Cohen et al. 2010; Morina et al. 2016), to date there has been no extension of the research to children with ASD. However, there is an emergent body of literature that has looked at the application of CBT with individuals with ASD to teach ER (Scarpa and Reyes 2011; Shaffer et al. 2018; Thomson et al. 2015; Weiss et al. 2018) and to treat symptoms of anxiety (Chalfant et al. 2007; Ung et al. 2015; Wood et al. 2014). We believe that examining modifications to CBT with children on the autism spectrum to teach ER and to treat anxiety may be helpful in the development of a model to treat symptoms of trauma in children with ASD given the commonalities of shared symptoms with typically developing children who have incurred trauma. Therefore, we will next look at potential treatment modifications found in the CBT literature aimed at teaching ER and treating anxiety in individuals with ASD.

### Modified CBT to Teach ER

Research applying CBT to teach ER skills to children with ASD is emergent (Scarpa and Reyes 2011; Shaffer et al. 2018; Thomson et al. 2015; Weiss et al. 2018). In these studies, treatment protocols with modifications were used

to teach children with ASD to recognize and regulate their own emotions in group settings. Modifications included: (a) decreasing session length; (b) use of songs, stories, and play activities; (c) inclusion of parent training sessions; (d) skill building via psycho-education regarding affect, stress management, and understanding emotion expression; (e) highly structured sessions on specific topics; (f) parent group meetings to provide psycho-education concurrent with the children's sessions; (g) progress checks; (h) use of multimedia to teach skills; (i) modelling and role playing to practice skills being taught; (j) mindfulness and relaxation exercises; (k) promotion of generalization to home and school environments; and/or (l) token economies to reinforce skill development (Scarpa and Reyes 2011; Thomson et al. 2015). In order to extend the literature and address the urgent need to treat maladaptive ER, Shafer et al. (2018) developed, and conducted initial evaluation of the Intensive Outpatient Program for Emotion Regulation Treatment (IO-PERT). IO-PERT is comprised of components from CBT, mindfulness practices, and Applied Behavior Analysis (ABA). IO-PERT also involves caregiver training, that is founded in CBT, mindfulness, and ABA. Initial results suggest a high level of parent satisfaction, and IO-PERT appears to have a positive impact on teaching coping skills (Shaffer et al. 2018). Weiss et al. (2018) conducted a randomized waitlist-controlled trial of a manualized CBT program, Secret Agent Society: Operation Regulation (SAS: OR) to teach ER to a group of children with ASD. Teaching emotion naming in self and others, using relaxation techniques in challenging situations, and systematic exposure to increasingly distressing situations were components of the treatment package. Results indicated moderate to strong effects based on caregiver ratings of the intervention, however, child-reports showed no change (Weiss et al. 2018). Weiss et al. argue the lack of reported change was expected, given similar findings in a recent meta-analysis reported by Weston et al. (2016).

### Modified CBT to Treat Anxiety

The second body of literature that may prove useful in the development of a treatment model for trauma is the treatment of anxiety in children and youth with ASD. Anxiety, a common result of exposure to trauma in typically developing children (Copeland et al. 2007; Courtois 2008; Mazefsky et al. 2014; Streek-Fischer and van der Kolk 2000), frequently emerges as a comorbid disorder in individuals on the spectrum. Modified CBT, implemented in groups or with individuals, has emerged as a commonly used treatment of anxiety with children with ASD (Chalfant et al. 2007; Wood et al. 2009, 2014). A systematic review and meta-analysis reported by Ung et al. (2015), reported moderate effects of group implemented CBT in this population.

As with the implementation of CBT to teach ER to children with ASD, the application to treating anxiety in this population requires modifications. Chalfant et al. (2007) modified the “Cool Kids” curriculum to treat anxiety in a group of 47 children with high-functioning ASD. Modifications included: (a) increased number of sessions; (b) adapted material to teach identification of anxious feelings; (c) adapted material to teach somatic responses to anxiety; (d) simplified cognitive restructuring exercises; (e) adapted gradual exposure exercises to fearful stimuli; (f) planned relapse prevention; (g) increased use of visual supports; (h) structured worksheets; (i) modified exercises to teach relaxation skills; and (j) planned weekly exposure tasks to be completed as homework. Chalfant et al. examined the effectiveness of the modified CBT treatment using an experimental comparison group design. The 47 children were assigned to either an experimental group or wait list control group. Group sessions for the experimental group were conducted over a period of 12 weeks. Results showed that the CBT treatment group experienced statistically significant reductions in symptoms of anxiety compared to the wait list control group.

More recent modifications to CBT for the treatment of anxiety in children and youth with ASD have involved implementing modular CBT (Wood et al. 2014). Modular CBT concerns administering the treatment protocol individually instead of in groups. Individual implementation allows for individualizing treatment, matching the intervention to the unique learning characteristics of the child (Wood et al. 2014). For example, Wood et al. (2014) implemented Behavioral Interventions for Anxiety in Children with Autism (BIACA; Wood et al. 2009), in individual sessions, allowing clinicians select modules on a session by session basis, in order to better tailor intervention to the needs of the child. Components such as: behavioral activation, cognitive restructuring, in vivo exposure, and parent training remained part of the treatment (Wood et al. 2014). Taken together, modular CBT, which allows for individualization of a treatment protocol, along with modifications described in the literature to teach ER to children with ASD (Scarpa and Reyes 2011; Shaffer et al. 2018; Thomson et al. 2015; Weiss et al. 2018), and modifications found in the CBT literature to treat anxiety in groups of children with ASD (Chalfant et al. 2007; Wood et al. 2009) begins to provide a model from which to build a protocol for the treatment of trauma in children with ASD.

### Trauma Treatment Model for Individuals with ASD

Currently, there is no evidence-based practice for the treatment of trauma in individuals with ASD. In the following section we propose a multi-component treatment package

that draws on evidence-based practices in the treatment of trauma in other populations, while considering modifications and individualization of treatment for children with ASD (see Fig. 2). The model is comprised of components from TF-CBT for typically developing children and modified CBT to teach ER and treat anxiety symptoms in individuals with ASD. Individualization of the treatment package should be considered on a case-by-case basis given the variability in learning styles of children with ASD. Components of the modified TF-CBT package are presented in Fig. 1 and discussed below (see Fig. 1). Variables affecting individualization of the treatment are addressed, and examples of how to individualize treatment are suggested.

### Functional Behavior Assessment (FBA)

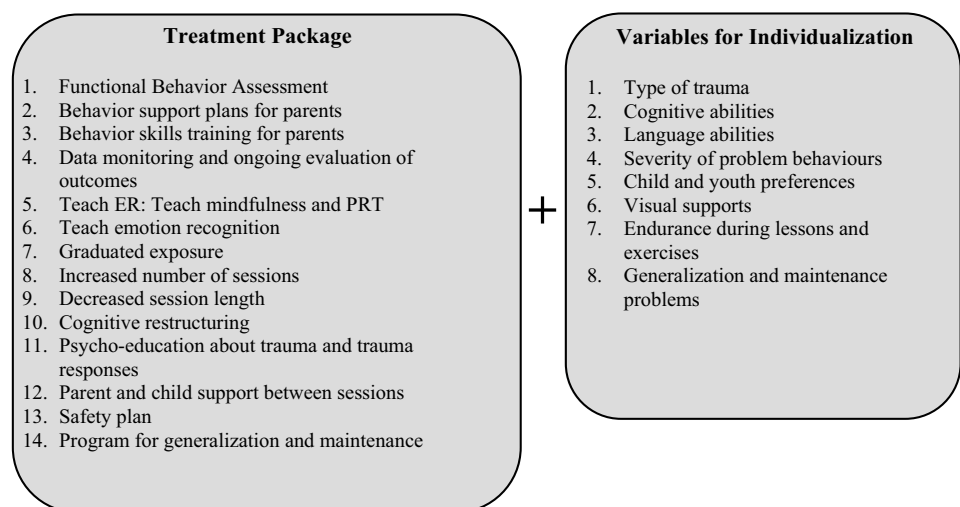
Many children who have incurred trauma(s), who are referred, or whose parents seek treatment engage in problem behaviors (Cohen et al. 2010). Furthermore, it is well documented that many children with ASD engage in problem behaviors as a result of their language impairment. Therefore, Cohen et al. (2010) recommend completion of an FBA to determine the function of the problem behaviors. The FBA will inform the development of a behavior support plan. Cohen et al. argue that it is important to determine the relationship, if any, between behavior problems and the child's trauma. The FBA can identify specific antecedent triggers for trauma-related problem behaviors and also the function of trauma-related behaviors. For example, self-harm, substance abuse or risky sexual behaviors triggered by memories of trauma may have the immediate function of reducing the trauma-related memories. Cohen et al. recommend assessing whether or not problem behaviors occurred prior to the trauma or if they emerged following the traumatic experience. Additionally, if the behavior problems

predated the trauma, assessing for changes in regard to rate, intensity or topography is recommended. For instance, completion of an FBA may inform the practitioner that self-harm in the form of hitting oneself in the head occurred prior to the trauma, however, a novel self-injurious behavior, in the form of scratching ones arm emerged following the trauma. Further, the FBA may determine that scratching may serve the function of escaping from traumatic memories.

### Behavior Support Plans and Behavioral Skills Training for Parents

With typically developing children, following the completion of an FBA, development of a function-based multi-component behavior support plan that is both technically sound and contextually appropriate is recommended (Cohen et al. 2010). The same component from this model should be applied to children with ASD, as they may present with worsening of pre-existing behavior problems or the emergence of new behavior problems resulting from traumatic experiences. One goal of intervention becomes to reduce problem behaviors while teaching children to use alternative communication responses and to regulate their emotional arousal. Like with typically developing children (Cohen et al. 2010), the development of behavior support plans should be a collaborative process, informed by parents and their child. Once a technically sound and contextually appropriate plan has been developed, parents should be taught to implement plan components with fidelity. To do so, the interventionist should employ behavioral skills training (BST) procedures such as role-play, coaching, and feedback. In addition to BST, training sessions should; (a) educate parents about trauma and the effects of trauma; (b) identify the nature of the trauma and create a trauma hierarchy; (c)

**Fig. 2** Treatment model for children with ASD who have suffered trauma(s) rooted in CBT and TF-CBT



**Trauma Treatment Model for Children with ASD**



plan for exposure homework exercises between sessions; and (d) review homework completion logs (Cohen et al. 2010).

### Data Monitoring and Ongoing Evaluation of Outcomes

Assessments of trauma symptomatology should be implemented prior to the onset of intervention, post intervention, and at 3–12 month follow-up to evaluate outcomes. Additionally, within sessions, a data-collection system to monitor the effectiveness of the approach should be made, and data-based decisions should be made on an ongoing basis to evaluate progress. Daily session data should be collected and evaluated for changes in: (a) the number of times the child uses an appropriate ER strategy; (b) the number of times the child engages in problem behavior in response to trauma associated stimuli; (c) the number of trauma triggers the child forbears using ER strategies (as per the trauma hierarchy); and (d) parent and child self-report of the emergence, continuation, or intensification of severe symptoms of trauma such as depression, self-injury or suicidal ideation.

### Teach Emotion Regulation

To address emotion dysregulation, a core symptom of trauma, teaching ER skills through mindfulness practices (Scarpa and Reyes 2011; Thomson et al. 2015) and Progressive Muscle Relaxation Training (PMRT) skills should be components of intervention. The use of multi-media (Scarpa and Reyes 2011; Thomson et al. 2015), such as videos to guide mindfulness practices, such as body scans and breath awareness should be incorporated. A mindfulness practice that may be used to teach emotion regulation is *Meditation on the Soles of the Feet*. This meditation practice directs individuals to focus on a neutral object, such as the soles of feet, and to maintain attention on this neutral body part (Singh et al. 2003). *Meditation on the Soles of the Feet* teaches the individual to stop, bring attention to the body, calm down, and then decide how to respond to the situation that triggered the emotional arousal (Singh et al. 2003). A variable to consider for individualization when teaching this practice may be that of the ability to maintain one's attention. Therefore, it will be important to ensure that the initial duration of mindfulness exercises is brief, gradually increasing time spent on these exercises. When working with children with severe cognitive impairments, the use of visual supports when teaching PMRT skills is recommended. When teaching flexing and relaxing of muscles, one can use photos of high preference characters (e.g., the Incredible Hulk) flexing and relaxing their muscles to model these actions. Finally, to extend on the application of the use of reinforcement procedures in the IO-PERT model for managing problem behaviors using token economies (Shaffer

et al. 2018), it will be necessary to create individualized plans to reinforce newly learned emotion regulation skills. Individualized token economies should be developed and implemented. For example, where one child may be able to earn three tokens before acquiring a backup reinforcer, another may require only earning two tokens before acquiring his/her backup reinforcer for the completion of mindfulness or PMRT exercises within sessions.

### Teach Emotion Recognition

Another component of a modified TF-CBT treatment package should include teaching children to name their emotions. When emotional suppression or dysregulation result from exposure to trauma, teaching children to name their emotional states may serve as a cue to engage in adaptive ER skills. For example, “I am angry—I should try to flex and relax my muscles” or “I feel scared—I should practice my breathing exercises.” A variable to consider for individualization is child preference. To help increase motivation to learn, one may include the learner's highest preference characters as part of the materials being used (e.g., if the learner has a preference for Mickey Mouse, one could include exemplars of him feeling happy, calm, sad, or angry). An additional variable to consider are the generalization difficulties of some learners on the autism spectrum. To promote generalization across stimuli, general case analysis is a systematic method for selecting teaching exemplars (Cooper et al. 2007). General case analysis requires selecting and teaching examples that are representative of the full range of stimulus situations (Cooper et al. 2007). For example, if teaching a child to label the emotion of anger, one ought to plan to teach the emotion across multiple exemplars by arranging the instructional materials so that they represent the full range of stimuli. A selection of materials, all representing the feeling of anger may include: Mickey Mouse feeling angry (or any cartoon character), a photo of the child her/himself feeling angry, a photo of a parent feeling angry, a line drawing of a person feeling angry, and a photo of a teacher feeling angry.

### Graduated Exposure

Graduated exposure is a common component of a TF-CBT treatment package (Cohen et al. 2005, 2010) and in the treatment of anxiety in children with ASD (Wood et al. 2009, 2014). Extending its application to the treatment of trauma in children with ASD is recommended. Exposure can systematically teach the child to tolerate stimuli that remind them of their trauma and gradually decrease the physiological distress associated with their experience. A trauma hierarchy should be created, in which environmental triggers are identified from least to most distressing. Children work their

way up the hierarchy as part of graduated exposure exercises (Wood et al. 2009). Successful attempts at using effective ER strategies in the face of environmental triggers are positively reinforced. Planning graduated exposure exercises between sessions can help with the promotion of generalization across environments (Chalfant et al. 2007). Although a common component of TF-CBT, individualization of this component of the package is important to emphasize. For example, providing opportunities to practice the same exposure exercise multiple times, across multiple environments, paired with child specific reinforcers for successful use of ER strategies in the face of distressing events should be considered. Further, in children with impaired language and cognitive abilities, it may be helpful to add a within-activity schedule to provide increased structure and predictability around exposure exercises. Following the within-activity schedule step by step, may increase the child's understanding of the process, and help the child to predict when it will end. Caution when implementing graduated exposure must be taken with individuals who have not developed sufficient emotion regulation skills, as exposure therapy can cause re-traumatization, leading to severe symptoms such as suicidal ideation or attempts, and depression (Courtois 2004, 2008). In cases where exposure therapy is contraindicated, the goal of therapy becomes teaching children to discriminate between dangerous and non-dangerous situations, and to use skills to problem solve about how to cope with both types of situations (Cohen et al. 2010).

### Cognitive Restructuring

Trauma narrative and processing aim to correct cognitive distortions that are the result of trauma. Additionally, cognitive coping skills aim to make clear the connection between one's thoughts, feelings, and behaviors (Cohen et al. 2010). In cases where individuals with ASD have severe cognitive impairments, cognitive restructuring exercises may require individualization or removal from the treatment package altogether. Similar to modifications found in the treatment of anxiety for children with ASD (Chalfant et al. 2007; Wood et al. 2009, 2014), increased use of visual supports is recommended for children who require them. The use of simplified language along with visual supports to teach concepts may help children understand the concepts being taught in cognitive restructuring exercises. In cases where a child cannot generate his or her own responses verbally, creation of worksheets, where he/she answers written questions or completes fill-in-the-blank exercises can be implemented. As well, re-scripting the traumatic narrative, simplifying language, adding pictures to help make meaning of the story, and adding visuals of happier endings for the child may be a way to individualize cognitive restructuring for learners with

language delays or severe cognitive impairments. When working with young children, focusing on teaching ER and implementing exposure therapy may be most relevant to treatment, while forgoing components of treatment such as cognitive restructuring.

### Psycho-education About Trauma and Trauma Responses

Another component of TF-CBT for individuals with ASD should be psycho-education regarding what trauma is and people's responses to trauma. The literature regarding teaching emotion regulation to children with ASD recommends parent education as a component of the treatment package (Scarpa and Reyes 2011; Shaffer et al. 2018; Thomson et al. 2015; Weiss et al. 2018). We further recommend that psycho-education should be implemented for both children and their parents. Cohen et al. (2010) found it beneficial to provide psycho-education about the connection between behavior problems and trauma. In addition, it is important to teach parents that changing their own behavior and changing the environment are crucial components for their child's behavior change. For children with ASD, psycho-education about trauma and responses to trauma also should be included. However, factors for individualization should again be considered. Like the literature on the treatment of anxiety in this population recommends, using simplified language or adding visual supports to instruction is recommended (Chalfant et al. 2007; Wood et al. 2014). Additionally, individualization of treatment may require consideration of child preferences when creating lesson materials. For example, when teaching children about how their bodies respond to trauma, one can create simple cartoons of the fight or flight response to threat, with developmentally appropriate language to teach this concept. An additional consideration for individualization may be a child's endurance to learn. Scheduling breaks away from task demands during psycho-education sessions is recommended for children who cannot attend to task demands for extended periods of time. Finally, as the literature for both teaching emotion regulation and the treatment of anxiety support, use of reinforcement strategies (Shaffer et al. 2018; Wood et al. 2014) should also be extended to the psycho-education about trauma and trauma responses. Consideration of child preferences when planning the use of reinforcers should be considered as well. If a token economy is used to reinforce active responding in sessions about the effects of trauma, then tokens can be customized to include child preferences. For example, if a child has a strong preference for vehicles, then tokens could be customized with images of vehicles.

## Dosage Level and Between-Session Support

When considering dosage level of treatment, interventionists should plan for an increase in the number of sessions and a decrease in session length to take into account the learning difficulties of individuals on the autism spectrum. This has commonly been a component of both treatment packages to teach ER and treat anxiety in children with ASD (Chalfant et al. 2007; Scarpa and Reyes 2011; Shaffer et al. 2018; Thomson et al. 2015; Weiss et al. 2018). In addition, providing support between sessions may prevent attrition rates when treating trauma. A brief between-session phone call, lasting 5–15 min, can be implemented to answer questions or concerns that clients may have or to ensure homework exercises are being completed (Koerner 2012).

## Safety Plan

A safety plan should be developed in order to enhance the safety of the child when he/she perceives their safety is threatened or to prevent future occurrences of the traumatic event. Developing a trusting working relationship with the therapist, identification of safe adults who can support the child, along with the development of emotion regulation skills must be prioritized (Cohen et al. 2012). Developing a trusting relationship with a child with ASD may be challenging as a result of idiosyncratic preferences, challenges with language skills, and impaired social and play skills. Therefore, ensuring child preferences are incorporated into therapy sessions is recommended.

An additional safety strategy is to help the child identify adults who are safe and who can support the child outside of therapy (Cohen et al. 2012, 2011). Adults who can support the child outside of therapy can provide support both in times of perceived threat, or when the child may have experienced a novel trauma (Cohen et al. 2011, 2012). The child with ASD may require more than the identification of safe adults in a therapy session. He/she may benefit from the creation of a visual support, that can be taken home, which includes: (a) a photo of each person identified as safe; (b) the name of the individual written on the visual; (c) contact information for the individual; (d) explicit rules written on the visual that state when he/she should seek support from the person. Additional modifications can be made to the visual support, depending on the particular level of need of the child. The use of the visual support should then be role-played in therapy, and paired with reinforcers contingent on correctly participating in the role-play activity. As well, the use of reinforcers should be applied to the natural environment to increase the likelihood that the child will use the safety visual when needed. Specifically, when the child uses the visual support to get adult support when feeling threatened, or if experiencing a new threat, he/she should

earn a reinforcer for seeking support from a safe person in the natural environment.

Finally, as Courtois (2004, 2008) has argued, exposure therapy can lead to severe side-effects such as re-traumatization, and the emergence of symptoms such as suicidal thoughts and attempts. In these cases, graduated exposure should be immediately terminated, and a shift in treatment should be made to further develop emotion regulation skills.

## Program for Generalization and Maintenance

In children with ASD, generalization and maintenance of treatment effects cannot be assumed, therefore it will need to be systematically promoted. Generalization can be promoted by: (a) selecting and teaching across a wide range of exemplars and skills (e.g., different triggers at the same level in a trauma-hierarchy; a variety of ER or mindfulness strategies to neutralize the effects of triggers for trauma-related problem behavior); (b) mediating generalization by teaching the child to use a self-monitoring and self-management checklist can prompt ER skills or mindfulness practices in the face of stimuli associated with past trauma; (c) providing opportunities for the child to use ER skills and mindfulness practices across a range of situations in which trauma-related problem behavior has occurred in the home, school, or community; and (d) arranging the environment so that the child receives positive reinforcement contingent on using ER skills and mindfulness practices to successfully self-regulate their behavior in the face of trauma-related stimuli. Maintenance can be systematically promoted by: (a) providing ongoing opportunities for exposure and practice of ER skills and mindfulness practices; and (b) delivering robust positive reinforcement (i.e., praise paired with tangible reward) for demonstration of appropriate ER skills and mindfulness practices in the face of triggers for trauma-related problem behavior.

## Conclusion

A collaborative research approach is needed to advance scientific knowledge of how to assess and treat trauma in children with ASD to ameliorate the immediate symptoms of trauma and to prevent long-term side effects such as learning challenges, emotion dysregulation, dissociation, anxiety, depression, and self-harm. It is important to note that development of valid and reliable assessments of trauma in children with ASD, which take into account the unique learning challenges are needed, however, this is beyond the scope of this article. To date, TF-CBT has been demonstrated in the literature to be an evidence-based treatment of trauma in typically developing children (Cohen et al. 2010; Morina et al. 2016). However, there has been no extension

in the research to children and youth with ASD. This paper proposes a modified TF-CBT model for the treatment of trauma in children and youth with ASD. However, research is required to evaluate the efficacy and acceptability of the proposed multicomponent treatment package when implemented with children with ASD. Given the positive results of empirically investigated treatments for typically developing children who have experienced trauma, and for adapted versions of CBT and ER training for children with ASD and anxiety, research on an adapted multicomponent model of treatment for trauma in children with ASD holds much promise.

**Author Contributions** AS conceived of this manuscript, completed a literature review, developed the modified treatment design for a trauma intervention for children with ASD, created the figures, and drafted the manuscript. JL helped draft the manuscript, helped guide the literature review, helped with the design of a treatment model for trauma in children with ASD, and revised figures. All authors read and approved the final manuscript.

## Compliance with Ethical Standards

**Conflict of interest** The authors declare that they have no conflict of interest.

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