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Symptom Presentation of Children with Autism Spectrum Disorder after
Adverse Childhood Experiences

A dissertation submitted in partial satisfaction of the requirements for the degree of
Doctor of Philosophy in Counseling, Clinical and School Psychology

by

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September 2020

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June 8th, 2020

DEDICATION

To the children that inspired this research.

We cannot rely on the silenced to tell us they are suffering.

- Hanan Ashrawi

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To my family – my mother, Sharn, and my siblings Gemma, Robert, and Kevin, who supported me in my goal of pursuing and completing graduate school. Thank you.

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ABSTRACT

Symptom Presentation of Children with Autism Spectrum Disorder after

Adverse Childhood Experiences

by

Amy C. Barrett

Research shows that children with developmental disabilities, such as autism spectrum disorder (ASD), are at significantly increased risk for adverse childhood experiences (ACEs) and traumatic experiences. Children and families impacted by ASD possess several identifiable risk factors which further amplify their risk for ACEs. There are several characteristics of ASD that may exacerbate posttraumatic stress symptoms in this population, such as pre-existing anxiety-related conditions and poor emotion regulation abilities. However, identifying posttraumatic stress symptoms in this population is difficult due to broad overlap between posttraumatic stress and ASD-related symptoms that leads to diagnostic overshadowing. The current study measured symptoms of posttraumatic stress and social impairment in children with ASD who experienced ACEs and compared them to children with ASD without ACEs and typically developing children with ACEs. Results found that children with ASD who experienced ACEs demonstrated greater rates of comorbid diagnoses of ADHD, depression, and anxiety and demonstrated significantly higher rates of posttraumatic avoidance, depression, anger/aggression, and overall posttraumatic stress compared to children with ASD without ACEs. They did not demonstrate increases in ASD-related symptoms of social impairment as a result of ACEs. ACEs type was predictive of posttraumatic stress symptoms in several domains. In typically developing children, a high number of accumulated ACEs was predictive of

clinically significant symptoms of social impairment that may contribute to the diagnostic ambiguity between ASD and posttraumatic stress response to ACEs in children.

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Symptom Presentation of Children with Autism Spectrum Disorder after Adverse Childhood Experiences

I. Introduction

Children are the most victimized segment of our population (Finkelhor, Ormrod, Turner, & Hamby, 2005). The most recent report by the U.S. Department of Health and Human Services Children's Bureau in 2018 estimated that 678,000 children are victims of child abuse or neglect annually (U.S. Department of Health & Human Services & Administration on Children, 2020). While these numbers are startling, the reality for children with disabilities is much worse. Research suggests that children with disabilities are 3.4 times more likely to experience abuse or neglect than their nondisabled peers (Sullivan & Knutson, 2000) and children with autism spectrum disorder encompass a significant proportion of these children.

It is estimated that autism spectrum disorder (ASD) affects approximately 1 in 54 children in the United States, with boys being four times as likely to be diagnosed as girls (Maenner, 2020). Children with ASD are at greater risk for adverse childhood experiences (ACEs)(Felitti et al., 1998), but research has yet to investigate how a diagnosis of ASD may impact a child's psychological response to ACEs. Individuals affected by ASD experience impairments in social communication and social interaction and have difficulty developing, understanding, and maintaining social relationships (American Psychiatric Association, 2013). They also present with restricted, repetitive patterns of behavior such as repetitive motor movements, fixated interests, insistence on sameness, inflexibility to adapt to changes in routine, and elevated response to sensory input. Many individuals with ASD are also dependent on others and are sometimes described as socially naïve, making

them more vulnerable to exploitation (Kerns, Newschaffer, & Berkowitz, 2015; McEachern, 2012). However, having a diagnosis of ASD not only impacts the affected individual, but all members within the family unit. A great deal of research has highlighted the increased levels of stress that parents of children with ASD endure in comparison to parents of children with other developmental disabilities or typically developing children (Dabrowska & Pisula, 2010; Estes et al., 2009; Schieve, Blumberg, Rice, Visser, & Boyle, 2007). Parent stress and psychological distress are significantly elevated due to factors such as limited social support, isolation, and the increased financial responsibilities of raising a child with special needs (Benson, 2006; Dunn, Burbine, Bowers, & Tantleff-Dunn, 2001; Singer, 2006). All of these risk factors combined increase the likelihood of ACEs among children with ASD (Algood, Hong, Gourdine, & Williams, 2011). Although children with disabilities are shown to experience more frequent and more severe episodes of maltreatment (Hershkowitz, Lamb, & Horowitz, 2007), it is believed that many victims with ASD go unidentified due to impairments in verbal communication and diagnostic overshadowing that may mask common red flags that abuse or neglect is occurring.

Despite this knowledge, very few studies have examined posttraumatic response in individuals with ASD, and results have failed to produce consistent findings. Questions still remain about how children with ASD process traumatic experiences differently than their typically developing peers. By understanding how this vulnerable population responds to ACEs, psychologists and practitioners may be better equipped with the knowledge needed to identify victims and provide appropriate care.

A. Prevalence Rates of Traumatic Experiences among Children with Developmental Disabilities

More than 60% of children and adolescents in the United States will experience a potentially traumatic event before they reach 16 years of age (Copeland, Keeler, Angold, & Costello, 2007; Finkelhor et al., 2005). The largest population-based study done to date found that 31% of children with disabilities experienced maltreatment compared to 9% of their nondisabled peers (Sullivan & Knutson, 2000). It was also discovered that most children with disabilities endure multiple forms of maltreatment, with neglect being most common. Among this vulnerable population, children with speech- and language-related disabilities, such as ASD, are at heightened risk for all forms of maltreatment –five times more likely to be a victim of neglect and physical abuse, three times more likely to be a victim of sexual abuse, and seven times more likely to be a victim of emotional abuse than their nondisabled peers. These stark findings have been substantiated by other community-based studies by finding that, according to parent report, 30.7% of children with ASD experienced physical and/or sexual abuse during childhood (Mandell, Walrath, Manteuffel, Sgro, & Pinto-Martin, 2005). The unfortunate truth is that despite this elevated rate of victimization, the rate of child-protection registration for children with autism and sensory disabilities is not elevated compared to the general population (Spencer et al., 2005). Very few child protective service agencies or social service agencies provide their employees with training for how to effectively assess and identify abuse and neglect in children with ASD due to limited understanding of the unique risk factors specific to this population.

C. Child Risk Factors Associated with ACEs in ASD Populations

In general, children are more vulnerable to maltreatment due to their dependence on adults and others; although this risk factor is heightened among children with disabilities

such as ASD (Kerns et al., 2015). One of the core symptoms of ASD is impairment in social communication (American Psychiatric Association, 2013). Some individuals with ASD are deemed “nonverbal” and lack the language abilities to communicate their wants and needs to others through speech. Others may have large vocabularies and strong speech abilities but struggle with the complexities of social conversation, interpretation of nonverbal social cues, and communication of mental or emotional suffering to others (Levy et al., 2010). It is hypothesized that these language and social impairments impede an individual’s ability to disclose abuse and prevent others in their environment (e.g. family members, teachers) from detecting victimization (McEachern, 2012). This idea is supported by research that have found that children with disabilities are more likely to experience severe abuse yet are less able to disclose maltreatment when it occurs (Hershkowitz et al., 2007). In addition, parents often describe their children with social disabilities as “socially naïve”, further putting them at risk of exploitation, coercion, or grooming for abuse (Edelson, 2010). These factors lead us to believe that individuals with ASD may be the unheard victims of trauma and maltreatment.

D. Parental and Family Risk Factors Associated with ACEs in ASD Populations

There are several risk factors within a child’s environment and family system that are shown to increase likelihood of maltreatment, including poverty or lack of financial resources, poor parent mental health, difficulties with impulse control, substance use, parenting or life stress, marital discord, feelings of isolation, and lack of social support (Brown, Cohen, Johnson, & Salzinger, 1998; Crouch, Milner, & Thomsen, 2001; Dixon, Browne, & Hamilton-Giachritsis, 2009; Doidge, Higgins, Delfabbro, & Segal, 2017; Jud, Lips, & Landolt, 2010; Pogge, 1992). Unfortunately, children and families impacted by

ASD experience several of these risk factors. Research findings show that parents of children with ASD experience significantly higher levels of stress, marital difficulties, and psychological distress than parents of children with other developmental disabilities or typically developing children (Dabrowska & Pisula, 2010; Estes et al., 2009; Gau et al., 2012; Schieve et al., 2007). After receiving their child's ASD diagnosis, several parents experience stages of questioning, denial, devastation, and self-blame (Altiere & von Kluge, 2009). Over time, parents are more likely to feel their child is harder to care for than other same-aged children, give up more of their life than expected to meet their child's needs, and experience increased difficulty balancing care tasks for their child with daily activities (Schieve et al., 2007). In addition, families with a child with ASD experience more financial difficulties due to the extensive health care needs of their child with ASD, such as psychiatric evaluations, early intervention therapies, and speech-language and behavioral in-home therapies (Hoefman et al., 2014). As a result, these parents suffer from higher rates of mental and physical health problems compared to parents of typically developing children. While many parents report feeling fulfillment from caring for their child, approximately 40% experience clinically elevated levels of depression. Rates are highest among this population in comparison to parents of all developmental disabilities as a whole (29%) and typically developing children (19%)(Singer, 2006).

One of the most influential predictors of parental stress and depression among parents of ASD is having inadequate social support (Benson, 2006; Dunn et al., 2001). Unfortunately, the positive effects of social support only go so far as its ameliorating effect decreases when a child's autism symptoms are severe (Estes et al., 2009). For many, their child's unpredictable behavioral challenges make leaving the house seemingly impossible,

resulting in limited family opportunities and feelings of isolation (Altiere & von Kluge, 2009; Dabrowska & Pisula, 2010) In addition, parents commonly report loss of support from those previously close to them (i.e. friends, extended family members, church) due to the challenges that come with having a child with ASD. In addition to feelings of isolation from those outside the home, it appears that parents may also feel disconnect in the parent-child relationship. An in-depth qualitative study found that parents of children with ASD commonly feel reduced closeness to their child and feel less able to share ideas or talk about things that matter with their child (Schieve et al., 2007). Dysfunctions in parent-child relationships and relationships that lack secure attachment are salient risk factors for maltreatment (Cyr, Euser, Bakermans-Kranenburg, & Van Ijzendoorn, 2010). Several studies have investigated this topic and found that children with disabilities generally show lower rates of secure attachment than their typically developing peers (Howe, 2006). However, further analyses specifically with children with ASD speculates that this finding applies predominantly to children with more severe autism symptoms and comorbid intellectual disability (Rutgers, Bakermans-Kranenburg, van Ijzendoorn, & van Berckelaer-Onnes, 2004). However, in many cases the extra required care and potential behavior problems seen among children with ASD may negatively impact parent-child bonding and increase likelihood of maltreatment.

Children and families affected by ASD possess several risk factors that increase their likelihood of ACEs. In addition, having four or more of these risk factors significantly increases one's risk (Brown et al., 1998). Researchers and practitioners are still left with the unanswered question of how individuals with ASD experience and respond to maltreatment and early adverse childhood experiences.

B. Adverse Childhood Experiences (ACEs) and ASD

The CDC-Kaiser Permanente Study is one of the largest investigations of the effects of child abuse and neglect on health and psychological wellbeing later in life (Felitti et al., 1998). The study of over seventeen thousand adult participants assessed for adverse childhood experiences (ACEs) during the respondent's first 18 years of life. ACEs included forms of abuse (emotional abuse, physical abuse, sexual abuse), neglect (emotional neglect, physical neglect), and household challenges (mother treated violently, substance abuse in the household, mental illness in the household, parental separation or divorce, incarcerated household member). The Center for Youth Wellness expanded the ACEs screener in 2015 from the original ten ACEs to include nine items assessing for exposure to additional early life stressors (Burk Harris, 2015). These include living in foster care, harassment or bullying at school, separation from a primary caregiver due to deportation or immigration, a serious medical procedure or life threatening illness, seeing or hearing violence in the neighborhood or in the school neighborhood, and being treated badly because of race, sexual orientation, place of birth, disability, or religion.

Research has documented the cumulative effect of ACEs on physical and mental health and behavior (Dube, Cook, & Edwards, 2003; Kalmakis & Chandler, 2014, 2015). In fact, having 4 or more ACEs is associated with early childhood toxic stress that leads to a variety of physical health problems, such as diabetes, heart disease, and stroke as well as mental health problems, such as depression and substance abuse in adulthood (Campbell, Walker, & Egede, 2016). Experiencing a high number of ACEs before age 5 problems in social development (Kerker et al., 2015). As a result, early detection can prevent further exposure to ACEs and the negative outcomes associated with them.

Very few studies have examined the presence and effect of ACEs on children with ASD. Two studies using the 2011-2012 National Survey of Children's Health identified that a diagnosis of ASD was associated with a higher probability of increased ACEs and simultaneously lower levels of resiliency (Berg, Shiu, Acharya, Stolbach, & Msall, 2016; Ricles, 2017). A study by Kerns discovered that increased ACEs in ASD is more pronounced when relatives of those with ASD have psychiatric disorders and when families are of low socioeconomic status (Kerns, Newschaffer, Berkowitz, & Lee, 2017). Unfortunately, the experience of ACEs is also associated with a delayed age of diagnosis and entrance into treatment services for young children with ASD (Berg, Acharya, Shiu, & Msall, 2018). While research has confirmed that children with ASD are at an increased risk for ACEs, no study has yet to examine the effects of abuse, neglect, and other ACEs on symptoms presentation of children with developmental disabilities, such as autism spectrum disorder.

E. The Impact of Social-Emotional Deficits in ASD on the Processing of Traumatic Events

There is very little research dedicated to how individuals with ASD respond to trauma and adverse experiences. One hypothesis is that deficits in social and emotional processing seen within ASD may serve as a protective factor against the ramifications of interpersonal trauma. Understanding facial information and recognizing emotional expressions are core skill deficits in ASD (S. Baron-Cohen et al., 2000; Hobson, Ouston, & Lee, 1989); yet, these interpersonal skills are likely utilized when identifying threatening interpersonal situations such as emotional abuse, bullying, or domestic violence. A study interviewing high-functioning children with autism discovered that while they could successfully

demonstrate understanding of basic emotions (happy, sad, angry, afraid, and disgusted), they demonstrated a significantly reduced ability to produce contextually appropriate accounts for complex emotions (curious, disappointed, and surprised) and self-conscious emotions (proud, embarrassed, guilty, and ashamed) compared to their typically developing peers (Losh & Capps, 2006). In addition, when asked to describe these emotions, they tended to do so with stereotypical or “textbook” responses rather than reflecting on past personal experiences or memories. As a result, many children and adults with ASD have difficulty with emotional insight, forming emotional connections with others, and paying attention to another’s distress (Dawson et al., 2004). Therefore, it is possible that these deficits may prevent a child with ASD from interpreting the harmful context of violent social situations, such as emotional abuse or domestic violence, and be spared from the damaging psychological effects? In partnership with emotion recognition is social insight. Individuals with ASD demonstrate deficits in Theory of Mind (ToM), the ability to attribute mental states (i.e. beliefs, desires, intention, and emotions) to themselves and others in order to predict and explain human behaviors (Simon Baron-Cohen, 2000). This leads psychologists to question the emotional impact that interpersonal violence may have on children with autism, specifically in regard to their ability to recognize the malicious intentions of others as well as their ability to appropriately understand painful emotions that occur as a result. However, there is evidence against this theory as a 2013 study found that children with ASD who experienced frequent bullying were more likely to experience internalizing symptoms than those who did not (Zablotsky, Bradshaw, Anderson, & Law, 2013). These results acknowledge that individuals with autism may be

sensitive to the negative effects of interpersonal conflict; however, more research is needed.

On the other hand, there are many ways in which cognitive patterns common among individuals with ASD may cause an exacerbated response to adverse experiences compared to their typically developing peers. For example, studies have shown that poor emotion regulation, a common symptom of ASD, increases the risk of developing traumatic stress and other psychopathological symptoms (Losh & Capps, 2006; Mazefsky et al., 2013; Mehtar & Mukaddes, 2011; Prizant & Laurent, 2011). Amplified emotional responses and poor emotional control may manifest in socioemotional and behavioral problems such as tantrums, verbal outbursts, emotional meltdowns, or anxiety attacks (Mazefsky et al., 2013). This reduction in emotional regulation likely decreases effective cognitive coping strategies, leading to exaggerated responses to trauma and stressors (Mazefsky et al., 2013; Turner, Finkelhor, & Ormrod, 2010). In thinking about how children and adolescents with ASD might exhibit signs of trauma and posttraumatic stress, several studies have identified a strong relationship between emotional dysregulation and self-injurious behavior (Duerden et al., 2012; Prizant & Laurent, 2011; Soke et al., 2017). This may occur when the individual feels triggered by sensory or environmental stimuli or feels frustrated due to lack of understanding about what is happening around them. It is hypothesized that self-injurious behaviors are used by individuals with ASD to regulate and reduce elevated arousal and release tension and anxiety associated with traumatic events.

In addition, individuals with ASD are more susceptible to developing comorbid disorders. Current studies estimate that 40% of the ASD population presents with comorbid anxiety disorders, which is higher than the 20-30% lifetime prevalence rate in the general

U.S. population (McLean, Asnaani, Litz, & Hofmann, 2011). The most common anxiety-related disorder among those with ASD is specific phobias (30%), followed by OCD (17%) and social anxiety disorder (16%)(van Steensel, Bögels, & Perrin, 2011). Individuals with ASD often experience cognitive perseveration and rumination, becoming “stuck” on thoughts that can be positive or negative in nature (Wood & Gadow, 2010). Cognitive perseveration can begin as early as toddlerhood and can lead to significant difficulties with disengaging from hurtful or disturbing thoughts or memories associated with a traumatic event. Research with typically developing individuals has shown that maladaptive coping styles of rumination, as well as avoidance, are strongly associated with increased vulnerability for exacerbated posttraumatic stress response (DiGangi et al., 2013). There is no known evidence to suggest that this pattern of increased rumination/perseveration leading to exacerbated posttraumatic stress response would be different in the ASD population. As a result, it is hypothesized that individuals with ASD may carry a significant predisposition to heightened posttraumatic stress response to maltreatment or traumatic events. Lastly, a common focus of posttraumatic treatment is to shift one’s perspective in response to an experienced trauma; however, the overly rigid, rule-governed, black-and-white thinking common among individuals with ASD may lead them to be less receptive to posttraumatic interventions and impede recovery following a traumatic event.

F. Barriers to Identifying Posttraumatic Symptoms in ASD Population

A large amount of research dedicated to studying posttraumatic response following traumatic or adverse childhood experiences in typically developing children has found that victims are at increased risk for developing psychiatric disorders, such as anxiety and depression, as well as functional impairments, interpersonal difficulties, and school-related

problems (Copeland et al., 2007; Scheeringa, Wright, Hunt, & Zeanah, 2006). A significant barrier to identifying posttraumatic stress symptoms in children with ASD is the high degree of overlap between ASD and PTSD, leading to potential diagnostic overshadowing of the emergence of posttraumatic stress response after adverse childhood experiences and experiences of trauma. Several of the primary symptoms outlined in the *Diagnostic and Statistical Manual of Mental Disorders*, Fifth Edition (DSM-V; American Psychiatric Association, 2013) and corresponding research for posttraumatic stress and trauma response in children overlap with symptoms commonly associated with ASD across several domains. These include avoidance of nonpreferred stimuli (i.e. activities, people, or conversations), emotion dysregulation, compulsive or self-injurious behaviors, hyperarousal to loud noises or sudden movements, social withdrawal, irritable behavior, angry outbursts or extreme temper tantrums, and dissociative behavior (i.e. fixed eyes, flattened affect, long periods of silence, monotonous voice, stereotyped movements, and excessive intellectualization)(Briere, 1996; Treatment, 2014). It has also been reported that the most prominent illustration of self-regulation difficulties witnessed in children after trauma is experiencing a seemingly minor stressor as overwhelming, resulting in self-destructive behaviors, compulsive behaviors, or self-injury (Van der Kolk, 2002). However, these responses are also seen among individuals with ASD in response to small changes in routine, transitions, or adverse environmental stimuli (American Psychiatric Association, 2013). To explore this fully, *Table 1* outlines the many known signs and symptoms of maltreatment that overlap with symptoms of ASD.

Table 1
Symptom overlap between posttraumatic stress and autism spectrum disorder in children

Child Neglect:	Child Emotional/Psychological Abuse:
-----------------------	---

Disturbed parent-child interactions	Insecure attachment
Social withdrawal	Difficulty making and retaining friends
Few reciprocal friendships	Social phobia
Receptive and expressive language deficits	Deficits in cognitive ability
Deficits in language comprehension and verbal abilities	Lack of creativity
Apathy and withdrawal	Disruptive classroom behavior
Ineffective coping	Self-abusive behavior
Difficulties recognizing/discriminating emotion	Anxiety
Physical aggression	Hyperactivity/distractibility
Attention Problems	Dependence on adults for help and support
Cognitive deficits	
Child sexual abuse (preschool):	Child Physical Abuse:
Developmental regression	Delayed play skills
Social withdrawal	Poor social interaction skills
Anxiety	Difficulty making friends
Tantrums/aggression	Deficits in prosocial behaviors
Eating disturbances	Deficits in social competence
Gastrointestinal issues	Interpersonal difficulties
Child sexual abuse (school-age):	Maltreatment in adolescents:
Developmental regression	Violence towards family members
Social withdrawal	Self-injurious behavior
Poor peer relations	Social-skills deficits
Anxiety	Suicidal thoughts
Phobias	Poor coping and anger management skills
Tantrums/aggression	High levels of daily stress
Obsessions	Low self-esteem
Poor attention	Vulnerable to sexual coercion
Gastrointestinal issues	Attention problems
	Eating disturbances

(Barnett, Miller-Perrin, & Perrin, 2010)

Children with ASD, particularly those with impaired verbal communication abilities, may exhibit behavioral reactions to ACEs similar to typically developing children. However, due to diagnostic overshadowing, these behaviors may be misinterpreted by others as a manifestation of ASD rather than traumatic stress, therefore leading to further victimization and inadequate or inappropriate interventions (Edelson, 2010). As a result, it is important to investigate how posttraumatic stress symptoms manifest in children with ASD in order to aid in the identification of victims and help inform evidence-based treatment approaches.

Very few studies have attempted to measure posttraumatic symptoms as a result of ACEs in children with developmental disabilities, and results have been inconsistent. A 2003 study found that adults with intellectual disability who had experienced childhood sexual abuse exhibited common symptoms of anxiety, depression, and post-traumatic symptoms compared to their nondisabled peers, but with the addition of stereotypical behavior (Sequeira, Howlin, & Hollins). Only 19 of the 54 abused individuals in this study demonstrated symptoms consistent with a DSM-IV diagnosis of post-traumatic stress disorder (PTSD), supporting other studies in the idea that the diagnosis of PTSD does not accurately capture the complex developmental effects of childhood trauma exposure (Cook et al., 2017; Copeland et al., 2007; Ford & Courtois, 2009; Hall, Jobson, & Langdon, 2014; Turner et al., 2010). Instead researchers are progressing towards conceptualizing children's response to maltreatment and trauma by looking at the range of presenting symptoms, which include affect and behavior regulation, disturbances in cognition, and interpersonal impairment (D'Andrea, Ford, Stolbach, Spinazzola, & van der Kolk, 2012). Mandell et al. found that children with ASD who experienced physical abuse were more likely to have academic problems, demonstrate sexual acting out, be sexually abusive towards others, attempt suicide, and run away from home compared to other children with ASD (2005). Those who experienced sexual abuse demonstrated these same symptoms, in addition to self-injurious behavior, other suicide-related problems, and increased psychiatric hospitalizations. Another study by Mehtar & Mukaddes in Turkey found that children with ASD and trauma showed deteriorations in social interaction, verbal communication skills, and self-care skills as well as increases in anger, aggression, stereotyped behavior, distractibility, sleep problems, agitation, self-injury, and

hyperactivity (2011). A recent study conducted with children and adolescents with ASD within an inpatient setting found that experiences of abuse were associated with significant increases in irritability, loss of interest, lethargy, intrusive thoughts, and distressing memories (Brenner, Pan, Mazefsky, Smith, & Gabriels, 2017). In contrast to other studies, they did not find any significant differences between groups for stereotyped behaviors, hyperactivity, adaptive skills, or anger/aggression. However, the study was limited to experiences of physical abuse, sexual abuse, or emotional abuse and did not assess for the presence of other adverse childhood experiences. Overall, the existing research is still unclear regarding how individuals with ASD respond to trauma and maltreatment.

G. Purpose and Aims

Research has shown that children with developmental disabilities, such as ASD and other speech-related impairments, are at significantly increased risk for ACEs. Children with ASD possess several identifiable risk factors, including impaired communication and social skills, heightened reliance on others, and increased parent stress and psychopathologies. There are several characteristics of ASD that may exacerbate posttraumatic stress symptoms in this population, such as pre-existing anxiety-related conditions and poor emotion regulation abilities. Currently, there is little research examining the unique symptom presentation for this population after adverse childhood experiences.

Due to this gap, the purpose of the current study is to examine how children with ASD respond to adverse childhood experiences compared to children with ASD who have not experienced adverse childhood experiences. It will also explore similarities and differences in symptom presentation compared to typically developing children who experience ACEs.

H. Hypotheses

Specifically, this study will address four research hypotheses:

1. Children with ASD and ACEs will demonstrate greater rates of externalizing symptoms than both other participant groups. Specifically, they will demonstrate greater rates of anger/aggression and self-injurious behaviors.
2. Children with ASD and ACEs will demonstrate greater rates of anxiety-related internalizing symptoms than both other participant groups. Specifically, they will demonstrate greater rates of anxiety, intrusion, avoidance, and compulsive behaviors.
3. Within symptom profiles of children with ASD and ACEs, externalizing symptoms will be of greater clinical significance than internalizing symptoms.
4. Among children with ASD and ACEs, there will be an inverse relationship between social impairment and posttraumatic stress symptoms. Children with higher SRS-2 scores (indicating of more significant impairments in social awareness and cognition) will demonstrate lower TSCYC scores (indicating less posttraumatic stress) in line with the hypothesis that reduced social cognition abilities associated with ASD will serve as a protective factor against the psychological effects of adverse experiences and traumatic events.

II. Methodology

A. Recruitment

After obtaining ethics approval for the proposed study from the institutional review board (IRB), participants were recruited and data was collected via TurkPrime, an online research platform integrated with Amazon Mechanical Turk. Through TurkPrime,

individuals can complete online research surveys in exchange for compensation. During the registration, all TurkPrime participants were required to electronically sign a participation agreement confirming they are at least 18 years of age. The survey was only visible to individuals who endorsed in their TurkPrime worker profile that they had at least one child under the age of 18. The study was advertised to participants on TurkPrime as a survey about “Parents, Children, and Stress.”

B. Sample

Participants were legal parental guardians of children ages 3-12 years who a) have a formal diagnosis of autism spectrum disorder as reported by the guardian, b) have at least one adverse childhood experience, or c) both conditions. A total of 304 surveys were completed through Qualtrics and TurkPrime. A consort diagram is provided in Figure 1. Of the 304 surveys submitted, 89 failed to meet validity requirements outlined in the consent form and survey instructions, and as a result were excluded from the dataset. 34 surveys were excluded as a result of a security breach in TurkPrime, which was identified by the rapid speed in which surveys were submitted and identical screener and survey responses. 26 surveys displayed patterned responding (i.e. *A,B,C,D,C,B,A*), 11 participants selected all answer choices in the eligibility screener (all diagnoses and all ACEs), 10 surveys were completed in less than 3 minutes, 6 participants selected *Decline To State* for all survey items, and 2 surveys were submitted incomplete (less than 75% of items completed). A total of 215 surveys were submitted that met validity requirements. These submissions were separated into three participant groups: children who were identified as having a diagnosis of ASD and no endorsed ACEs (n=45), children who were identified as having a diagnosis of ASD and endorsement of at least one ACE (n=86), and children who

were typically developing (TD) and endorsement of at least one ACE. Children in the TD group were identified as having a) any mental health diagnosis other than ASD or b) no diagnosis.

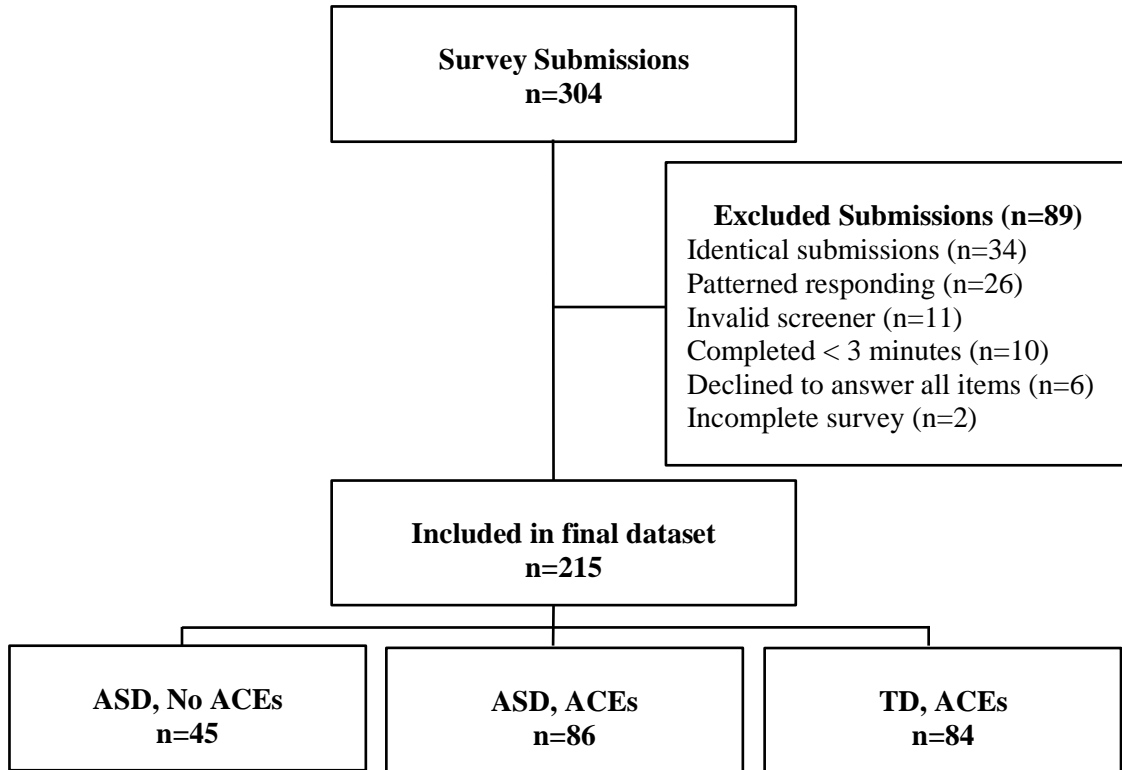


Figure 1. Consort diagram

C. Procedure

Interested participants were able to click a link in TurkPrime, which directed them to a Qualtrics survey where consent and survey procedures were completed. First, participants were provided an electronic consent form outlining the procedures of the study, requirements for participation, limits of confidentiality, terms of compensation, and potential risks and benefits. Within the consent form, participants were informed that their TurkPrime Worker ID was encrypted and not viewable by the researchers. Therefore, all responses to the screener and survey items were anonymous and it was not possible to

report any survey responses to law enforcement or child welfare services. If participants consented, they were then directed to an eligibility screener (Appendix A) that assessed for their child's a) age, b) mental health diagnoses, and c) adverse childhood experiences as measured by the CWY ACEs Screener. Participants whose child met eligibility criteria by having a child between the 3-12 years of age who a) had a diagnosis of ASD, b) had at least 1 ACE, or c) both, were then forwarded to the full survey. Participants who did not meet eligibility criteria were forwarded to a debriefing form that thanked them for their interest in the study and provided them with a list of online informational resources about child wellness and ACEs. At the conclusion of the survey, participants were shown a debriefing form that thanked them for their participation and provided them with online resources about child wellness and ACEs as well as a six-digit code to enter on TurkPrime in order to claim compensation. Participants were compensated \$3.00 for their participation in the study. Payment was authorized by the researcher and processed through participants' TurkPrime accounts. While participants were allocated 90 minutes to complete the survey, the median time used to complete the survey was 17.1 minutes.

D. Assessment Measures

Participants completed three survey measures: the Trauma Symptom Checklist for Young Children (TSCYC) to measure symptoms of posttraumatic stress, the Social Responsiveness Scale, Second Edition (SRS-2) to measure symptoms of social impairment related to autism spectrum disorder, and two subtests of the Repetitive Behavior Scale, Revised (RBS-R) to measure self-injurious behaviors and compulsive behaviors.

1. CYW Adverse Childhood Experiences Survey

The Center for Youth Wellness Adverse Childhood Experiences Questionnaire (CYW ACE-Q; Center for Youth Wellness, 2015) is a parent-report survey that assesses for 17 experiences of abuse, neglect, trauma exposure, family problems, and separation from caregivers (See Appendix A). Parents were provided with a list of descriptions and asked to select all adverse childhood experiences their child has experienced during their lifetime.

2. Trauma Symptom Checklist for Young Children

The Trauma Symptom Checklist for Young Children (TSCYC) is a 90-item parent-report survey that assesses acute and chronic posttraumatic symptomatology and other psychological effects of traumatic events in children ages 3 to 12 years (Briere, 2005)(See Appendix C). The TSCYC is the first fully standardized trauma measure for children as young as 3 years of age. The measure utilizes a 4-point Likert scale: *1=not at all*, *2=sometimes*, *3=often*, *4=very often*. Results produce scores based on nine clinical scales: anxiety, depression, anger/aggression, posttraumatic stress – intrusion, posttraumatic stress – avoidance, posttraumatic stress – arousal, posttraumatic stress – total, dissociation, and sexual concerns. It also contains two validity scales: response level, a measure of general under endorsement of common problems, and atypical response, a measure of general over endorsement of symptoms that often indicates a caregiver’s need to present the child as particularly symptomatic or because the caregiver is overwhelmed. Norms are based on a stratified national sample of 750 children, and separate norms are established for males and females based on three age groups: 3 to 4 years, 5 to 9 years, and 10 to 12 years. All scales demonstrate adequate reliability ($\alpha=.73$ to $.93$) and construct validity as evidenced by significant correlations between specific types of maltreatment and elevated scale scores in post-traumatic stress, dissociation, and sexual concerns. The measure has been used

widely and demonstrated clinical utility with diverse racial and ethnic populations (Briere et al., 2001; Williams, Malcoun, & Bahojb Nouri, 2015).

3. Social Responsiveness Scale, Second Edition

The Social Responsiveness Scale, Second Edition (SRS-2) is a 65-item parent-report measure that assesses the severity of autism symptomatology among individuals ages 2.5 years through adulthood (Constantino & Gruber, 2012)(See Appendix D). The parent-report measure utilizes a 4-point Likert scale: *1=not true, 2=sometimes true, 3=often true, 4=almost always true*. Results produced a total score reflecting severity of social deficits as well as five subscale scores: social awareness (ability to recognize social cues of others), social cognition (ability to interpret of social behavior of others), social communication (reciprocal communication in social situations), social motivation (degree of motivation to participate in social interactions with others), and restricted interests and repetitive behavior (stereotypy and circumscribed interests). The SRS-2 demonstrates strong statistical overlap with the Child Behavior Checklist (CBCL; Achenbach) in its assessment of symptoms of social problems, thought problems, and attention problems ($r=.48$ to $.64$)(Bölte, Poustka, & Constantino, 2008; Constantino, Przybeck, Friesen, & Todd, 2000). However, the SRS-2 is more sensitive to behavior problems commonly associated with ASD, is inept at distinguishing ASD from other psychiatric conditions, and scores are not significantly correlated with IQ (Constantino et al., 2000; Constantino et al., 2007). Separate norms are used based on participant's gender and several studies have demonstrated the measure's clinical utility with diverse populations in a number of countries (Bölte, 2012; Bölte et al., 2008; J. Wang, Lee, Chen, & Hsu, 2012; Wigham, McConachie, Tandos, Le Couteur, & team, 2012). The normative sample for the School-

Age Form included 2,025 ratings of 1,014 children across 16 age levels, with demographic characteristics similar to the US Census data in terms of gender, race/ethnicity, parent education level, and geographic region (Bruni, 2014). The measure shows high internal consistency ($\alpha=.95$ to $.97$) in ASD-affected groups and control groups. Research has shown that the SRS-2, has high inter-rater reliability mothers and fathers ($r=.91$; Constantino et al., 2003) and has repeatedly demonstrated strong test-retest reliability ($r=.88$ to $.95$; (Bölte et al., 2008; Constantino et al., 2009; Constantino et al., 2000). The SRS-2 demonstrates substantial agreement with the Autism Diagnostic Interview-Revised ($r=.65$ to $.77$)(ADI-R; Rutter, Le Couteur, & Risi, 2001) and Autism Diagnostic Observation Schedule ($r=.37$ to $.58$)(ADOS; Lord, Rutter, DiLavore, & Risi, 2001) in measuring ASD symptomatology through domain scores (Constantino et al., 2003; Constantino et al., 2004; Constantino et al., 2007; Lee et al., 2010). In terms of predictive validity, the measure was successful in identifying 92% of those affected by ASD (Bruni, 2014).

4. Repetitive Behavior Scale – Revised

The Repetitive Behavior Scale – Revised (RBS-R) is a 43-item parent-report measure that assesses for restricted and repetitive behaviors commonly observed among individuals with ASD (J. W. Bodfish, Symons, Parker, & Lewis, 2000)(See Appendix E). Two clinical subscales of the RBS-R were included in the current study: self-injurious behavior (actions that cause or have the potential to cause redness, bruising, or other injury to the body) and compulsive behavior (behavior that is repeated and performed according to a rule or involves things being done “just so”). This measure was used to assess for compulsive and self-injurious behaviors that were not assessed for as part of the SRS-2. Parents were asked to rate items on a 4-point Likert Scale: 0= *behavior does not occur*, 1= *behavior*

occurs and is a mild problem, 2= behavior occurs and is a moderate problem, 3= behavior occurs and is a severe problem. This leads to a minimum score of 0 and a maximum score of 24 for each subtest. Sample norms demonstrated for children with ASD a mean score of $M=3.65$ ($SD=4.50$) for self-injurious behaviors and a mean score of $M=5.01$ ($SD=4.19$) for compulsive behaviors (Lam & Aman, 2007). The measure demonstrates good inter-rater reliability ($r=.55$ to $.78$) and strong test-retest reliability across subscales ($R=.52$ to $.96$) (J. Bodfish & Lewis, 2002). Follow-up studies illustrate the measure's adequate internal consistency ($\alpha \leq .72$) and clinical use for measuring restricted and repetitive behaviors in young children with ASD (Mirenda et al., 2010). In comparison to the CBCL, the study found strong correlations between RBS-R factors and externalizing problem behaviors on the CBCL.

E. Data Analysis

Descriptive statistics were calculated using means and standard deviations for age and proportions for categorical variables (gender, race, income level, language level, relationship to the child). Chi-square tests of independence were conducted to assess for associations between participant group (ASD, ACEs; ASD, No ACEs; TD, ACEs) and each demographic variable. A one-way ANOVA was used to assess for differences in the number of mental health diagnoses between the three groups. A one-way MANOVA assessed for differences in prevalence rates of mental health diagnoses between groups and follow-up univariate ANOVAS and tukey posthoc tests assessed for specific differences on specific diagnoses and between groups. An independent samples t-test was used to assess for differences in ACEs count between the ASD, ACES and TD, ACES groups. A

one-way MANOVA assessed for differences in prevalence rates of specific ACEs types between groups.

One-way MANCOVAs were conducted to assess for differences in posttraumatic stress symptoms, social impairment symptoms, and self-injurious/compulsive symptoms between participant groups while adjusting for language ability. Follow-up univariate one-way ANCOVAs were performed using Bonferroni adjustments to assess for differences in specific subscales between groups.

A standardized multiple regression models were used to predict posttraumatic stress symptoms from the presence of each ACEs type among children with autism spectrum disorder. A second standardized regression was run to predict symptoms of social impairment from ACEs count and language level among typically developing children. A third standardized regression model was run to predict posttraumatic stress symptoms from ACEs count and level of social cognition impairments among children with autism spectrum disorder.

III. Findings

A. Demographic Results

Demographic information for the sample is provided in Table 2. The average age of children in the sample was 7.32 years ($SD = 2.91$) and a majority were male (62%). A majority of respondents were mothers (61%), followed by fathers (34%), related legal guardians (3%), non-related legal guardians (1.5%), and grandparents (0.5%). The race/ethnicity of the sample closely matched that of the U.S. population, with a majority of children in the sample identified as Caucasian (67%), followed by African American

(13%), Mixed Race (9%), Latino/a/x (6%), and Asian/Pacific Islander (5%). Participants were distributed across socioeconomic status, with over half of the sample identifying as having an annual household income of \$20,000 to \$40,000 (29%) or \$40,000 to \$60,000 (26%).

To assess for associations between the three participant groups and demographic categories, chi-square tests of independence were conducted for gender, age, race/ethnicity, income level, respondents' relationship to the child, and language level. Separate chi-square analyses found there were no statistically significant associations between group and gender [$\chi^2(2)=0.36, p=.84$], group and age [$\chi^2(18)=15.02, p=.66$], group and race/ethnicity [$\chi^2(8)=8.59, p=.38$], group and income level [$\chi^2(10)=6.96, p=.73$], or group and respondents' relationship to the child [$\chi^2(8)=8.57, p=.380$]. A chi-square test of independence found a statistically significant association between group and language level, $\chi^2(6)=23.87, p=.001$. The association was moderately strong, Cramer's $V=.236$ (Cohen, 1988). Typically developing children were more likely

to have fluent conversational language (88.1%) than children with ASD with ACEs (62.8%) and children with ASD without ACEs (57.8%). Observed frequencies and adjusted residuals are presented in Table 3.

Table 2
Demographic information regarding study sample

Characteristics	ASD, No ACEs (n=45)	ASD, ACEs (n=86)	TD, ACEs (n=84)	Total (n=215)
Relationship (%)				
Mother	68.9	60.5	58.3	61.0
Father	31.1	32.5	36.9	34.0
Grandparent	0	0	1.2	0.5
Related legal guardian	0	3.5	3.6	3.0
Non-related legal guardian	0	3.5	0	1.5
Child's Gender (%)				
Male	62.2	64.0	59.5	61.9
Female	37.8	36.0	40.5	38.1
Child's Mean Age (SD)	6.40 (2.74)	7.21 (2.87)	7.93 (2.93)	7.32 (2.91)

Child's Language Level (%)				
Nonverbal/Preverbal	6.7	2.3	0	2.3
Single Words	11.1	5.8	1.2	5.1
Phrase Speech	24.4	29.1	10.7	20.9
Fluent Conversation	57.8	62.8	88.1	71.6
Child's Race/Ethnicity (%)				
African American	15.6	15.1	9.5	13.0
Latino/a/x	2.2	8.1	4.8	5.6
Asian/Pacific Islander	2.2	4.7	5.9	4.7
White/Caucasian	71.1	67.4	65.5	67.4
Mixed Race	8.9	4.7	14.3	9.3
Family Income Level (%)				
Less than 20,000	4.5	7.0	10.7	7.9
20,000 to 40,000	24.4	32.5	28.6	29.3
40,000 to 60,000	31.1	29.1	20.2	26.0
60, 000 to 80,000	15.6	16.3	22.6	18.6
80,000 to 100,000	11.1	5.8	8.3	7.9
Greater than 100,000	13.3	9.3	9.6	10.2

Table 3
Crosstabulation of group and language level

Group	Language Level			
	Nonverbal/Preverbal	Single Words	Phrase Speech	Fluent Conversation
ASD, No ACEs	3 (2.2)	5 (2.1)	11 (0.7)	26 (-2.3)
ASD, ACEs	2 (0.0)	5 (0.4)	25 (2.4)	54 (-2.3)
TD, ACEs	0 (-1.8)	1 (-2.1)	9 (-2.9)	74 (4.3)

Note. Adjusted residuals appear in parentheses below observed frequencies.

B. Mental Health Diagnoses

A one-way ANOVA was conducted to determine if the total number of mental health diagnoses was different between groups. Results indicated a significant difference in the number of diagnoses between groups, $F(2, 212)=17.80, p<.001$. Tukey postdoc analyses revealed that children with ASD who experienced ACEs had a significantly higher number of mental health diagnoses ($M=2.68, SD=1.62$) when compared to children with ASD without ACEs ($M=1.44, SD=0.78; p=.002$) and typically developing children with ACEs

($M=1.11$, $SD=1.39$; $p<.001$). Frequency and prevalence rates of mental health diagnoses are presented in Table 4.

Table 4
Frequency and prevalence of mental health diagnoses by group

Diagnosis	ASD, No ACEs (n=45)		ASD, ACEs (n=86)		TD, ACEs (n=84)		F
	n	%	n	%	n	%	
ADHD	4	8.9	33	38.4	32	38.1	7.41**
Anxiety Disorder	2	4.4	18	20.9	19	22.6	3.71*
Autism Spectrum Disorder (ASD)	45	100	86	100	0	0	
Conduct Disorder	0	0	4	4.7	3	3.6	1.03
Depressive Disorder	0	0	14	16.3	8	9.5	4.42*
Eating Disorder	1	2.2	5	5.8	2	2.4	0.87
Intellectual Disability	2	4.4	5	5.8	2	2.4	0.62
Learning Disorder	4	8.9	12	14.0	8	9.5	0.56
Mood Disorder/Bipolar Disorder	0	0	4	4.7	4	4.8	1.10
Obsessive Compulsive Disorder (OCD)	2	4.4	6	7.0	7	8.3	0.34
Oppositional Defiance Disorder (ODD)	2	4.4	4	4.7	3	3.6	0.07
Panic Disorder	1	2.2	2	2.3	4	4.8	0.49
Posttraumatic Stress Disorder	2	4.4	2	2.3	1	1.2	0.68

* $p<.05$. ** $p<.01$. *** $p<.001$

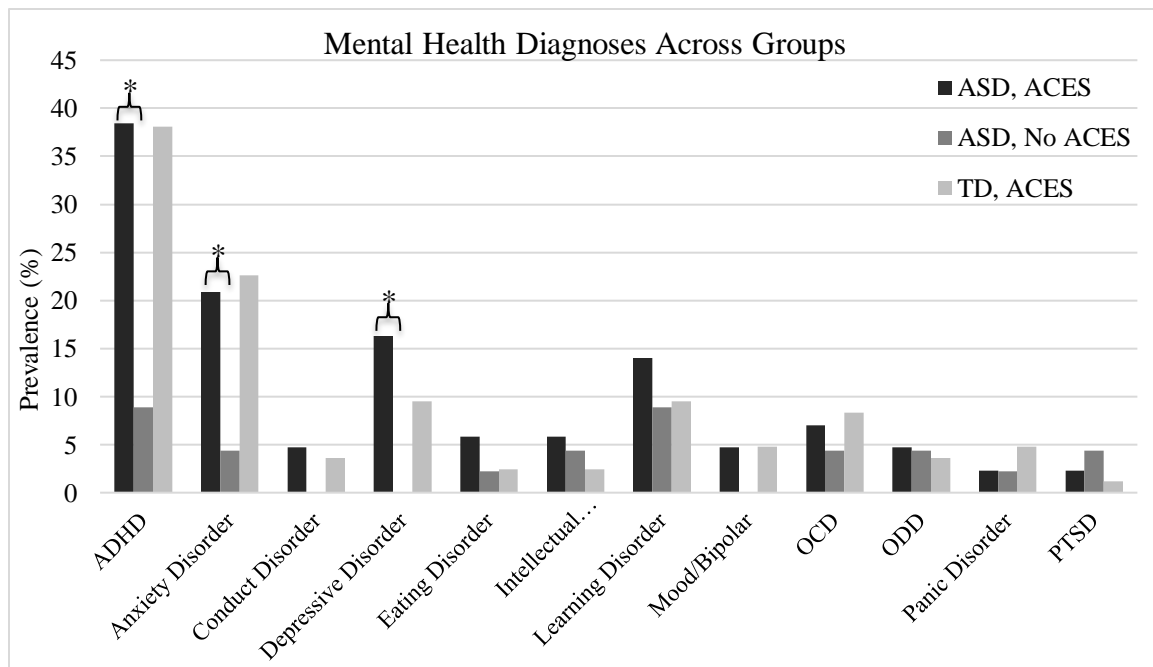


Figure 2. Prevalence of mental health diagnoses across groups.

A one-way MANOVA was conducted and found significant differences in prevalence rates of all mental health diagnoses when analyzed together, $F(24, 402)=1.372, p=.01$, partial $\eta^2 =.114$). Follow-up univariate ANOVAS showed statistical differences between groups for prevalence rates Attention Deficit Hyperactivity Disorder [$F(2, 212)=7.72, p=.001$], Depressive Disorder, [$F(2, 212)=4.42, p=.01$] and Anxiety Disorder [$F(2, 212)=3.71, p=.03$](See Figure 2). Tukey posthoc analyses revealed that among all children with ASD in the sample, children who experienced ACEs demonstrated significantly higher rates of comorbid attention-deficit hyperactivity disorder ($p=.001$) and depressive disorder ($p=.01$) and marginally higher rates of anxiety disorder ($p=.05$) than their peers with ASD without ACEs. There were no statistically significant differences in the prevalence rates of specific mental health diagnoses between children with ASD and ACEs and typically developing children with ACEs, with the exception of ASD. There was also not a significant difference in the prevalence rates of posttraumatic stress disorder (PTSD) between groups [$F(2, 212)=.678, p=.51$], with prevalence rates appearing low across all three groups (1.2% of TD, ACEs participants; 2.3% of ASD, ACEs participants; 4.4% of ASD, No ACEs participants).

C. ACEs Count and Type

While ACES count was measured in this study, the analyses described cannot be viewed as a true prevalence rate that is representative of the general population because periods of recruitment were directed towards children who had an increased number of adverse childhood experiences (i.e. more than three ACEs). Notwithstanding, an independent samples t-test revealed non-significant differences in ACEs count [$t(157)=1.49, p=.14$] between children with ASD ($M=3.15, SD=2.22$) and typically

developing children ($M=2.70$, $SD=1.65$) in the study. A one-way MANOVA was conducted to assess for differences in prevalence rates of ACEs type the two groups. Results revealed no significant differences in the prevalence of ACEs types when measured together, $F(17, 152)=1.266$, $p=.22$, partial $\eta^2 = .124$ (See Table 5). Follow-up univariate ANOVAS revealed marginally significant differences between children with and without ASD in prevalence rates of physical neglect [$F(1, 168)=4.05$, $p=.05$, partial $\eta^2=.024$], physical abuse [$F(1,168)=3.15$, $p=.08$, partial $\eta^2=.018$], and harassment and bullying at school [$F(1, 168)=3.10$, $p=.08$, partial $\eta^2=.018$]. Prevalence rates of ACEs types are presented in Figure 3.

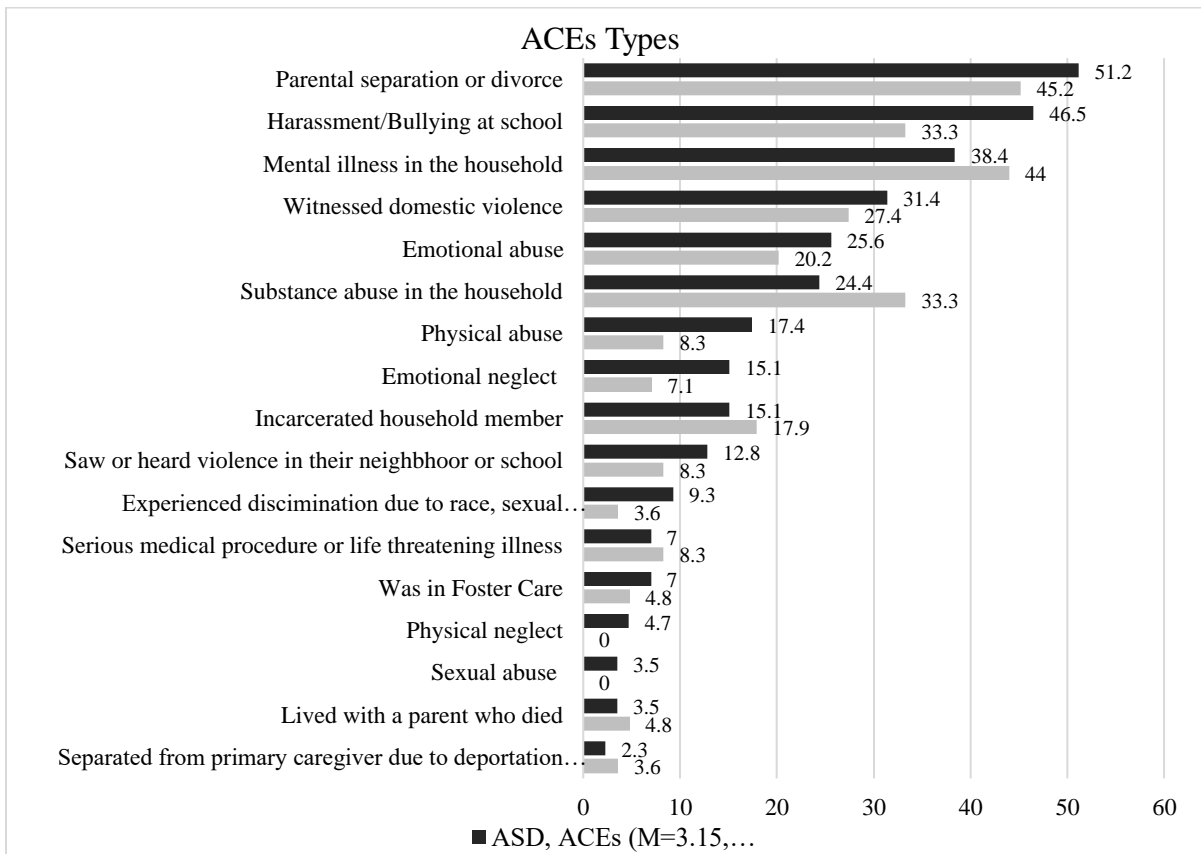


Figure 3. Prevalence (%) of ACEs type across groups

Table 5
Frequency and prevalence of ACEs type by group

ACEs Type	ASD, ACEs (n=86)		TD, ACEs (n=84)		<i>F</i>
	n	%	n	%	
Parental separation or divorce	44	51.2	38	45.2	.592
Lived with a parent who died	3	3.5	4	4.8	.173
Was in foster care	6	7.0	4	4.8	.373
Separated from primary caregiver due to deportation or immigration	2	2.3	3	3.6	.229
Household member had substance abuse problems (drugs or alcohol)	21	24.4	28	33.3	1.64
Household member served time in jail or prison	13	15.1	15	17.9	.230
Household member was depressed, mentally ill, or attempted suicide.	33	38.4	37	44.0	.560
Emotional abuse	22	25.6	17	20.2	.681
Physical abuse	15	17.4	7	8.3	3.15
Witness to domestic violence	29	31.4	23	27.4	.327
Sexual abuse	3	3.5	0	0.0	3.00
Saw or heard violence in their neighborhood or school	11	12.8	7	8.3	.886
Discrimination due to race, sexual orientation, disability, etc.	8	9.3	3	3.6	2.31
Harassment or bullying at school	40	46.5	28	33.3	3.10
Serious medical procedure or life threatening illness	6	7.0	7	8.3	.110
Physical neglect (went without food, clothing, housing and/or protection)	4	4.7	0	0.0	4.05
Emotional neglect (felt unsupported, unloved, and/or unprotected)	13	15.1	6	7.1	2.73

**p*<.05

D. Differences in Posttraumatic Stress Symptoms Between Groups

Two separate one-way multivariate analyses of covariance (one-way MANCOVAs) were conducted to determine whether there were significant differences in 1) TSCYC validity scale scores and 2) TSCYC clinical scale scores between groups, having controlled for language level. Language level was controlled for as previous chi-square analyses revealed statistically differences across groups. Means, adjusted means, standard deviations, and standard errors for the nine TSCYC subscales are presented in Table 6.

Table 6
Means, adjusted means, standard deviations, and standard errors for the nine TSCYC subscales for each group

TSCYC Subscale	ASD, No ACEs		ASD, ACEs		TD, ACEs	
	<i>M (SD)</i>	<i>M_{adj} (SE)</i>	<i>M (SD)</i>	<i>M_{adj} (SE)</i>	<i>M (SD)</i>	<i>M_{adj} (SE)</i>
<i>Validity Scales</i>						
Response Level	51.76 (8.63)	51.15 (1.18)	45.00 (6.98)	44.80 (0.84)	46.31 (8.29)	46.85 (0.87)
Atypical Response	58.24 (16.58)	54.46 (2.81)	62.28 (22.40)	61.35 (2.00)	56.43 (17.79)	58.88 (2.07)
<i>Clinical Scales</i>						
Anxiety	57.31 (16.59)	57.25 (2.72)	67.11 (19.19)	67.49 (1.94)	62.64 (17.10)	62.70 (2.01)

Depression	55.73 (15.49)	54.76 (1.64)	66.91 (18.88)	66.58 (1.88)	60.58 (17.03)	61.44 (1.95)
Anger/Aggression	55.47 (13.49)	54.40 (2.29)	64.00 (15.65)	63.64 (1.63)	58.05 (15.73)	58.99 (1.69)
PTS - Intrusion	53.56 (15.58)	52.47 (2.92)	63.94 (21.60)	63.58 (2.08)	58.85 (18.73)	59.81 (2.16)
PTS - Avoidance	52.27 (13.61)	50.70 (2.81)	65.37 (21.58)	64.85 (2.00)	58.62 (18.03)	60.00 (2.07)
PTS - Arousal	66.29 (15.93)	65.78 (2.47)	72.45 (15.69)	72.28 (1.76)	65.11 (16.94)	65.55 (1.82)
PTS Total	60.56 (14.86)	59.42 (2.72)	70.65 (19.24)	70.27 (1.94)	63.12 (18.28)	64.12 (2.01)
Dissociation	68.22 (20.11)	67.59 (2.77)	67.41 (17.31)	67.20 (1.97)	62.29 (18.07)	62.84 (2.04)
Sexual Concerns	50.62 (13.58)	49.81 (2.10)	53.38 (15.96)	53.11 (1.50)	50.23 (11.62)	50.94 (1.55)

Note. Adjusted means and standard errors reflect data values when language level is controlled for.

In regard to validity scales, a one-way MANCOVA showed that there was a statistically significant difference between groups on TSCYC validity subscales after controlling for language level, $F(4, 420)=4.953, p=.001$, Wilks' $\Lambda = .912$, partial $\eta^2=.045$. Results of the MANCOVA are presented in Table 7. Follow up univariate one-way ANCOVAs were performed using a Bonferroni adjustment of $p<.025$. Results found statistically significant differences in adjusted means between groups on the Response Level subscale [$F(2)=9.779, p<.001$, partial $\eta^2=.085$]. The ASD, No ACEs group ($M=51.15, SE=1.18$) demonstrated a statistically higher mean score than both the ASD, ACEs group ($M=44.80, SE=0.84; p<.001$) and the TD, ACEs group ($M=46.85, SE=0.87; p=.01$). However, the response level validity scores for all three groups still fell within the normal range (<70). There was no significant difference in adjusted means between groups on the Atypical Response scale [$F(2)=2.03, p=.134$, partial $\eta^2=.019$], with all three groups falling within the normal range (<70). While differences in mean scores did not meet clinical significance, a one-way ANOVA revealed that the ASD, ACEs group demonstrated significantly higher prevalence rates of Atypical Response t-scores that fell in the significant range (25.6%) compared to the TD, ACES group (10.7%) and the ASD, No ACEs group (13.3%), $F(2, 212)=3.68, p=.03$. Results did not reveal a significant difference in groups for significant Response Level scores, $F(2, 212)=.191, p=.83$.

Table 7

MANCOVA results of TSCYC validity subscales by group and controlling for language level

TSCYC Subscale	<i>Sum of Squares</i>	<i>Df</i>	<i>Mean Square</i>	<i>F</i>	<i>p</i>	Partial eta squared
Response Level	1177.51	2	588.75	9.779	<.001*	0.085
Atypical Response	1389.97	2	694.98	2.033	.13	0.019

*Significant using Bonferroni adjustment of $p < .025$

In regard to clinical scales, a one-way MANCOVA showed that there was a statistically significant difference between groups on TSCYC clinical subscales after controlling for language level, $F(18, 406)=2.678$, $p < .001$, Wilks' $\Lambda = .799$, partial $\eta^2 = .106$. Results of the MANCOVA are presented in Table 8. Follow up univariate one-way ANCOVAs were performed using a Bonferroni adjustment of $p < .005$. Results found statistically significant differences in adjusted means between groups on subscales of depression [$F(2,211)=6.888$, $p = .001$, partial $\eta^2 = .061$], anger/aggression [$F(2,211)=5.782$, $p = .004$, partial $\eta^2 = .052$], PTS avoidance [$F(2, 211)=8.582$, $p < .001$, partial $\eta^2 = .075$], and total posttraumatic stress [$F(2, 211)=5.916$, $p = .003$, partial $\eta^2 = .053$]. Results did not find significant differences in adjusted means between groups for anxiety [$F(2, 211)=4.944$, $p = .008$, partial $\eta^2 = .045$], PTS intrusion [$F(2, 211)=4.87$, $p = .009$, partial $\eta^2 = .044$], PTS arousal [$F(2, 211)=4.270$, $p = .015$, partial $\eta^2 = .039$], dissociation [$F(2, 211)=1.429$, $p = .242$, partial $\eta^2 = .013$], or sexual concerns [$F(2, 211)=.989$, $p = .374$, partial $\eta^2 = .009$].

Table 8

MANCOVA results of TSCYC clinical subscales by group and controlling for language level

TSCYC Subscale	<i>Sum of Squares</i>	<i>Df</i>	<i>Mean Square</i>	<i>F</i>	<i>p</i>	Partial eta squared
Anxiety	3172.56	2	1586.28	4.944	.008	0.045
Depression	4170.13	2	2085.07	6.888	.001*	0.061
Anger/Aggression	2632.10	2	1316.50	5.782	.004*	0.052
PTS - Intrusion	3606.06	2	1803.03	4.870	.009	0.044
PTS - Avoidance	5850.77	2	2925.39	8.582	<.001*	0.075
PTS - Arousal	2251.37	2	1125.69	4.270	.015	0.039
PTS Total	3779.79	2	1889.89	5.916	.003*	0.053

Dissociation	946.79	2	473.40	1.429	.24	0.013
Sexual Concerns	377.24	2	188.62	0.989	.37	0.009

*Significant using Bonferroni adjustment of $p < .005$.

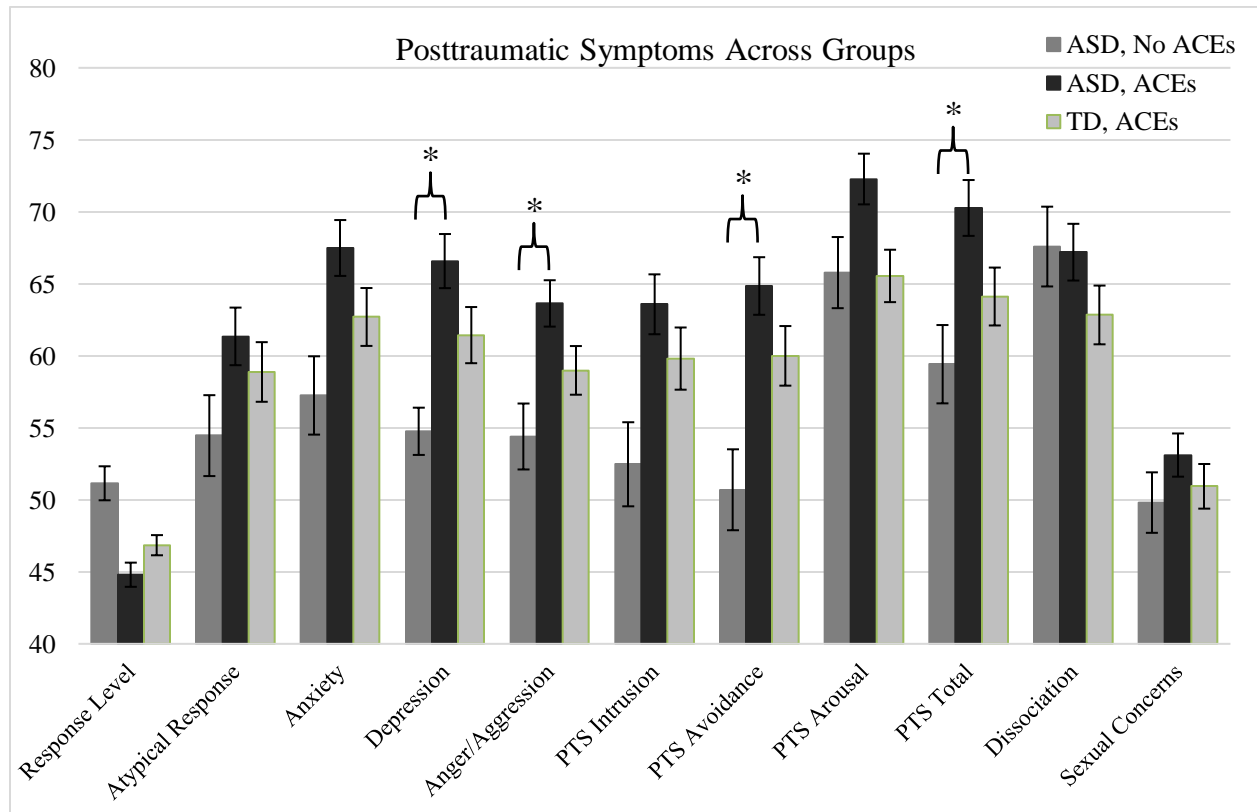


Figure 4. Adjusted means for TSCYC T-Scores across groups when controlling for language level

Adjusted means are presented, unless otherwise stated. T-scores for depression were statistically greater in the ASD, ACEs group ($M=66.58$, $SE=1.88$) compared to the ASD, No ACEs group ($M=54.76$, $SE=2.64$), a mean t-score difference of 11.82, 95% CI [4.053, 19.591], $p=.001$. T-scores for anger/aggression were statistically greater in the ASD, ACEs group ($M=63.643$, $SE=1.634$) compared to the ASD, No ACEs group ($M=54.398$, $SE=2.293$), a mean t-score difference of 9.245, 95% CI [2.507, 15.983], $p=.003$. T-scores for avoidance were statistically greater in the ASD, ACEs group ($M=63.643$, $SE=1.634$) compared to the ASD, No ACEs group ($M=54.398$, $SE=2.293$), a mean t-score difference

of 14.147, 95% CI [5.908, 22.391], $p < .001$. Avoidance t-scores for the TD, ACEs group ($M = 59.992$, $SE = 2.071$) were also statistically greater than those for the ASD, No ACEs group, with a mean t-score difference of 9.289, 95% CI [0.694, 17.884], $p = .03$. T-scores for total posttraumatic stress (PTS Total) were statistically greater in the ASD, ACEs group ($M = 70.271$, $SE = 1.935$) compared to the ASD, No ACEs group ($M = 59.417$, $SE = 2.716$), a mean t-score difference of 10.854, 95% CI [2.873, 18.835], $p = .004$. While not statistically significant, analyses revealed that children with ASD demonstrated a higher baseline of total posttraumatic stress at one ACE (61.51) compared to their typically developing peers (53.81) (See Figure 5). Children with ASD also demonstrated a slightly weaker relationship between ACEs count and total posttraumatic stress, increasing 2.9 t-score points in PTS-total for every accumulated ACE compared to typically developing children who increased 3.6 t-score points in PTS-Total for every accumulated ACE.

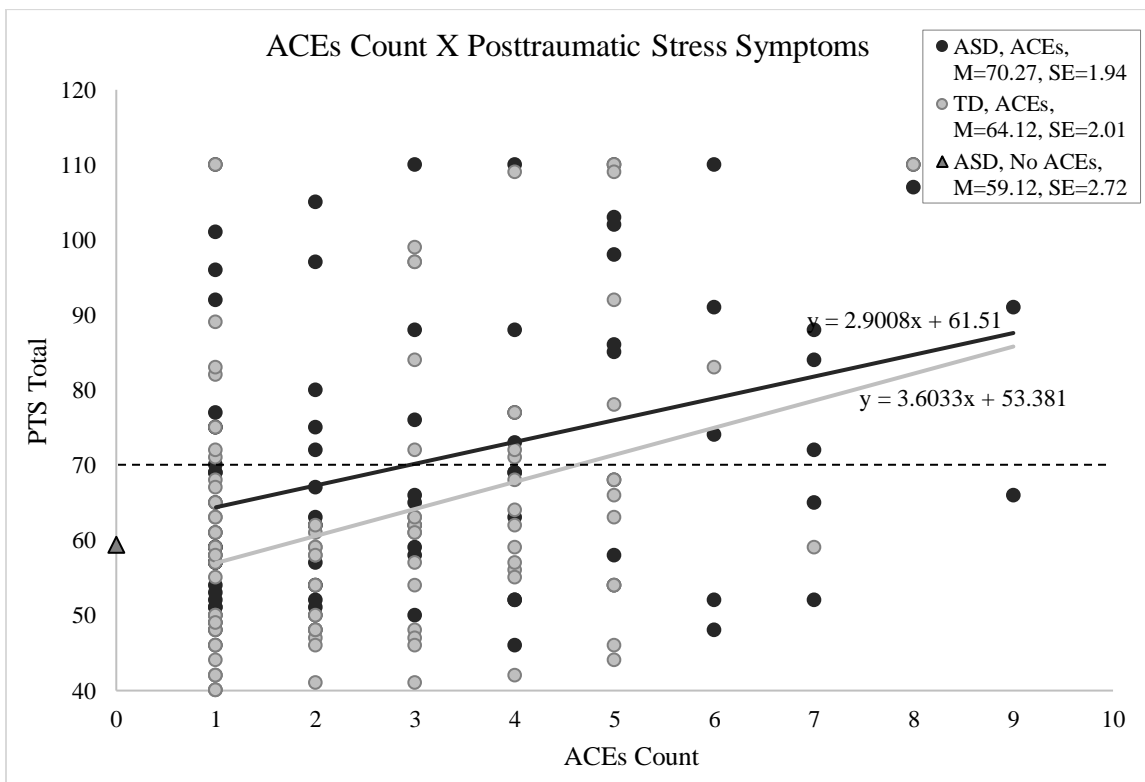


Figure 5. Scatterplot of ACEs count on Posttraumatic Stress – Total

E. ACEs Type as Predictors of Posttraumatic Stress Symptoms in Children with ASD

Standard multiple regression models were run to predict posttraumatic stress symptoms from the presence of each ACEs type among children with autism spectrum disorder.

A standard multiple regression was used to predict anxiety symptoms from the presence of each ACEs type. Results found that the multiple regression model significantly predicted anxiety scores, $F(17,113)=2.608$, $p=.001$, $R_{2Adj}=.174$. Specifically, emotional abuse ($p=.001$) and separation from a primary caregiver due to deportation or immigration ($p=.017$) were significant predictors of increased anxiety. The model predicted that participants' anxiety t-scores are 17.48 greater when they experience emotional abuse and 32.84 points greater when they experience separation from a primary caregiver due to deportation or immigration.

Results found that a multiple regression model significantly predicted depression scores, $F(17, 113)=3.073$, $p<.001$, $R_{2Adj}=.213$. Specifically, the death of a parent or caregiver ($p=.03$) and harassment/bullying ($p=.02$) were significant predictors of increased depression. The model predicted that participants' depression t-scores are 27.86 points greater when they experience the death of a parent or caregiver and 8.55 points greater when they experience harassment or bullying.

Results found that a multiple regression model significantly predicted anger/aggression scores, $F(17, 113)=2.763$, $p=.001$, $R_{2Adj}=.19$. Specifically, the death of a parent or caregiver ($p=.01$) and emotional abuse ($p=.03$) were significant predictors of increased anger and aggression. The model predicted that participants' anger/aggression t-scores are 27.40

points greater when they experience the death of a parent or caregiver and 9.20 points greater when they experience emotional abuse.

Results found that a multiple regression model significantly predicted intrusion scores, $F(17, 113)=2.487, p=.002, R_{2Adj}=.16$. Specifically, separation from a primary caregiver due to deportation or immigration was identified as a significant predictor of increased intrusion symptoms ($p=.03$), with predicted intrusion t-scores being 32.83 points greater when participants with ASD experience separation from a primary caregiver due to deportation or immigration.

Results found that a multiple regression model significantly predicted sexual concerns, $F(17, 113)=3.267, p<.001, R_{2Adj}=.229$. Specifically, three ACEs types were identified as significant predictors of increased sexual concerns: sexual abuse ($p<.001$), living with a household member who served time in jail or prison ($p=.02$), and seeing or hearing violence in his/her neighborhood or school ($p=.03$). The model predicted that participants' sexual concern scores are 32.94 points greater when they experience sexual abuse, 12.21 points greater when they live with a household member who served time in jail or prison, and 13.47 points greater when they see or hear community violence.

Results found that multiple regression models significantly predicted posttraumatic avoidance scores [$F(17, 113)=2.609, p=.001, R_{2Adj}=.174$] and overall posttraumatic (PTS total) scores [$F(17, 113)=2.337, p=.004, R_{2Adj}=.149$]; however, no ACEs types were identified as significant predictors of posttraumatic symptoms for either subscale. Results found that a multiple regression models did not significantly predict posttraumatic arousal [$F(17, 113)=1.735, p=.05, R_{2Adj}=.088$] and dissociation scores [$F(17, 113)=1.20, p=.276, R_{2Adj}=.025$] based on ACEs type.

F. Differences in Social Impairment Symptoms Between Groups

A one-way multivariate analyses of covariance (one-way MANCOVA) was conducted to determine whether there were significant differences in levels of social impairment as measured by the SRS-2, while controlling for differences in language levels. Results found statistically significant differences between groups on SRS-2 subscales of social impairment, $F(14, 410)=4.74, p<.001$, Wilks' $\Lambda=.799$, partial $\eta^2=.139$. Means, adjusted means, standard deviations, and standard errors for the seven SRS-2 subscales are presented in Table 9.

Table 9
Means, adjusted means, standard deviations, and standard errors for the seven SRS-2 subscales for each group.

SRS-2 Subscale	ASD, No ACEs		ASD, ACEs		TD, ACEs	
	<i>M (SD)</i>	<i>M_{adj} (SE)</i>	<i>M (SD)</i>	<i>M_{adj} (SE)</i>	<i>M (SD)</i>	<i>M_{adj} (SE)</i>
Social Awareness	65.64 (9.94)	65.00 (1.34)	64.88 (8.47)	64.67 (0.96)	57.96 (8.84)	58.53 (0.99)
Social Cognition	70.38 (10.50)	69.43 (1.63)	68.23 (11.54)	67.92 (1.16)	57.38 (10.52)	58.22 (1.20)
Social Communication	71.44 (11.41)	70.34 (1.66)	70.29 (10.85)	70.05 (1.18)	60.20 (11.01)	60.83 (1.23)
Social Motivation	67.62 (10.35)	67.01 (1.71)	68.17 (11.84)	67.99 (1.22)	59.11 (11.14)	59.59 (1.26)
RRB	67.87 (12.51)	67.73 (1.79)	69.38 (11.53)	69.34 (1.23)	56.02 (11.56)	56.14 (1.32)
SCI	71.67 (10.56)	70.91 (1.57)	70.62 (10.31)	70.36 (1.11)	60.05 (10.56)	60.72 (1.16)
SRS Total	71.53 (11.01)	70.91 (1.60)	70.83 (10.35)	70.62 (1.14)	59.38 (10.65)	59.93 (1.18)

Note. Adjusted means and standard errors reflect data values when controlling for language level.

Follow up univariate one-way ANCOVAs were performed using a Bonferroni adjustment of $p<.007$. Results are presented in Table 10. Results found statistically significant differences in adjusted means between groups on all subscales of the SRS-2 ($p<.001$), with the TD, ACEs group demonstrating significant lower rates of social impairment in all domains than both ASD, ACEs group and ASD, No ACEs group (See Figure 6).

Table 10

MANCOVA results of SRS-2 subscales by group and controlling for language level

TSCYC Subscale	Sum of Squares	Df	Mean Square	F	p	Partial eta squared
Social Awareness	1831.49	2	915.75	11.74	<.001*	.100
Social Cognition	4926.09	2	2463.04	21.36	<.001*	.168
Social Communication	4194.86	2	2097.43	17.55	<.001*	.143
Social Motivation	3103.62	2	1551.81	12.32	<.001*	.105
RRB	7634.73	2	3817.36	27.53	<.001*	.207
SCI	4528.08	2	2264.04	21.20	<.001*	.167
SRS Total	5444.37	2	2722.18	24.54	<.001*	.189

*Significant using Bonferroni adjustment of $p < .007$

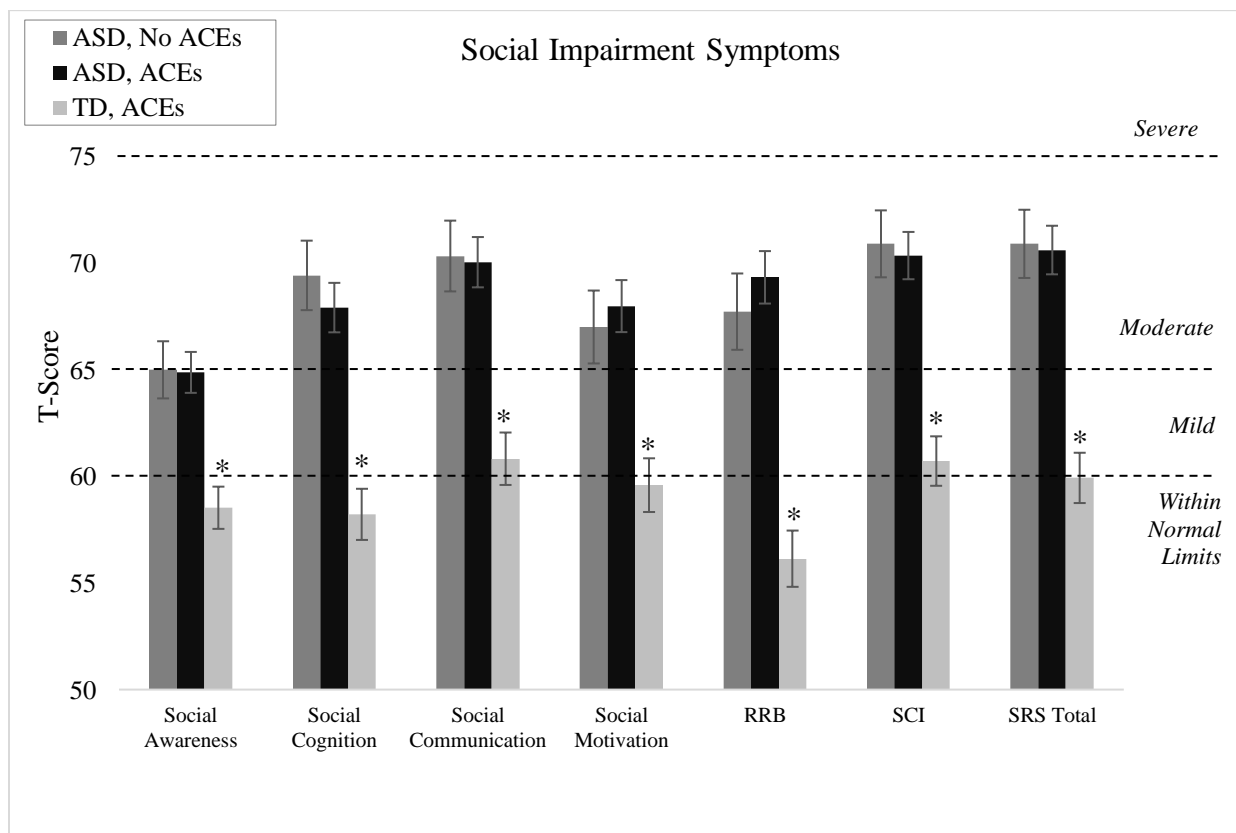


Figure 6. Mean SRS-2 T-Scores across groups when controlling for language level

G. ACEs Count as Predictor of Social Impairment Symptoms in Typically Developing Children

A standard multiple regression model was run to predict symptoms of social impairment (SRS-2 Total) from ACEs count, and language level. Results found that the model significantly predicted social impairment symptoms in typically developing children, $F(2, 81)=6.527, p=.002, R_{2Adj}=.118$. ACEs count was the strongest contributor to the model ($p=.004$), with increased ACEs count predicting greater social impairment symptoms. Specifically, SRS-2 Total T-scores increased 1.98 points for each accumulated ACE. Language level was also a significant predictor in the model ($p=.02$), with increased language abilities predicting lesser social impairment symptoms. Regression coefficients and standard errors can be found in Table 11.

Table 11
Multiple regression results of social impairment symptoms for typically developing children

SRS-2 Total	B	95% CI for B		SE B	β	R ₂	ΔR_2
		LL	UL				
Model						.14	.12**
Constant	80.53***	57.72	103.34	11.47			
ACEs Count	1.98**	.656	3.31	.666	.308		
Language Level	-6.85*	-12.73	-.968	-.240	-.240		

Note. B = unstandardized regression coefficient; CI=confidence interval; LL=lower limit; UL=upper limit; SE B=standard error of the coefficient; β =standardize coefficient; R₂ =coefficient of determination; ΔR_2 =adjusted R₂.

* $p<.05$, ** $p<.01$, *** $p<.001$

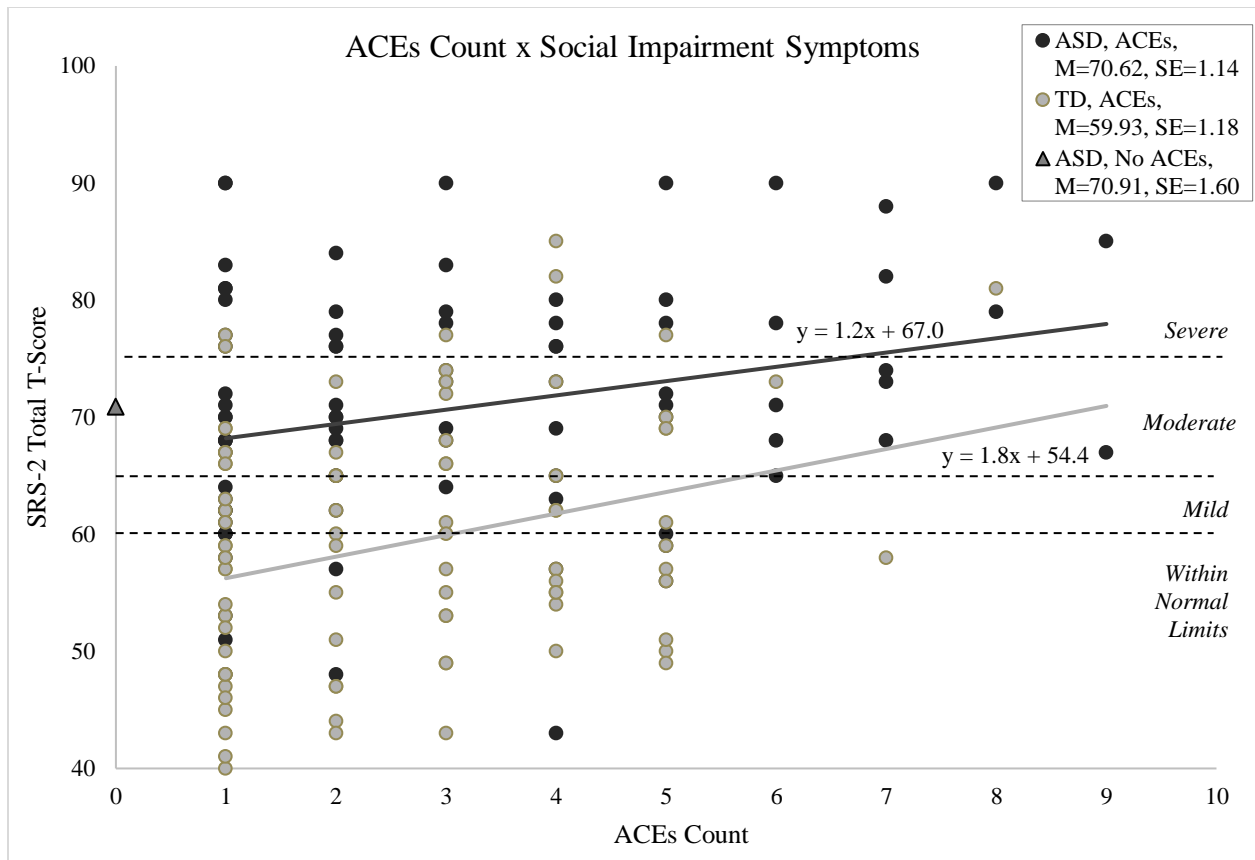


Figure 7. Scatterplot of ACEs count on SRS-2 Total Score

H. Differences in Self-Injurious and Compulsive Behaviors Between Groups

A one-way multivariate analyses of covariance (one-way MANCOVA) was conducted to determine whether there were significant differences in self-injurious and compulsive behaviors, as measured by the RBS-R, while controlling for differences in language levels. Results did not find statistically significant differences between groups on selected subtests of the RBS-R, $F(4, 420)=2.03$, $p=.09$, Wilks' $\Lambda=.962$, partial $\eta^2=.019$. Follow up univariate one-way ANCOVAs were performed using a Bonferroni adjustment of $p<.025$ and found non-significant differences between groups for self-injury ($p=.03$) and compulsive behaviors ($p=.11$). Means, adjusted means, standard deviations, and standard

errors for the seven SRS-2 subscales are presented in Table 12. Results of the MANCOVA are presented in Table 13.

Table 12

Means, adjusted means, standard deviations, and standard errors for the two RBS-R subscales for each group.

RBS-R Subscale	ASD, No ACEs		ASD, ACEs		TD, ACEs	
	<i>M (SD)</i>	<i>M_{adj} (SE)</i>	<i>M (SD)</i>	<i>M_{adj} (SE)</i>	<i>M (SD)</i>	<i>M_{adj} (SE)</i>
Self-Injury	2.60 (4.13)	2.24 (0.57)	3.51 (4.16)	3.39 (0.40)	1.55 (3.90)	1.87 (0.42)
Compulsive Behaviors	3.96 (4.06)	3.63 (0.57)	4.48 (3.95)	4.37 (0.40)	2.85 (3.45)	3.13 (0.42)

Note. Adjusted means and standard errors reflect data values when controlling for language level.

Table 13

MANCOVA results of RBS-R subscales by group and controlling for language level

TSCYC Subscale	<i>Sum of Squares</i>	<i>Df</i>	<i>Mean Square</i>	<i>F</i>	<i>p</i>	Partial eta squared
Self-Injury	101.618	2	50.81	3.647	.028	.033
Compulsive Behaviors	62.807	2	31.40	2.267	.106	.021

*Significant using Bonferroni adjustment of $p < .025$

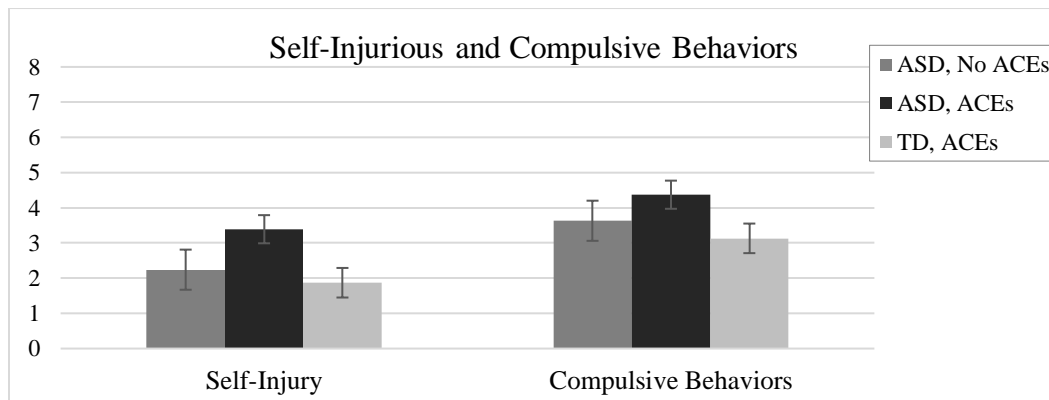


Figure 8. RBS-R scores across groups when controlling for language level

I. ACEs Count and Impairments in Social Cognition as Predictors of Posttraumatic Stress Symptoms in Children with ASD

A standard multiple regression model was run to predict overall posttraumatic stress symptoms (PTS total) from ACEs count and level of social cognition, as measured by the

SRS-2 Social Cognition subscale, among children with autism spectrum disorder. Results found that the model significantly predicted posttraumatic stress levels, $F(2, 128)=22.73$, $p<.001$, $R_{2Adj}=.251$. Both variables added significantly to the prediction ($p<.001$). The model revealed a positive association between ACEs count and total posttraumatic stress, with PTS Total t-scores increasing 2.81 points for every accumulated ACE. The model revealed a positive association between social cognition symptoms and posttraumatic stress symptoms, with PTS Total t-scores increasing 0.56 points for every 1.00 point increase in SRS-2 Social Cognition t-scores. Regression coefficients and standard errors can be found in Table 14.

Table 14
Multiple regression results of overall posttraumatic stress for children with ASD

PTS Total	B	95% CI for B		SE B	β	R ²	ΔR_2
		LL	UL				
Model						.26	.25***
Constant	22.84***	5.51	40.15	8.75			
ACEs Count	2.81***	1.63	4.00	.600	.357		
Social Cognition	.559***	.310	.807	.125	.339		

Note. B = unstandardized regression coefficient; CI=confidence interval; LL=lower limit; UL=upper limit; SE B=standard error of the coefficient; β =standardize coefficient; R²=coefficient of determination; ΔR_2 =adjusted R².

*** $p<.001$

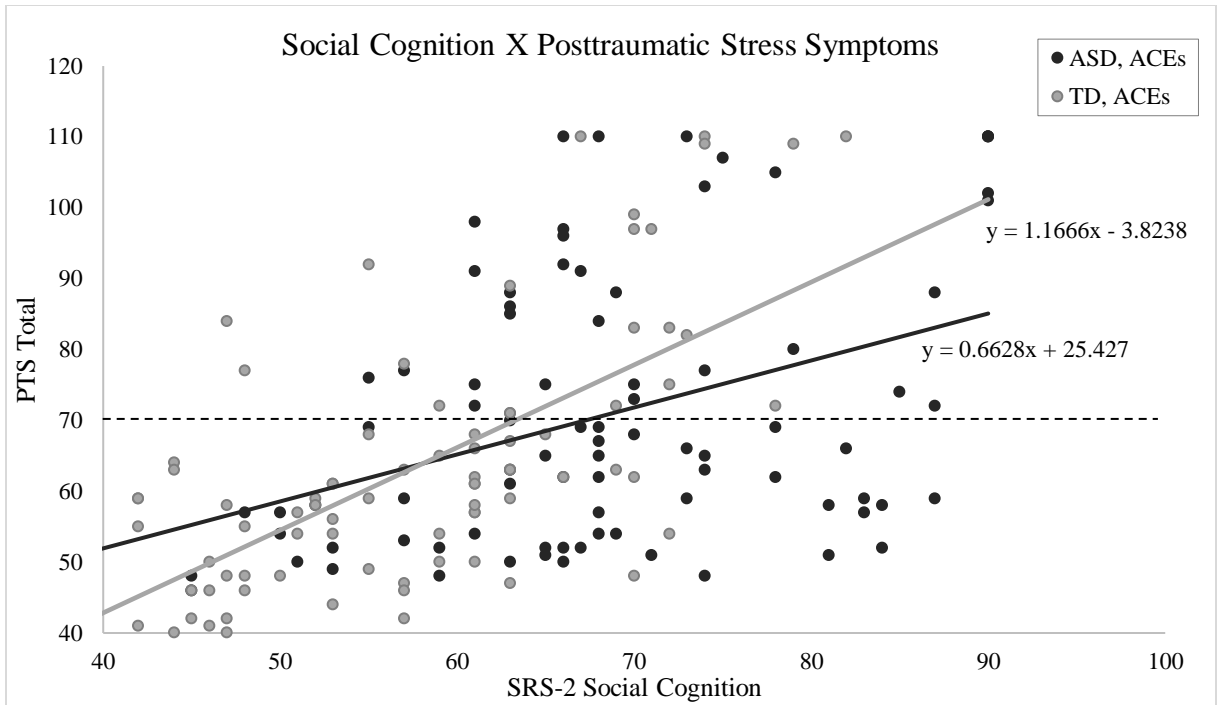


Figure 9. Scatterplot of social cognition on posttraumatic stress

IV. Discussion

This study presents data gathered from a national sample of caregivers of children who experienced ACEs, who had a diagnosis of autism spectrum disorder, or both. Participants were separated into three groups: children with ASD who experienced ACEs, children with ASD who did not experience ACEs, and typically developing children who experienced ACEs. Findings provide strong support for the psychological impact that ACEs have on children with autism spectrum disorder. Children with ASD were observed to experience comorbid mental health diagnoses than both other groups and demonstrated significant increases in posttraumatic stress symptoms in several domains compared to other children with ASD who did not experience ACEs.

A. Demographic Characteristics

Females appeared to have a greater ACEs count than males, and females with ASD experienced the highest number of adverse experiences of all groups in the sample. As expected, the typically developing group in the sample showed a greater frequency of children with fluent language abilities than both ASD groups; therefore, language level was controlled for in subsequent analyses. All other demographic variables were equally distributed within groups.

B. Mental Health Diagnoses

Results revealed that children with ASD who experienced ACEs possessed significantly more mental health diagnoses than both other participant groups. Specifically, children with ASD who experienced ACEs demonstrated higher comorbidity rates than their peers with ASD who did not endure ACEs, including increased prevalence rates of Attention-Deficit Hyperactivity Disorder (ADHD; 38.4% versus 8.9%), Anxiety Disorder (20.9% vs 4.4%), and Depressive Disorder (16.3% versus 0%). Though children with ASD and ACEs demonstrated a significantly higher *number* of diagnoses than their typically developing peers, the *types* of diagnoses were consistent across groups, indicating that symptoms of posttraumatic stress may manifest similarly as symptoms of ADHD, depression, and anxiety for both children with ASD and their typically developing peers. Notably, diagnostic rates of PTSD were low for all children who experienced ACEs. These results are consistent with current literature stating that symptoms of school-age children who experience chronic and repeated traumatic experiences are not adequately represented by a PTSD diagnosis, but instead present with symptom presentations similar to ADHD, anxiety disorder, oppositional defiant disorder, or the newly proposed developmental

trauma disorder (Cohen, 2009; McDonald, Borntrager, & Rostad, 2014; Van der Kolk, 2017).

C. ACEs Count and Type

Children with ASD in the sample were most likely to experience parental separation or divorce (51.2%), harassment or bullying at school (46.5%), witnessing domestic violence (31.4%) and emotional abuse (25.6%). Children with ASD were observed to experience marginally significantly greater traumatization rates compared to their typically peers in four areas. Almost half of children with ASD (46.5%) experienced harassment or bullying at school compared to only one-third (33.3%) of their typically developing peers. This is consistent with previous research that a diagnosis of ASD significantly increases children's risk for bullying victimization but decreases risk for being a perpetrator of bullying compared to community children (Hwang, Kim, Koh, & Leventhal, 2018). While not reaching statistical significance, children with ASD in the study also demonstrated greater rates of physical abuse (17.4% vs 8.5), physical neglect (4.7% vs 0%) and sexual abuse (3.5% vs 0%) compared to their typically developing peers, affirming widespread literature that children with disabilities are at increased risk for maltreatment (Mandell et al., 2005; Sullivan & Knutson, 2000).

D. Posttraumatic Stress Symptoms among Children with ASD

Overall, children with ASD who experienced ACEs demonstrated significantly greater levels of depression, anger/aggression, posttraumatic avoidance, and total posttraumatic stress than their unvictimized peers with ASD. Analyses revealed that children with ASD demonstrated a higher baseline level of posttraumatic stress when experiencing one ACE compared to their typically developing peers. This elevation in baseline posttraumatic

stress symptoms may be explained by a diagnostic overlap in already present ASD symptoms and posttraumatic stress symptoms, as children with ASD who did not experience ACEs also demonstrated a mean posttraumatic stress t-score that is higher than would be expected for typically developing children without ACEs based on the linear model (See Figure 5). As children with ASD accumulated ACEs, they appeared to demonstrate gradual increases in posttraumatic stress, though not quite as strongly as their typically developing peers. According to linear modeling, children with ASD experienced an increase of 2.9 t-score points for each accumulated ACE while their typically developing peers experience a greater increase of 3.6 t-score points for each accumulated ACE, illustrating that an increase in symptoms as measured by the TSCYC may not be as strong for children with ASD compared to typically developing children as ACEs accumulate.

The study hypothesized that children with ASD and ACEs would demonstrate the greatest levels of externalizing symptoms (i.e. anger, aggression, self-injurious behaviors) of all three participant groups. In support of this hypothesis, children with ASD in the sample showed statistically higher levels anger and aggression as a result of ACEs compared to their peers with who did not experience ACEs. While children with ASD and ACEs demonstrated the highest levels of self-injurious behaviors of the three groups, this difference was not statistically significant. Contrary to expectations, externalizing symptoms presented as less clinically elevated than several other symptoms subscales, particularly internalizing subscales. Specifically, children with ASD and ACEs demonstrated statistically significant increases in depressive symptoms as a result of ACEs, a finding which is consistent with current research connecting exposure to traumatic events and interpersonal trauma in childhood to disruptions in the development of appropriate

emotion regulation abilities (Dvir, Ford, Hill, & Frazier, 2014). However, the prevalence of depressive symptoms in this sample is particularly notable. While around 70% of children with ASD are reported to have at least one comorbid psychiatric disorder, depressive disorders occur in around 10% or less of children with ASD (Leyfer et al., 2006; Matson & Goldin, 2013; Simonoff et al., 2008). Therefore, the presence of clinically significant depressive symptoms and a 16% prevalence rate of diagnosed depressive disorders in the ASD, ACEs group is clinically meaningful.

It was hypothesized that children with ASD would present with increased anxiety-specific posttraumatic stress symptoms, such as anxiety, intrusion, avoidance, and compulsive behaviors. The most prominent increase as a result of ACEs was posttraumatic avoidance, or the avoidance of stress and anxiety associated with a traumatic experience. This finding overlaps with several interesting theories, including the “eye avoidance” theory of ASD, posing that individuals with ASD avoid looking at the eye region of other people as it may be perceived as socially threatening (Tanaka & Sung, 2016) and findings that children with ASD demonstrate increased vigilance to threatening faces as evidenced by gaze avoidance (Q. Wang et al., 2018). Results of this study provide evidence that anxiety-driven avoidance is a prominent response to traumatic or adverse experiences among children with ASD. This is concerning as research with typically developing individuals has shown that maladaptive coping styles of rumination and avoidance are strongly associated with increased vulnerability for exacerbated posttraumatic stress response (DiGangi et al., 2013). While increases in anxiety and intrusion symptoms as a result of ACEs did not meet statistical significance for children with ASD, mean scores increased from the normative range to broaching clinical significance. In contrast with

expectations, compulsive behaviors did not increase significantly as a result of ACEs for children with ASD.

Lastly, it should be acknowledged that children with ACEs who did *not* experience ACEs demonstrated unexpectedly high levels of arousal and dissociative symptoms. Elevations in dissociative symptoms may be explained by the overlap in symptoms of dissociation associated with posttraumatic stress (i.e. detachment, withdrawal, and disengagement) and some of the social characteristics associated with autism spectrum disorder (i.e. reduced social interest, difficulty in social interactions, lack of eye contact). Similarly, the arousal subscale measures symptoms of hyper-arousal in children and is commonly reflective of attention and concentration problems; however, core symptoms of attention, impulsivity, and hyperactivity are frequent in ASD and may explain this false elevation (Mayes, Calhoun, Mayes, & Molitoris, 2012). These results suggest that the arousal and dissociation subscales of the TSCYC may not be an accurate measurement of posttraumatic stress response in the ASD population and may result in false elevations.

E. Impact of ACEs Type on Posttraumatic Stress among Children with ASD

Children with ASD demonstrated significant increases in posttraumatic stress symptoms as a result of specific ACEs in two domains – separation from caregivers and exposure to violence or abuse.

Results of the study found that experiencing the death of a parent or caregiver was predictive of significantly increased symptoms of depression, anger, and aggression for children with ASD. These results shed light on the importance of the parent-child bond for children with ASD and further discredit early claims that insufficient parent-child attachment contributed to the cause of autism spectrum disorders (Mahler, 1952).

Separation from a primary caregiver due to immigration or deportation was predictive of significant increases in symptoms of anxiety and posttraumatic intrusion for children with ASD. This data supports previous research that forced parent-child separation as a result of parental detention and deportation leads to significant increases in posttraumatic stress among typically developing children (Rojas-Flores, 2017) and highlights that this result is equally true for children with ASD. These results provide evidence in support of the strong psychological impact that separation from caregivers can pose to children with ASD and the importance of the parent-child bond for children with developmental disabilities.

Results found that exposure to violence in the form of community violence or experiences of bullying and abuse were predictive of significant symptom increases in several domains. Experiencing bullying or harassment in the school setting was a significant predictor of depressive symptoms, which is clinically meaningful due to the high prevalence rate of bullying and harassment experienced by children with ASD in this study. In addition, the elevations in depression seen among children with ASD 12 years of age and younger in this study is likely an unfortunate precursor to documented increases in risk of suicidality observed among adolescents with ASD who experience bullying (Holden et al., 2020). Emotional abuse was predictive of significant increases in symptoms of anxiety, anger, and aggression. This is consistent with the current literature documenting that emotional abuse is particularly predictive of difficulties with emotion regulation and is associated with a variety of psychiatric disorders (Burns, Jackson, & Harding, 2010; Taillieu, Brownridge, Sareen, & Afifi, 2016).

Increased sexual concerns were predicted when children with ASD experienced sexual abuse, lived with a household member who was incarcerated, and were witness to

community violence in home and school settings. The emergence of sexual behaviors is well-documented for children who are victims of sexual abuse (Dewinter, Vermeiren, Vanwesenbeeck, Lobbestael, & Van Nieuwenhuizen, 2015; Kellaher, 2015). However, this behavior in children with ASD might also serve as a sensory-seeking method of self-soothing when exposed to a variety of traumatic or stressful life experiences. Sensory stimulation has been shown to be critically involved in many types of self-soothing and stress-reducing behaviors (Uvnäs-Moberg, Handlin, & Petersson, 2015). Research has documented that while some forms of sensory stimulation can be aversive for individuals with ASD, other sensory experiences are initiated by individuals with ASD as a calming strategy to bring reprieve from anxiety and stress and help the individual cope with uncomfortable situations (Robertson & Simmons, 2018). Inadequate communication, social skills, and understanding of appropriate norms of social behavior may also contribute to increased inappropriate or problematic sexualized behavior among children with ASD as a result of ACEs in comparison to their typically developing peers (Gougeon, 2010).

F. Social Impairment Symptoms across Groups

Overall, children with ASD who experienced ACEs did not demonstrate a significant increase in social impairment symptoms when compared to their peers with ASD who did not experience ACEs. As expected, typically developing children demonstrated significantly lower levels of social impairment symptoms for all SRS-2 subscales compared to both ASD groups. However, they demonstrated symptoms in the mild range for social communication and social communication/interaction (SCI), indicative of some difficulties with reciprocal communication and interaction skills in social situations after experiencing adverse events.

G. ACEs Count as Predictor of Social Impairment Symptoms in Typically Developing Children

Regression models found that ACEs count significantly predicted increases in social impairment symptoms for typically developing children who experienced ACEs, with SRS-2 Total scores increasing 1.98 points for every accumulated ACE. While typically developing children fall within normal limits when they experience few or no ACEs (see Figure 7), they transition into the mild range for ASD-related symptoms of social impairment once they accumulate 3 ACEs and into the moderate range once they accumulate 6 ACEs. While research supports that sustained emotional distress associated with ACEs can adversely affect emotional and social development in young children (Jimenez, Wade, Lin, Morrow, & Reichman, 2016), these results suggest that as typically developing children accumulate a high number of ACEs, they may demonstrate social impairments that begin to resemble those of children with autism spectrum disorders. This has significant implications for identification, assessment, and differential diagnosis between ASD and posttraumatic stress response.

H. Impact of Social Impairment on Posttraumatic Stress Symptoms in Children with ASD

A major question posed in this study was the degree to which social cognition, or one's ability to interpret social behaviors of other people, impacts the processing of traumatic experiences and resulting posttraumatic stress symptoms for children with ASD. It was hypothesized that social cognition impairments would be inversely associated with posttraumatic stress symptoms, meaning that as impairments in social cognition increased (indicating worse social cognition), posttraumatic symptoms would decrease. In turn, it

was hypothesized that social deficits associated with ASD would serve as a protective factor against the ramifications of exposure to adverse experiences or traumatic events. However, regression models revealed a positive association between social cognition impairments and posttraumatic stress symptoms among children with ASD and ACEs, indicating that increased difficulties with social impairments do not serve as a protective factor but instead another symptom of increased stress response to ACEs. As a result, it cannot be concluded that individuals with ASD are at any lesser risk of experiencing the psychological effects of traumatic experiences than their typically developing peers.

I. Clinical Implications

Results of the current study build upon the minimally existing research on ASD and ACEs (Berg et al., 2018; Hoover & Kaufman, 2018; Kerns et al., 2017; Ricles, 2017). Compared to children with ASD who have not experienced ACEs, children with ASD and ACEs demonstrate significantly higher rates of comorbid psychiatric diagnoses, including ADHD, anxiety, and depressive disorders. While these diagnoses have been well-documented as common comorbidities in ASD, no research has yet to hypothesize that comorbidities in ASD may be attributed to adverse or traumatic experiences. Therefore, children and adolescents with ASD should be routinely screened for ACEs, particularly when comorbid mental health symptoms begin to arise as they may serve as a warning sign of psychological distress to adverse childhood experiences.

In regard to differential diagnosis, models revealed that typically developing children with a high number of accumulated ACEs may present with similar levels social impairment symptoms as a child with ASD with relatively few ACEs. Therefore, it is imperative that psychological practitioners and psychiatric evaluators assess for ACEs

within diagnostic batteries, particularly when social impairments are present or when considering a diagnosis of autism spectrum disorder. It is important to assess for and consider the impact of ACEs when conceptualizing the inherent cause for social difficulties in children. Specifically, practitioners should assess for ACES in order to differentiate whether social difficulties are likely attributed to early adverse traumatic experiences or to an inherent neurodevelopmental disorder.

Results of the study provide clear evidence that reduced social awareness or social understanding associated with ASD does *not* serve as a protective factor against the detrimental psychological effects of traumatic experiences. Therefore, adaptations of trauma-focused interventions for individuals with ASD are clinically essential, yet currently lacking in both research and clinical practice. Children with ASD who experienced ACEs demonstrate increases in both internalizing and externalizing symptoms, with significantly greater levels of avoidance, depression, anger/aggression, and total posttraumatic stress than their peers with ASD who did not experience ACEs. While already common among individuals with ASD, anxiety symptoms became more prominent as a result of ACEs. From this we can interpret that engaging individuals with ASD in trauma-focused interventions, such as trauma-focused cognitive behavioral therapy, may be particularly challenging. Therefore, gradual exposure in trauma-focused treatment sessions is imperative for addressing symptoms of posttraumatic avoidance and should be a primary focus of intervention.

Specific ACEs types were shown to be predictive of increases in posttraumatic stress symptoms. Separation from primary caregivers due to deportation or immigration was predictive of increased depression and intrusive symptoms for children with ASD. This is

particularly impactful given the forcible separation and detention of children from parents seeking asylum at the United States-Mexico border under the Trump Administration beginning in 2018. The harmful and long-term neurological and psychological consequences of forcible separation of children from their parents due to immigration is well documented (Jones-Mason, Behrens, & Gribneau Bahm, 2019; Teicher, 2018; Upchurch & Gibson, 2019), and this study provides evidence that this experience is equally impactful for children with ASD.

Harassment and bullying at school was a highly occurring adverse experience for children with ASD and was predictive of depressive symptoms. This highlights an essential need for clinical- and school-based interventions to reduce the prevalence of bullying and harassment experienced by children and adolescents with autism and other developmental disabilities within school settings. Children who are identified as victims of bullying and harassment should receive trauma-focused interventions to ameliorate depressive symptoms. If left unaddressed, these children are at increased risk of suicidality in their adolescence years (Holden et al., 2020). Experiencing the death of a primary caregiver was also predictive of increased depression, anger, and aggression in children with ASD, highlighting the significance of the parent-child relationship for children with a disability that previously, and falsely, was thought to be rooted in poor parent-child attachment.

J. Limitations and Future Directions

There are several limitations of the current study that should be addressed and built upon in future research. First, statistical differences on several TSCYC subscales between children with ASD with and without ACEs provides new supportive evidence that the TSCYC may demonstrate appropriate sensitivity in identifying posttraumatic stress

response in ASD populations. However, further research is needed to explore this claim specifically for children with minimal language abilities (preverbal, nonverbal, or single word speech) as they only encompassed 8.1% of children with ASD and ACEs in the sample.

Second, children with ASD and ACEs were significantly more likely than both other groups to violate the Atypical Response validity subscale, a scale designed to measure a respondent's tendency to over-report their child's symptoms or report symptoms are that "not typically observed" among trauma-exposed children. This elevation likely occurred due to the presence of ASD-related symptoms as well as symptoms that may emerge for a child with ASD after adverse experiences that may not occur for typically developing children. Therefore, this subscale should be interpreted with caution when the TSCYC is used to measure posttraumatic stress among individuals with ASD and other developmental disabilities.

Third, the current study did not include a group for typically developing children who did not endure ACEs. Including this participant group in future studies would build upon findings in the current study exploring symptom increases within the ASD population as a result of ACEs.

Lastly, research suggests that children with disabilities are more likely to experience multiple episodes of maltreatment rather than single episodes (Sullivan & Knutson, 2000). Therefore, further research should assess for more the impact of frequent occurrence of the same ACEs type, ACEs duration, and ACEs severity on posttraumatic stress.

IV. Conclusion

The results of this study provide new evidence detailing how posttraumatic stress symptoms present in children with ASD after adverse childhood experiences. This study also provides concrete evidence that reduced social cognition associated with ASD does not serve as a protective factor against the psychological consequences of interpersonal trauma. These results highlight the importance of assessing for ACEs during diagnostic evaluations and shed light on the diagnostic ambiguity that is evident between highly accumulated ACEs and symptoms of social impairment associated with ASD. It is hoped that these results will be used in the development and adaptation of trauma-focused assessments and trauma-focused interventions for the ASD population with the goal of supporting lifelong social, emotional, and mental wellbeing.

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Appendix A.

Eligibility Screener

1. Child's age

- Less than 2 years
- 2
- 3
- 4
- 5
- 6
- 7
- 8
- 9
- 10
- 11
- 12
- 13 years or older

2. Does your child have any of the following diagnoses? (confirmed by a doctor, psychologist, or school officials). *Check all that apply.*

- Anxiety Disorder
- Attention-Deficit Hyperactivity Disorder (ADHD)
- Autism Spectrum Disorder (ASD) or Asperger's
- Conduct Disorder
- Depression
- Eating Disorder
- Intellectual/Cognitive Disability
- Learning Disorder
- Obsessive-Compulsive Disorder (OCD)
- Oppositional Defiant Disorder (ODD)
- Panic Disorder
- Posttraumatic Stress Disorder (PTSD)
- Bipolar or Mood Disorder
- None of the above

3. Has your child experienced any of the following at any point since he/she was born? *Check all that apply.*

- Child's parents or guardians were separated or divorced.
- Child lived with a parent or guardian who died.
- Child was in foster care.
- Child was separated from his/her primary caregiver through deportation or immigration.
- Child lived with someone who had a problem with drinking or using drugs.
- Child lived with a household member who served time in jail or prison.
- Child lived with a household member who was depressed, mentally ill, or attempted suicide.

- A household member swore at, insulted, humiliated, or put down your child in a way that scared him/her OR a household member acted in a way that made your child afraid that he/she might be physically hurt.
- Someone pushed, grabbed, slapped, or threw something at your child OR your child was hit so hard that he/she was injured or had marks.
- Child saw or heard household members hurt or threatened to hurt each other.
- Someone touched your child's private parts, or asked your child to touch their private parts in a sexual way.
- Child often saw or heard violence in the neighborhood or in his/her school.
- Child was often treated badly because of race, sexual orientation, place of birth, disability, or religion.
- Child experienced harassment or bullying at school.
- Child has a serious medical procedure or life threatening illness.
- More than once, child went without food, clothing, a place to live, or had no one to protect him/her.
- Child often felt unsupported, unloved, and/or unprotected.
- None of the above.

Appendix B.

Demographics Survey

1. Child's gender

- male
- female

2. Relationship to child of person completing this form

- mother
- father
- grandparent
- other related legal guardian (e.g. aunt, uncle, sibling)
- non-related legal guardian (e.g. foster parent)

3. Child's race or ethnicity

- Asian/Pacific Islander
- Black/African
- Caucasian/White
- Hispanic/Latinx
- Native American
- Mixed Race / Biracial
- Other

4. Family's annual income

- Less than \$20,000
- \$20,000 to \$40,000
- \$40,000 to \$60,000
- \$60,000 to \$80,000
- \$80,000 to \$100,000
- Greater than \$100,000

5. What is the general language level of your child?

- Nonverbal/preverbal (may use vocalizations, but not yet using words)
- Single words (e.g. "yes" "no" "mama" "dada")
- Phrase speech (2-3 word sentences; e.g. "I want ball")
- Fluent conversational speech (can converse back and forth)

Appendix C.

Trauma Symptoms Checklist for Young Children (TSCYC)

The following items have to do with things the child does, feels, or experiences. Please indicate how often he or she has done, felt, or experienced each of the following things *in the past month*.

- 1 = Not At All
- 2 = Sometimes
- 3 = Often
- 4 = Very True

1. Temper tantrums
2. Looking sad
3. Telling a lie
4. Bad dreams or nightmares
5. Living in a fantasy world
6. Seeming to know more about sex than he or she should
7. Being easily scared
8. Not wanting to go somewhere that reminded him or her of a bad thing from the past
9. Worrying that his or her food was poisoned
10. Flinching or jumping when someone moved quickly or there was a loud noise
11. Being bothered by memories of something that happened to him or her
12. Worrying that someone might be sexual with him or her
13. Not wanting to talk about something that happened to him or her
14. Not doing something he or she was supposed to do
15. Breaking things on purpose
16. Talking about sexual things
17. Having trouble concentrating
18. Blaming himself or herself for things that weren't his or her fault
19. Acting frightened when he or she was reminded of something that happened in the past
20. Pretending to have sex
21. Worrying that bad things would happen in the future
22. Arguing
23. Getting into physical fights
24. Drawing pictures about upsetting things that happened to him or her
25. Not noticing what he or she was doing
26. Having trouble sitting still
27. Playing games about something bad that actually happened to him or her in the past
28. Seeming to be in a daze
29. Having trouble remembering an upsetting thing that happened in the past
30. Using drugs
31. Fear of the dark
32. Being afraid to be alone
33. Spacing out

34. Being too aggressive
35. Touching other children's or adult's private parts (under or over clothes)
36. Suddenly seeing, feeling, or hearing something bad that happened in the past
37. Hearing voices telling him or her to hurt someone
38. Staring off into space
39. Changing the subject or not answering when he or she was asked about a bad thing that happened to him or her
40. Having a nervous breakdown
41. Not laughing or being happy like other children
42. Crying at night because he or she was frightened
43. Hitting adults (including parents)
44. Being frightened of men
45. Not being able to pay attention
46. Seeming to be a million miles away
47. Being easily startled
48. Watching out everywhere for possible danger
49. No longer doing things that he or she used to enjoy
50. Becoming frightened or disturbed when something sexual was mentioned or seen
51. Not sleeping for two or more days
52. Not paying attention because he or she was in his or her own world
53. Making mistakes
54. Crying for no obvious reason
55. Not wanting to be around someone who did something bad or him or her or reminded him or her of something bad
56. Being tense
57. Worrying about other people's safety
58. Becoming very angry over a little thing
59. Drawing pictures about sexual things
60. Pulling his or her hair out
61. Calling himself or herself bad, stupid, or ugly
62. Throwing things at friends or family members
63. Getting upset about something in the past
64. Temporary blindness or paralysis
65. Getting upset about something sexual
66. Not going to bed at night the first time he or she was asked
67. Fear that he or she would be killed by someone
68. Saying that nobody liked him or her
69. Crying when he or she was reminded of something from the past
70. Saying that something bad didn't happen to him or her even though it did happen
71. Saying he or she wanted to die or be killed
72. Acting as if he or she didn't have any feelings about something bad that happened to him or her
73. Whining
74. Not sleeping well
75. Worrying about sexual things
76. Being frightened by things that didn't use to scare him or her

77. Hallucinating
78. Acting like he or she was in a trance
79. Forgetting his or her own name
80. Getting upset when he or she was reminded of something bad that happened
81. Avoiding things that reminded him or her of a bad thing that happened in the past
82. Acting jumpy
83. Making a mess
84. Acting sad or depressed
85. Being so absent-minded that he or she didn't notice what was going on around him or her
86. Not wanting to eat certain foods
87. Yelling at family, friends, or teachers
88. Not playing because he or she was depressed
89. Being disobedient
90. Intentionally hurting other children or family members

Appendix D.

**Social Responsiveness Scale, Second Edition – School-Age Form
(SRS-2, School-Age)**

For each question, please choose what best describes this child's behavior *over the past 6 months*.

- 1 = Not True
- 2 = Sometimes True
- 3 = Often True
- 4 = Almost Always True

1. Seems much more fidgety in social situations than when alone.
2. Expressions on his/her face don't match what he/she is saying.
3. Seems self-confident when interacting with others.
4. When under stress, he/she shows rigid or inflexible patterns of behavior that seem odd.
5. Doesn't recognize when others are trying to take advantage of him/her.
6. Would rather be alone than with others.
7. Is aware of what others are thinking or feeling.
8. Behaves in ways that seem strange or bizarre.
9. Clings to adults, seems too dependent on them.
10. Takes things too literally and doesn't get the real meaning of a conversation.
11. Has good self-confidence.
12. Is able to communicate his/her feelings to others in words or gestures.
13. Is slow or awkward in turn-taking interactions with peers (for example, doesn't seem to understand the give-and-take of conversations).
14. Is not well coordinated in physical activities.
15. Is able to understand the meaning of other people's tone of voice and facial expressions.
16. Avoids eye contact or has unusual eye contact.
17. Recognizes when something is unfair.
18. Has difficulty making friends, even when trying his/her best.
19. Gets frustrated trying to get ideas across in conversations.
20. Shows unusual sensory interests (for example, mouthing or spinning objects) or strange ways of playing with toys.
21. Is able to imitate others' actions.
22. Plays appropriately with children his/her age.
23. Does not join group activities unless told to do so.
24. Has more difficulty than other children with changes in his/her routine.
25. Doesn't seem to mind being out of step with or "not on the same wavelength" as others.
26. Offers comfort to others when they are sad.
27. Avoids starting social interactions with peers or adults.
28. Thinks or talks about the same thing over and over.
29. Is regarded by other children as odd or weird.

30. Becomes upset in a situation with lots of things going on.
31. Can't get his/her mind off something once he/she starts thinking about it.
32. Has good personal hygiene.
33. Is socially awkward, even when he/she is trying to be polite.
34. Avoids people who want to be emotionally close to him/her.
35. Has trouble keeping up with the flow of a normal conversation.
36. Has difficulty relating to adults.
37. Has difficulty relating to peers.
38. Responds appropriately to mood changes in others (for example, when a friend's or playmate's mood changes from happy to sad).
39. Has an unusually narrow range of interests.
40. Is imaginative, good at pretending (without losing touch with reality).
41. Wanders aimlessly from one activity to another.
42. Seems overly sensitive to sounds, textures, or smells.
43. Separates easily from caregivers.
44. Doesn't understand how events are related to one another (cause and effect) the way other children his/her age do.
45. Focuses his/her attention to where others are looking or listening.
46. Has overly serious facial expressions.
47. Is too silly or laughs inappropriately.
48. Has a sense of humor, understands jokes.
49. Does extremely well at a few tasks, but does not do as well as most other tasks.
50. Has repetitive, odd behaviors such as hand flapping or rocking.
51. Has difficulty answering questions directly and ends up talking around the subject.
52. Knows when he/she is talking too loud or making too much noise.
53. Talks to people with an unusual tone of voice (for example, talks like a robot or like he/she is giving a lecture).
54. Seems to react to people as if they are objects.
55. Knows when he/she is too close to someone or is invading someone's space.
56. Walks in between two people who are talking.
57. Gets teased a lot.
58. Concentrates too much on parts of things rather than seeing the whole picture. For example, if asked to describe what happened in a story, he/she may talk only about the kind of clothes the characters are wearing.
59. Is overly suspicious.
60. Is emotionally distant, doesn't show his/her feelings.
61. Is inflexible, has a hard time changing his/her mind.
62. Gives unusual or illogical reasons for doing things.
63. Touches others in an unusual way (for example, he/she may touch someone just to make contact and then walk away without saying anything).
64. Is too tense in social settings.
65. Stars or gazes off into space.

Appendix E.

Repetitive Behavior Scale - Revised (RBS-R)
Self-Injurious and Compulsive Behaviors Subtests

Instructions:

Please rate this person's behavior by reading each of the items listed and then choosing the score that best describes how much of a problem the item is for the person. Be sure to read and score all items listed. Make your ratings based on your observations and interactions with the person over the last month. Use the definitions given below to score each item.

0 = behavior does not occur

1 = behavior occurs and is a mild problem

2 = behavior occurs and is a moderate problem

3 = behavior occurs and is a severe problems

Self-Injurious Behavior Subscale: movement or actions that have the potential to cause redness, bruising, or other injury to the body, and that are repeated in a similar manner

1. Hits self with body part (hits or slaps head, face, or other body area)
2. Hits self against surface or object (hits or bangs head or other body part on table, floor, or other surface)
3. Hits self with object (Hits or bangs head or other body area with objects)
4. Bites self (Bites hand, wrist, arm, lips, or tongue)
5. Pulls (Pulls hair or skin)
6. Rubs or scratches self (rubs or scratches marks on arms, legs, face, or torso)
7. Inserts finger object (eye-poking, ear-poking)
8. Skin picking (picks at skin on face, hands, arms, legs, or torso)

Compulsive Behavior Subscale: behavior that is repeated and is performed according to a rule, or involves things being done "just so"

9. Arranging / Ordering (arranges certain objects in a particular pattern or place; need for things to be even or symmetrical)
10. Completeness (must have doors opened or closed; takes all items out of a container or area)
11. Washing / Cleaning (excessively cleans certain body parts; picks at link or loose threads)
12. Checking (repeatedly checks doors, windows, drawers, appliances, clocks, locks, etc.)
13. Counting (counts items or objects; counts to a certain number or in a certain way)
14. Hoarding / Saving (collects, hoards, or hides specific items)
15. Repeating (need to repeat routine events; in/out door, up/down from chair, clothing on/off)
16. Touch / Tap (need to touch, tap, or rub items, surfaces, or people)