Language Profiles of Children Who Have Experienced Complex Trauma and Fetal Alcohol Spectrum Disorders

Christel G. Ciolino
Western Michigan University, ciolino.christel@gmail.com

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LANGUAGE PROFILES OF CHILDREN WHO HAVE EXPERIENCED COMPLEX TRAUMA AND FETAL ALCOHOL SPECTRUM DISORDERS

by

Christel G. Ciolino

A thesis submitted to the Graduate College in partial fulfillment of the requirements for the degree of Master of Arts
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Thesis Committee:

Yvette D. Hyter Ph.D., Chair
Janice Bedrosian, Ph.D.
Michelle Suarez, Ph.D.
Children who experience maltreatment and children with Fetal Alcohol Spectrum Disorders (FASD) have similar neurological differences and are at risk for language impairments. However, limited research has been conducted to analyze their specific skill sets. To address this limitation, retrospective data from the Children’s Trauma Assessment Center of Southwest Michigan were analyzed. The linguistic profiles of 79 children with histories of varying numbers of traumatic experiences and comorbid FASD statues are compared in the areas of semantics, syntax, pragmatics, and social communication. Individuals had high pass rates on the CELF-5 Screening Test and high overall scores on the Pragmatic Protocol-Revised Discourse Subtests, but show clinically significant deficits on specific areas of these assessments. Individuals also had elevated rates of impairments on tests of social perspective taking. Kruskal-Wallis test revealed that individuals with 6-11 trauma exposure status have statistically significant higher scores on Narrative Retell than those with 11-15 trauma exposures. Conversation skills were not impacted by numbers of exposures. Due to a lack of participants, individuals with comorbid FASD could not be analyzed in this study. Future research should expand on these results with more comprehensive assessments and use it to develop more sensitive linguistic treatments for this population.
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Christel G. Ciolino
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CHAPTER I

LITERATURE REVIEW

Introduction to Trauma Exposure and Fetal Alcohol Spectrum Disorders

Trauma Definitions

Every year, thousands of children are impacted by their exposure to traumatizing events and endure long-term physiological, cognitive, and emotional effects from their experiences. This combination of trauma exposure and its long-term consequences is known as complex trauma (Cook, Blaustein, Spinazzola, & Van Der Kolk, 2003). Children can experience trauma indirectly by living in areas where they witness violence (due to war and crime) and by being exposed to many prolonged medical procedures. Many children, especially in the United States, directly undergo complex trauma because of maltreatment (Yehuda, 2016), which The Centers for Disease Control and Prevention (CDC, 2016) defines as actions or failures to take action that result in the injury, potential for injury, or threat of injury to a child. Maltreatment is comprised of two main categories, abuse and neglect. Actions resulting in injury or potential injury are considered acts of abuse. More specifically, any caregiver behavior that harms a child physically, violates a child in a sexual manner, or damages a child’s psychological state is considered an act of abuse. Any failure to take action that results in injury or potential injury to a child is considered an act of neglect. Specifically, it is a failure to provide a safe environment for the child or a failure to attend to the child’s physical, medical, educational, or psychological needs (Leeb, Paulozzi, Melanson, Simon, & Arias, 2008).
Trauma Occurrence

Within the general population of the United States, the incidence rate of maltreatment is 39.46 per 1,000 children (Sedlack & Basena, 2014). As a result, thousands of children have the potential to be negatively impacted by complex trauma each year. The incidence of neglect is significantly higher than abuse. Approximately 77.5% of maltreatment cases were considered acts of neglect and about 28% of these were considered acts of abuse (National Scientific Council on the Developing Child, 2012; Sedlack & Basena, 2014). Different populations are more likely to experience abuse and neglect. Children with disabilities, low socioeconomic statuses, and those with higher numbers of siblings have higher rates of maltreatment (Davis, 2011; Sedlack & Basena, 2014). Despite having similar maltreatment rates to other racial/ethnic groups, Latinos, Native Americans, and African Americans are generally overrepresented in child welfare systems. It is hypothesized that this inequality is influenced by lower socioeconomic statuses and increased neighborhood deterioration. Additionally, this overrepresentation could be the result of biased reporting standards and culturally different views on maltreatment (Westby, 2007). Males and females were also equally likely to experience maltreatment. However, females are more likely to experience sexual abuse than males (Sedlack & Basena, 2014).

Trauma and Fetal Alcohol Spectrum Disorder

Many children who experience trauma resulting from maltreatment may have additional complications because of prenatal alcohol exposure. Nationally, about 31% of children in the child welfare system were removed from their homes because of parental substance abuse (Child Welfare Information Gateway, 2014). Children raised by parents who abuse alcohol are at an increased risk of prenatal alcohol exposure. Alcohol is a known teratogen and children who
experience prenatal alcohol exposure are at very high risk of fetal alcohol spectrum disorders (FASD). These disorders are diverse but are generally defined as issues with growth, facial dysmorphia, behavioral differences, and neurological deficits resulting from prenatal alcohol exposure. Hyter, Henry, Atchison, Sloane, Black-Pond, and Shangraw (2003) found that approximately 30% of children assessed for trauma at the Children’s Trauma Assessment Center also met diagnostic criteria for FASD as established by Astley (2004). Diagnoses were given by a qualified physician. Similar figures were also found in two later studies conducted at the Children’s Trauma Assessment Center of Southwest Michigan. Henry, Sloane, and Black-Pond (2007) found that approximately 40% of their sample of children with trauma exposure had comorbid FASD. Additionally, Hyter (2012) found that about 32% of her sample experienced comorbid FASD. Because these data were collected several years ago from a clinical population, additional research should be conducted to determine if this rate is still accurate, and if it generalizes to the overall population of maltreated children in the United States. However, the relative consistency of this statistic and large sample sizes utilized provide some preliminary evidence that trauma exposure is correlated with FASD. Considering these figures as well as previously discussed risk factors, it is critical to understand the epidemiology and symptomatology of FASD when studying children who have experienced trauma.

**FASD Definition**

The CDC (2017) provides definitions for several different diagnoses under the umbrella of FASD. Each diagnosis presents with a unique set of symptoms. The most involved is fetal alcohol syndrome (FAS). Individuals with FAS often have atypical facial features, slower prenatal and postnatal growth, and more advanced problems with the central nervous system. Another diagnosis under the wider diagnostic category of FASD is alcohol-
related neurodevelopmental disorder (ARND), which is typically characterized by deficits in attention, judgement, impulse control, and learning disabilities without the facial features typically associated with fetal alcohol syndrome. Alcohol-related birth defects is a diagnostic label used to describe an inverse pattern of symptomatology. Individuals with alcohol-related birth defects experience a wide range of physical differences associated with prenatal alcohol exposure, but not the cognitive and behavioral deficits associated with other FASDs. The last category of FASD is neurodevelopmental behavior disorder associated with prenatal alcohol exposure. This recently developed diagnostic label is given to individuals who display cognitive deficits in memory/thinking, adaptive behavior, behavior deficits, and had exposure to more than 13 alcoholic drinks per month in utero. Most FASD diagnoses are made by a team of professionals using an array of physical examinations to measure growth and facial features as well as behavioral neurocognitive tests to determine CNS dysfunction.

**FASD Occurrence**

Estimating the exact number of individuals with FASD is a complex process. The diagnostic process itself is highly involved. Many medical and behavioral examinations are required to make the diagnosis, and not all facilities have the resources to do so. Additionally, many FASD symptoms are also found in other developmental disorders, and individuals with FASD have heterogeneous symptomologies. Furthermore, it is difficult to determine if someone was genuinely exposed to alcohol in utero, as maternal alcohol use is often under reported (Hyter, 2007). Because of these complicating diagnostic factors, experts can only provide approximations of its prevalence. May and colleagues (2014) estimate that the prevalence of FASD in first graders living in the Midwest is about 2.4%-4.8%. This finding is highly similar to findings from national studies of school-aged children living in the United States and Western
European Countries. The Center for Disease Control (2017) states that 2-5% of school-aged children in these countries have FASD.

**FASD and Trauma Exposure**

Current evidence suggests that children with FASD also experience higher rates of maltreatment than the general population. Price, Cook, Norgate, and Mukherjee (2017) conducted a systematic review of the literature on trauma and prenatal alcohol exposure. They found significant evidence demonstrating that children with prenatal alcohol exposure and FASD had higher rates of trauma/maltreatment exposure. Some studies had comorbidity rates as high as 95%. All of the studies analyzed found that children with FASD or prenatal alcohol exposure had higher rates of maltreatment than the general population. This has been further supported by experimental research. One study found that 73% of a large sample of children with FASD experienced comorbid maltreatment (Greenbaum, Stevens, Nash, Koren, & Rovet, 2009; Parkinson & McLean, 2013). This supports earlier findings by Streissguth, Barr, Kogan, and Bookstein (1996) who also found that about 73% of participants with fetal alcohol exposure in their sample experienced maltreatment and other traumatic experiences such as domestic violence exposure. As there have been few large national or international studies of the comorbidity rates of FASD and maltreatment exposure, additional research must be conducted before any conclusions are reached. However, the high comorbidity rates in these studies suggest that a large percentage of co-occurrence would be highly probable. Furthermore, Wesby (2007) hypothesizes that children with FASD are more likely to experience maltreatment because of their status as children with disabilities. In general, children with disabilities are more likely to exhibit challenging behaviors and are unable to express when something is hurting them or uncomfortable. As a result, they experience higher rates of maltreatment than the general
population. Adults who abuse alcohol also are more likely to “live in worlds that are disruptive and prone to violence,” which puts their children at a greater risk of harm (Coggins, Timler, & Olswang 2007, p. 120). Additionally, children who were exposed to alcohol prenatally also more likely have an increased number of foster care placement transitions or different living situations (Smith, Johnson, Pears, Fisher, & Degarmo, 2007). Higher numbers of living arrangements increase the chances that a child will experience the loss of significant people in their lives, a type of trauma.

Rationale

Considering these risk factors, it is not surprising that children with FASD experience increased rates of maltreatment. However, there has been a limited number of published studies that analyze the impact of trauma and comorbid FASD on various cognitive and linguistic outcomes. Considering the complex psychological, neurological, and physiological effects of each condition, more studies are needed to provide a complete understanding of this population’s functioning. This additional research will allow professionals to provide more sensitive services to affected individuals. Data about language development in children who experienced maltreatment and FASD are especially limited. As language is a critical component of functioning in society at large, it is essential to develop an enhanced understanding of how maltreatment, FASD, and their interaction affects linguistic development in order to help professionals improve their overall outcomes. This study has the potential to address some of these limitations in the literature by analyzing the effects of trauma and comorbid FASD on tests of pragmatics, semantics, and syntax. Before the current study is addressed, a brief review of the cognitive and linguistic profiles of children in these populations and a description of their outcomes is provided along with a summary of the neurological characteristics influencing these
profiles. Additionally, factors impacting linguistic and cognitive variation within these populations will be discussed due to the heterogeneous nature of these conditions and disorders.

**Neurological Impact of Trauma**

Brain development is affected by life experiences, especially in the first two years of life. Because maltreatment minimizes positive experiences received from the environment and exposes children to a high frequency of stressful experiences, it can cause anatomical and physiological changes to the developing brain. The first set of neurological changes take place in the body’s stress response systems, particularly the hypothalamic-pituitary-adrenal axis (HPA axis) (De Bellis, 2001; Henry, Sloane & Black-Pond, 2007; The National Scientific Council on Neglected Child, 2012). The HPA axis is the system that releases cortisol, a hormone that triggers the response of the sympathetic nervous system (De Bellis, 2001; The National Scientific Council on Neglected Child, 2012). When this system is activated, the hypothalamus produces an increased amount of corticotrophin-releasing hormone and arginine vasopressin, which trigger the anterior pituitary gland to release adrenocorticotropic hormone. This causes the adrenal gland to produce cortisol. Elevated levels of cortisol are associated with activation of the sympathetic nervous system. The sympathetic nervous system incites involuntary bodily changes during times of stress, specifically, increasing heart rate and slowing down digestive processes (De Bellis, 2001; Tarullo & Gunnar, 2006).

**Trauma and the HPA Axis**

Maltreatment/trauma exposes children to stressful situations that activate the HPA axis with atypical frequency. Constant activation of neurons in the HPA axis strengthens the connections amongst them and changes the way the neurotransmitters and hormones in the
system are released (Kuhlman, Vargas, Geiss, & Lopez-Duran, 2015). It also affects how they influence the development of brain structures. This process is referred to as "priming" (DeBellis, 2001). Primed HPA axes can exhibit stronger excitatory responses to stress. This response occurs if responsive caregiving is not provided early in life. There are many individual differences in response due to individual genetic predisposition, the chronicity of trauma, the severity of trauma, the type of trauma, and the age of first trauma exposure. In addition, few studies on HPA responsiveness in humans have been conducted so the few available studies are very diverse due to these factors (Kuhlman, Vargas, Geiss, & Lopez-Duran, 2015). As a result, there is evidence demonstrating the opposite phenomena, in which maltreated children demonstrate hyporesponsiveness to stressors. In several tests of cortisol responsiveness, maltreated children demonstrated less activation of the HPA axis, which indicates that maltreatment is also associated with reduced activity in the HPA axis. This difference in responsiveness could also be a result of the receptors in the system becoming less responsive to the transmitter or from an increased release of inhibiting neurotransmitters as a way of adapting to constant stress over time (Cook et al., 2003; Davis, Moss, Nogin & Web, 2015; De Bellis, 2001; Twardosz & Lutkzer, 2010). These differences in HPA axis function greatly influences how individuals respond to stressful situations in their lives.

In addition to these changes in stress response, maltreatment can cause differences in the everyday functioning of the HPA axis. These effects are nuanced and change based on the developmental period in which stress occurs as well as individual factors like genetic predisposition, economic status, and access to treatment. Typically, children who experience complex trauma often have different cortisol release patterns than children who have not experienced complex trauma (De Bellis, 2001; Tarullo & Gunnar, 2006; The National Scientific
Council of the Developing Child, 2012). Rather than having heightened levels of cortisol during
the morning and lower cortisol levels at night, children who have experienced maltreatment
typically have a flat pattern of cortisol release throughout the day. Many young children who
have experienced maltreatment have elevated overall levels of cortisol in their systems, but over
time the HPA axis often adapts by reducing the daily levels of cortisol released. Many adults
who experienced maltreatment as children have reduced overall levels of cortisol compared to
adults who did not experience maltreatment as children (De Bellis, 2001; Kuhlman et al. 2015;

Tarullo & Gunnar’s (2006) literature review provides some preliminary evidence demonstrating
that children who have been maltreated experience different basal cortisol levels based on their
behavioral profiles. Specifically, children who experienced maltreatment and demonstrate
internalizing problems tend to have elevated basal cortisol levels, while children with
maltreatment exposure and with externalizing issues tend to have lower basal cortisol levels
compared to controls. However, compared to other children with externalizing issues, children
with histories of maltreatment have higher basal levels of cortisol. These changes in basal
cortisol levels may cause children to be in a constant state of vigilance and make the brain more
vulnerable to future stressors, which puts children at an increased risk of anxiety disorders and
mood disorders. These childhood disruptions in HPA axis functioning increase an individual’s
chances of experiencing depression, diabetes, heart disease, stroke, post-traumatic stress disorder
(PTSD) and cognitive deficits in adulthood (Davis et al., 2015; Pevandiou & Chrousos, 2012).

**Catecholamine System and Trauma Exposure**

Other systems of arousal associated with stress are also affected by exposure to chronic
trauma, specifically the catecholamine system. Children who experience maltreatment frequently
demonstrate elevated levels of catecholamine neurotransmitters (epinephrine, norepinephrine, and dopamine), which help regulate arousal. These neurotransmitters are essential to many of the brains’ daily functions, and atypical levels can have dramatic and widespread changes to many areas of the brain (Davis et al., 2015; De Bellis, 2001). This indicates that trauma affects multiple systems of arousal and has widespread effects on brain functioning.

**Physiological Effects of Trauma**

Children who have experienced maltreatment have some additional neurophysiological changes resulting from differences to their stress-response systems. They often demonstrate altered patterns of synaptic pruning, neuronal generation, synaptic production, and myelination (DeBellis, 2001; Twardosz & Lutkzer, 2010). Additionally, children who have experienced maltreatment demonstrate reduced electrical activity in the brain and lower levels of interhemispheric transfer. This can result in difficulty with social cognition, reduced information processing, and slower processing speed (The National Scientific Council of the Developing Child, 2012; De Bellis, 2001; Cook et al., 2003). There are also some preliminary data suggesting that children who experienced neglect demonstrate noticeably decreased glucose metabolisms in the limbic systems, but additional data is required in order to determine the full impact of maltreatment and complex trauma on brain metabolism. This could result in altered functioning of the brain centers responsible for emotional regulation, memory, and stress response (The National Scientific Council of the Developing Child, 2012; Twardosz & Lutkzer, 2010).
**Anatomical Effects of Trauma**

These physiological changes affect the brain anatomy of children who have experienced maltreatment. They often have reduced cortical grey matter, larger ventricles, and lower intracranial volume (The National Scientific Council of the Developing Child, 2012; De Bellis, 2001). Additionally, these children often demonstrate reduced volume of the corpus callosum, which is responsible for interhemispheric transfer (Cook et al., 2003; De Bellis, 2001). This can result in reduced social functioning. Several other specific brain regions also show reduced volume and altered functioning including: the orbitofrontal cortex, which is involved in executive functioning and social information processing; the thalamus or the sensory relay system of the brain; the nucleus acumens and striatum, which are responsible for determining neurotransmitter rewards; the fusiform face area, which is responsible for recognizing faces; the amygdala, which is associated with anger, fear, and other primitive emotions; the hippocampus, which is associated with long-term memory; and the anterior cingulate, which is responsible for conflict monitoring and resolution as well as executive functioning (Cook et al., 2003; Davis et al., 2015; De Bellis, 2001; Henry et al., 2007; The National Scientific Council of the Developing Child, 2012).

**Neurological Impact of FASD**

FASD, by its definition, also involves neurological changes. Exposure to the teratogen, alcohol, in utero frequently causes a range of heterogeneous differences in both brain anatomy and physiology. The severity and type of these neurological deviations are influenced by many factors including the developmental stage at which the fetus was exposed to alcohol, the amount of alcohol a child is exposed to, and other additional environmental or individual factors that
vary from person to person (Brown & Connor, 2013; Riley, Infante, & Warren, 2011). Despite the wide range of severities and symptomologies, studies have found several general trends in the neurological profiles of children with FASD.

**Physiological Effects of FASD**

Children with FASD have demonstrated neural physiological differences in several studies. According to one magnetic resonance spectroscopic imaging study (which measures metabolic functioning), adolescents with FASD and young adults with FASD tend to have lower metabolic ratios of nutrients needed for glial cell function in both cortical and subcortical areas of the brain. Having smaller metabolic ratios of nutrients in the brain can affect the brain’s ability to function with accurate speed and build synapses in an age-appropriate manner (Fagerlund et al., 2006). This can greatly alter a child’s ability to learn in an age-appropriate way. In addition, Wozniak et al. (2013) found that children with FASD also experienced lower levels of neural connectivity associated with white-matter abnormalities compared to typically developing controls. In this study, neural connectivity was measured by resting state functional magnetic resonance imaging studies of 10-to 17-year-old children. Decreased levels of neural connectivity can result in decreased cognition and information processing. Additional studies are required to further understand the complex neurological differences in individuals with FASD, especially from a developmental perspective.

**Anatomical Effects of FASD**

Anatomically, one of the most salient neurological features of FASD is the reduced white matter volumes. One longitudinal diffusion tensor imaging study found that compared to typically developing children, individuals with FASD demonstrated greater reductions of mean
diffusion with age, especially in the fronto-occipital region and superior longitudinal fasciculi. This indicates decreased white matter volume. White matter deficiencies are associated with many neurological and cognitive deficiencies, especially those associated with executive functioning and social cognition. In addition, having reduced white matter has been connected to an increased risk of mental illnesses, autism spectrum disorders, and attention disorders (Fields, 2008). In addition, this study also showed that children with FASD had reduced cortical and subcortical grey matter volume, which can also affect cognitive abilities. Participants also demonstrated fewer age-related volume increases (Brown & Connor, 2013; Triet, Lebel, Baugh, Rasmussen, Andrew, & Beaulieu, 2013). In addition, children with FASD were found to have reduced brain volume and head circumference, increased rates of corpus callosum malformation/agenesis, diminished cerebellar volume, decreased volume of the frontal lobe, narrower temporal and parietal lobes, and diminished fusiform gyri (Brown & Connor, 2013). These neuroanatomical differences can all result in decreased executive functioning, social cognition, and inferencing. Decreased cerebellar volume is associated with decreased cognitive performance on measures of vocabulary, working memory, and set shifting (Moore, D’Mello, McGrawth, & Stoodley, 2017).

It is important to note that despite different etiologies, children with FASD demonstrate neurological profiles that are similar to those of children who experienced maltreatment or trauma (Hyter, 2007; Henry et al., 2007). These neurological presentations are associated with comparable cognitive and linguistic profiles. Differences in cognitive and linguistic functioning resulting from these neurological changes could greatly impact the academic and cognitive outcomes of individuals with FASD and maltreatment exposure. Accordingly, it is important to obtain a nuanced understanding of cognition and language in these populations. Just as the
literature demonstrates that children with FASD and children with maltreatment exposure exhibit diverse neurological profiles, current evidence suggests that their cognitive and linguistic outcomes are variable as well. There are many factors that contribute to this diversity and they must be accounted for in order to obtain an improved understanding of language and cognition in these populations. As a result, the current study analyzed the cognitive and linguistic profiles of individuals as well as the factors influencing linguistic development in these populations. The literature on linguistic development is less expansive and therefore will be the focus of this study.

**Cognitive Profiles of Children Exposed to Trauma and FASD**

While this study focuses on the linguistic functioning of children with FASD and maltreatment exposure, cognition has a significant impact on language (Traxler, 2012). Accordingly, understanding the cognitive skills of individuals in these populations provides improved comprehension of their linguistic functioning. For purposes of this study, aspects of cognitive functioning that affect language development and scores on standardized tests of language, (e.g., general intelligence quotients, memory, executive functioning, and social cognition) will be discussed along with the factors associated with variation in these populations.

**General Intelligence Quotient**

Children who experienced maltreatment and those who experienced FASD both tend to have lower scores on tests of general intelligence. Measuring intelligence is multifaceted and affected by many factors. Like all standardized assessments, intelligence quotients have an element of bias; that is, many other factors other than intellectual performance such as culture, gender, ethnicity, and age can affect scores.
**Trauma exposure.** Several studies demonstrated that children who experienced maltreatment demonstrated significantly lower scores on several measures of general intelligence and learning than children who did not experience maltreatment (Eslow, Egeland, Blood, Wright, & Wright, 2012; The National Scientific Council on the Developing Child, 2012). Viezel, Freer, Lowell, and Castillo (2014) demonstrated that children who experienced maltreatment had lower scores on The Wechsler Intelligence Scale for Children (WISC: Wechsler, 2003). Specifically, they found that children who experienced maltreatment had "relatively intact nonverbal" and fluid intelligence quotients compared to controls. However, participants had poorer verbal crystallized intelligence scores compared to controls. Participants were only matched based on age, ethnicity, and gender. As a result, additional research will be required to determine how socioeconomic status and other confounding factors affect different types of intelligence quotients amongst children who have experienced maltreatment.

Henry et al. (2007) had different results. Their analysis demonstrated that children who had trauma exposure and children with comorbid FASD and trauma exposure exhibited mean scores within 1.0 standard deviation of the mean on the Kaufman-Brief Intelligence Test-2nd edition (KBIT-2: Kaufman & Kaufman, 2004). Participants in both groups did not demonstrate significant differences between their verbal and nonverbal scores. Despite receiving scores in the normal range on general intelligence tests, participants in both groups showed higher percentages of major to moderate developmental delays in more specific areas of cognition and development. Specifically, participants demonstrated high percentages of developmental delays in attention, memory, receptive language, expressive language, visual processing, fine motor, graphomotor, and gross motor skills. Richardson, Black-Pond, Sloane, Atchison, Hyter, and Henry (2015) also found that children with trauma exposure experienced scores within 1.0 standard deviation of the
mean on the KBIT-2. Participants, however, still exhibited significantly lower scores within this normal limit when compared to controls. Nonverbal, verbal, and composite scores were similarly affected.

These conflicting results may be associated with multiple factors. Scores on the KBIT-2 typically predict outcomes on the Wechsler Intelligence Scale (Kaufman & Kaufman, 2002). However, the KBIT-2 has a significantly shorter administration time, which could imply that deficits in attention may have a reduced impact on scores. Children with trauma exposure have an increased rate of attention disorders, which may have impacted performance (Ouyang, Xiangming, Mercy, Perou, & Grosse, 2008). It may also be more sensitive to differences in these more specific cognitive subskills than other tests. It may also be that different tests are more sensitive to the types of skills with which the individuals with FASD/maltreatment exposure have difficulties. Additionally, the samples utilized for each study had distinct characteristics. Henry, et al., (2007) analyzed a clinical population and Viezel et al. (2014) analyzed children who were in the general population. Additional research is needed to fully untangle these complex interactions and gain a more robust understanding of the cognitive abilities of children who have experienced trauma.

**FASD.** Carter, Jacobson, Molteno, Doge, Meintjes, Jacobson, and Jacobson (2002) found that children who experienced prenatal alcohol exposure and FASD also demonstrated lower average intelligence quotients (IQ) on generalized tests of intelligence. This is further supported by evidence from an experimental study. Kodituwakku and Kodituwakku (2014) found that the majority of studies analyzed in their literature review demonstrated that children with FASD exhibited lower verbal and nonverbal scores on intelligence assessments. The severity of
participants' intellectual disability was significantly affected by both parental socioeconomic status and the amount of alcohol consumed while the child was in utero.

**Executive Functioning and Attention**

Executive functioning is defined as the set of skills that allows individuals to perform complex cognitive tasks. It includes cognitive flexibility, sequencing, and inhibition (Center on the Developing Child, 2011). Because of their reduced frontal lobe volume, decreased neuro-connectivity, and other neurological changes, children who have experienced trauma as well as those with FASD are especially susceptible to deficits in executive functioning and attention (Henry et al., 2007, Cook et al., 2003). Some of the differences in executive function experienced by those with trauma exposure and FASD are discussed below.

**Trauma exposure.** Several studies demonstrate that children with trauma exposure have multiple deficits in executive functioning. DePrince, Weinzierl, and Combs (2009) found that children who experienced maltreatment and domestic violence exposure demonstrated increased numbers of executive functioning impairments compared to typically developing peers. Moderate effect sizes were found between the two groups. Impairments were measured using a series of standardized tests that evaluated working memory, impulse control, auditory attention, processing speed, and interference. They were also found to have deficits in basic levels of attention in addition to these more advanced executive functioning skills. In one large national study, individuals with trauma exposure experienced higher-level attention deficits and exhibited increased numbers of ADHD symptoms when compared to controls (Ouyang, et al., 2008). Henry et al. (2007) also found that children with trauma exposure exhibited significantly greater impairments on general tests of basic attention. This is further supported by Cook et al. (2003)
whose expert panel found that children with trauma exposure demonstrated increased rates of executive function impairment and attention in their literature review. Collectively, these results indicate that children with trauma exposure exhibit deficits in attention and other measures of executive functioning.

**FASD.** Several studies also found that individuals with FASD also demonstrate impaired executive functioning. Brown and Connor (2013) found that they exhibited higher rates of attention disorders and had increased difficulty with more advanced executive functioning skills such as metacognitive memory strategies, self-regulation, inhibition, visual-spatial processing, visuomotor integration, cognitive flexibility, utilization of feedback, planning, abstract thinking, processing speed, and deductive reasoning when compared with the typically developing population. There is additional evidence demonstrating that children with FASD have additional higher-level deficits in executive functioning and attention, even when compared to children who also have attention disorders without co-occurring FASD. On assessments that analyzed basic attention, children with maltreatment exposure had similar performances to children with attention disorders. However, children with FASD showed increased impairments in assessments that measured skills in more advanced tasks that required alerting, orienting, and problem-solving skills (Kodituwakku & Kodituwakku, 2014). These studies demonstrate that children with FASD have executive functioning impairments in multiple levels of functioning.

**Memory**

The literature about trauma, FASD, and their effects on memory is quite diverse and limited in its scope. These populations have increased rates of executive functioning impairments, which may make encoding and retrieving memories more difficult. However, the
literature shows that children with these conditions demonstrate varying severities and types of memory deficits. A summary of some of the research on memory, FASD, and maltreatment exposure is provided below.

**Trauma exposure.** Multiple studies demonstrate that children who experienced trauma have deficits in multiple aspects of memory, and several studies demonstrate that these children do not experience deficits in memory. Cicchetti, Rogosch, Howe, and Toth (2010) found that children who experienced maltreatment had similar performances to controls on tests of basic recall and recognition. However, participants demonstrated increased false recognition memories if they had experienced emotional maltreatment. False recognition is mistakenly identifying new stimuli as something that had previously been presented (Brockdorff & Lamberts, 2004). Maguire et al. (2015) also provide some evidence that individuals with trauma exposure may have unique memory deficits resulting from their emotional state. Their systematic review found that children who had experienced neglect did not have any deficits in memory recall when compared with typically developing peers in all studies analyzed in their systematic review. One of the studies reviewed found that children with histories of neglect exhibited significantly reduced performance in tests of negative false recall when asked to remember things said about them if they had negative self-esteem.

Bücker and colleagues (2012) had different results. Their findings suggested that children who were exposed to trauma demonstrated worse performance on assessments of immediate verbal recall and working memory, which might be associated with their deficits in executive functioning. Richardson et al. (2015) also found that trauma exposure was associated with decreased scores on tests of memory. Approximately 84.5% (455 out of 538) of children who
experienced significant trauma demonstrated severe memory impairments on tests of working memory, short-term memory, auditory/visual registration, and word retrieval. Multiple factors could have contributed to these varied results including the use of different assessment tools and the inclusion of different types of trauma exposures (direct and indirect) in each study. Further research must be conducted to determine how these various factors impact performance on memory assessments.

**FASD.** Children with FASD also have been found to have memory deficits. However, their discrepancies are more consistently documented in the literature. This population has demonstrated lower scores on tests of working memory (Paolozza, et al., 2014). Children with FASD have also been found to have impairments in source memory (remembering where information was acquired), recognition, and visuospatial memory tasks where they had to draw complex abstract images from memory (Kully-Martens, Pei, Job, & Rasmussen, 2012). Further study is required to determine how additional components of memory and retrieval are encoded.

**Sensory Dysfunction**

In addition to memory impairment, children in these populations also tend to have different responses to sensations. Children with histories of trauma exposure demonstrate a high prevalence of sensory modulation disorders. They exhibit difficulty regulating their behaviors in response to the sensory input they receive from the environment when they are overwhelmed by an absence or overabundance of sensory stimulation as a result of these impairments (Atchison, 2007). Franklin, Deitz, Jirikowic, and Astley (2008) found that children with FASD were also found to have similar sensory processing deficits, as evidenced by their performance on the Short Sensory Profile (Dunn, 1999). This is further supported by Jirowick, Olson, and Kartin (2009).
Using the Quick Neurological Screening Test (Mutti, Sterling, & Martin, 1998), Developmental Neuropsychological Assessment (Korkman, Kirk, & Kemp, 1998), and the Short Sensory Profile, they found that Children with FASD were also found to have reduced sensory modulation, increased sensorimotor problems, and more soft neurological symptoms (symptoms that are not associated with a specific brain region or a specific syndrome) than children without FASD.

**Social Cognition**

Social Cognition is broadly defined as the “various cognitive processes that allow an individual to take advantage of being part of a group” (Frith, 2008, p. 2033). Social cognition is comprised of many individual skills including social perspective taking, emotional recognition, and emotional understanding. Many of these cognitive processes are associated with activity in the frontal lobe, neural connectivity, and several other neurological areas specifically affected by trauma and FASD. This makes them especially susceptible to deficits in social cognition. Accordingly, much of the literature demonstrates that children in these populations have difficulty in multiple aspects of social cognition.

**Trauma exposure.** Some studies demonstrated that children had impaired perspective-taking abilities in multiple domains. Elementary school children and adolescents with trauma exposure exhibited lower social perspective taking abilities and more egocentrism, as evidenced by their scores on the Interpersonal Negotiation Strategies Interview (Schultz, Yeates, & Selman, 1989) and Chandler's Bystander Cartoons Test (Chandler, 1973). These standardized
assessments present children with a scenario involving an interpersonal conflict and utilize probing questions to determine how well the child understands the character's perspective (Burack et al., 2006). This was further confirmed in a meta-analysis by Luke and Banerjee (2013), who found that both adolescents and school-aged children who had experienced many different types of maltreatment scored lower on several tests of general perspective taking.

Several studies have addressed more specific aspects of perspective taking by analyzing performance on different theory of mind tasks. A systematic review found that children who have experienced maltreatment are more likely to have difficulty with basic false belief tasks. However, there were mixed results with more advanced perspective taking and hostile attribution tasks. Some studies supported deficits in these tasks and others found that children performed similarly to controls (Benarous, Guilé, Consoli, & Cohen, 2015). Using the more rigorous method of meta-analysis, Luke and Banerjee (2013) provide additional evidence demonstrating that children who experienced maltreatment exhibit lower scores on first-order false belief tests; however, they did not analyze performance on other types of theory of mind. O'Reilly and Peterson (2015) were able to analyze multiple aspects of theory of mind in their experimental study and found that 4- to 13-year-old children with maltreatment exposure had more extensive deficits on both basic and advanced tasks. Theory of mind was analyzed using Wellman and Lui's Theory of Mind Scale (Wellman & Lui, 2004), which evaluates theory of mind in multiple dimensions. Specifically, it measured the ability to understand that people had different wants,
beliefs, knowledge access, and hidden emotions. This study also utilized several other well-verified tasks to assess first-order and second-order belief attribution. On nearly every measure, children who experienced maltreatment had significantly lower pass rates on both first-order and second-order tasks. However, children who experienced maltreatment exhibited equal results to controls on the hidden emotion task, even though it was a more advanced skill. The authors suspect that this may be a result of growing up in an environment where adults often conceal their emotions, or because the children themselves often had to conceal their own negative emotions. These studies collectively provide strong evidence demonstrating that individuals with maltreatment have deficits in general measures of perspective taking and basic theory of mind tasks. However, additional research is necessary to fully understand their performance on more advanced measures of theory of mind.

These children also experience deficits on several measures of emotional understanding and recognition. Luke and Banerjee (2013) found that school-aged children who experienced maltreatment had lower scores on tests of emotional recognition, understanding, and composite measures of emotional knowledge (both recognition and understanding combined) compared to controls. In this meta-analysis, emotional understanding was measured by a child's ability to describe how a situation would provoke a certain emotion or select the appropriate emotion to describe how someone might be feeling in a situation. Recognition was measured by the ability to match emotions to both facial expressions and changes in vocal quality or prosody. Children
who experienced maltreatment tended to have the most difficulties (greater effect sizes) in emotional understanding and fewer difficulties in emotional recognition. Koizumi and Takagishi (2014) found some more specific deficits in facial expression recognition in their study of Japanese children who had been maltreated. Participants who experienced maltreatment exhibited significantly reduced ability to recognize positive facial expressions but had similar performance to controls in identifying negative facial expressions. It is important to generalize this result with caution, as individuals from Japan may have significantly different outcomes than individuals from other countries with readily accessible social services. According to Human Rights Watch (2016), the Japanese child welfare system previously utilized institutions to care for 90% of the children in their program. Institutionalization is associated with reduced outcomes, especially for younger children. Recently, laws were passed to reduce the rate of institutionalization. However, most of the Japanese children who experienced maltreatment lived in institutions when this study was conducted, which could have affected their performance on these tasks. Further assessment is required to fully understand how children with trauma exposure perform in specific aspects of emotional recognition and understanding.

**FASD.** The literature also demonstrates that children with FASD exhibit deficits in multiple aspects of social cognition when compared to peers. Children with FASD tend to display socially inappropriate behaviors, have difficulty forming interpersonal relationships, utilize poor social judgement, and have greater difficulty perceiving/responding to social cues (Parkinson & Mclean, 2013). This was further confirmed by Stevens, Dudek, Nash, Koren, and
Rovet (2015) who found that children with FASD scored lower than controls on both parent reports and on in-person professional assessments of social cognition. These measures analyzed general perspective taking as well as performance on more specific tasks such as hidden emotion, belief attribution, and emotional identification. Children with fetal alcohol syndrome also demonstrated significantly lower total scores on the Vineland Adaptive Behavior Social Scales (Sparrow, Balla, & Cicchetti, 1984). They also exhibited greater discrepancies between their chronological age and their age-equivalent scores on the social skills section of the Vineland Adaptive Behavioral Scales than peers with the same verbal intelligence quotients and similar general intelligence quotients. This suggests that the deficits in social skills demonstrated by children with FASD are not accounted for by intelligence quotient alone (Thomas, Kelly, Mattson, & Riley, 1998). These studies demonstrate that there is substantial evidence to suggest that those with FASD also exhibit deficits in social cognition.

**Comorbid FASD and trauma exposure.** Impaired social cognition has also been found in children who have both comorbid FASD and trauma exposure. Greenbaum et al. (2009) found that a sample of children with FASD, a majority of whom had comorbid trauma exposure also demonstrated reduced social cognition and scored significantly lower than controls on the Social Skills Rating System for Strategic Control of Emotions Task (Gresham & Elliot, 1990). This cognitive task measures social cognitive performance by presenting children with scenarios and then asking them when it is socially appropriate to display emotions. This study also analyzed performance on theory of mind tasks. In contrast to previous studies that analyzed children with either trauma exposure or FASD, no deficits were found on theory of mind tasks in this group of participants. Emotional recognition was also assessed in this study. Participants demonstrated lower scores on tasks where they had to determine if a person's facial expression matched a
certain emotion. However, they performed similarly to controls when they had to determine if a certain pattern of prosody matched a certain emotion. As this is only one study, additional evidence is required to support this result and explore other aspects of social cognition in this population.

**Cognitive Variability in Children who have Experienced Trauma and FASD**

Children who have experienced complex trauma and FASD have many different factors that influence their cognitive development. For children with trauma exposure, the age, severity, and chronicity of exposure all determine how these symptoms manifest. Individuals with FASD have different cognitive outcomes depending on the amount of exposure, physical symptoms, and their individual diagnosis (English et al. 2005; Maguire et al., 2015; Pears, Kim, & Fisher, 2008; Valentino, Cicchetti, Tosch, & Rogosch, 2011). Personal and genetic factors also affect cognitive development in both of these populations, but more research is required to fully understand the differences in this population stemming from these causes.

**Effects of Type of Maltreatment on Cognition**

Currently, studies that discuss the relationship between the type of trauma experienced (e.g., abuse, neglect, domestic violence exposure) and associated differences in cognition have mixed results. Some studies demonstrate that the type of maltreatment or trauma exposure influences cognitive skills. Others demonstrate that different types of maltreatment exposure are not correlated with differences in cognition. Pears et al. (2008) analyzed differences in cognitive functioning amongst preschoolers who experienced physical abuse, sexual abuse, emotional maltreatment, supervisor neglect, or physical neglect. They found that compared to children with other trauma exposures, children who had experienced neglect or physical abuse
had the lowest intelligence quotients, as indicated by performance on the Wechsler Preschool and Primary Scales of Intelligence (Weschler, 2003), Preschool Language Scale: 3rd edition (Zimmerman, Steiner, & Pond, 1992), and Developmental Neuropsychological Assessment. Different types of maltreatment were also associated with significant differences in social functioning. English et al. (2005) found that neglect and physical abuse were associated with lower scores on the Socialization Subtest of the Vineland Adaptive Behaviors Screener (Sparrow, Balla, & Cicchetti, 1984). In addition, there is some evidence demonstrating that young children who experienced abuse exhibited fewer examples of child-initiated play and more imitative play than children who had experienced neglect or general maltreatment. This indicates that these children have differences in their play development, which is associated with differences in social cognition in younger children (Valentino et al., 2011).

There is evidence to refute these findings. Crozier and Barth (2005) found that school-aged children with different types of maltreatment exposure did not demonstrate significant differences in cognitive functioning. In this study, cognitive performance was measured using the KBIT-2 and the reading and math subtests of the Woodcock-McGrew-Werder Mini-Battery of Achievement (Woodcock, McGrew, & Werder, 1994). More research is needed to determine whether these different outcomes are the result of the different assessment measures used, the varying ages of the children being assessed, or some other factor.

**Effects of Severity of Trauma and Multiple Trauma Experiences on Cognition**

Additionally, there is evidence demonstrating that children who experience more severe abuse and neglect experience greater deficits in intellectual functioning. Severity is often determined clinically by both qualitative and quantitative measures. Typically, these measures
describe either the impact of trauma on a child or the number of different types of exposures a child has experienced.

There is some evidence suggesting that severity is negatively correlated with multiple aspects of cognition. Maguire et al.’s (2015) systematic literature review found that the majority of studies analyzed demonstrated that increased severity of neglect (as measured by the amount of harm caused) was correlated with lower intelligence quotients. This was further confirmed by Richardson et al. (2015) who found children with higher scores on several tests of clinically determined trauma severity demonstrated significantly lower scores on the KBIT-2.

Additionally, two studies found that more severe trauma had a significant effect on adaptive functioning and social cognition. Both studies measured severity using the Modified Maltreatment Classification System Severity Codes (English et al., 1997). This system uses a qualitative system to assess severity by determining the amount of harm each type of abuse and neglect has caused the child. English et al. (2005) found that severity had a significant main effect on all aspects of adaptive functioning as measured by the Vineland Test of Adaptive Behaviors Screener. Children with more severe maltreatment also had lower scores on theory of mind tasks compared to controls with less severe maltreatment (O'Reilly & Peterson, 2015). Studies analyzing the relationship between cognition and the number of trauma exposures are more diverse. Children who experienced multiple types of trauma were more likely to experience severe developmental delays in fine motor control and sequencing compared to children who had only experienced one type of maltreatment. However, no significant differences were found in measures of memory and visual-spatial processing (Richardson, Black-Pond, & Sloane, 2008). Additionally, English et al. (2005) found that experiencing multiple types of maltreatment was
not significantly associated with any one aspect of adaptive functioning, but it was included in a significant interaction. Children who experienced many different types of trauma exposure and were older at the time of their first Child Protective Services report had lower scores on the Vineland Daily Living Socialization subtest. It is important to interpret these results with caution. The majority of participants in both studies were exposed to a large number of different trauma types, statistical analyses may have been less accurate as a result of the uneven number of participants in each comparison group. Accordingly, additional research is needed to provide a more complete understanding of the effect of multiple traumatic exposures on general and social cognition.

Effects of Age and Chronicity of Trauma Exposure on Cognition

While limited in its scope, there is some evidence suggesting that being exposed to trauma at an earlier age and having a more chronic exposure to trauma can result in poorer cognitive outcomes. Data analyzed from the National Survey of Child and Adolescent Well Being (Dowd et al., 2004) demonstrated that children who had experienced more chronic maltreatment had significantly lower scores on the KBIT-2 compared to controls (Jaffee & Maikovich-Fong, 2011). This pattern was also found in measures of adaptive functioning. English and colleagues (2005) found that children who were exposed to more chronic maltreatment demonstrated lower social adaptation scores as well as lower general scores on the Vineland Test of Adaptive Behavior Screener. While further research with bigger samples sizes is needed to confirm these results, together these studies suggest that increased chronicity of trauma exposure negatively impacts cognition.
Enslow, Egeland, Blood, Wright, and Wright (2012) found that children exposed to trauma in the first two years of life had significantly lower scores on cognitive assessments when maternal intelligence quotient and environmental factors were controlled for. These lower scores persisted through the age of 8 years. This indicates that earlier trauma exposure may have more harmful long-term effects on the brain. This makes sense, as the brains of younger children demonstrate more neuroplasticity and are more strongly affected by the environment. However, Jaffee and Maikovich-Fong (2011) found that any trauma experienced before the age of nine was associated with lower intelligence quotients. Experiencing trauma at a younger age did not result in significantly lower intelligence quotients. These contradictory results may be because Jaffee and Maikovich-Fong (2011) did not control for maternal intelligence quotients. Additional research is required to determine the effects of controlling for maternal intelligence quotient and to discover if other factors influence the effects of early trauma exposure on cognition.

Factors Influencing Cognitive Variability in FASD

A lot of the variability in FASD is related to the specific diagnosis given to a child under the diagnostic "umbrella". Most commonly, children with fetal alcohol syndrome (FAS) demonstrate lower scores on tests of general intelligence than children with partial FAS and ARND (Mattson, Crocker, & Nguyen, 2011; Jacobson & Jacobson, 2002). Children with ARND were found to have lower scores on theory of mind tasks and parent reports of empathy than children with partial FAS and FAS (Stevens et al., 2015). Different physical characteristics were also associated with reduced cognitive functioning. Children with more severe facial dysmorphia had lower scores on general intelligence tests than children without facial dysmorphia (Mattson et al., 2011). Additionally, Carter et al. (2016) found that children who demonstrated both long-term and prenatal growth restriction had the lowest scores on IQ, learning/memory, and
cognitive flexibility. Their scores were significantly lower than the scores of children with FASD who “caught up” to peers postnatally and those who did not exhibit any growth deficits. Finally, differences in prenatal exposure impact cognition. Kodituwakku and Kodituwakku (2014) found that the timing of alcohol exposure in utero, the amount of alcohol the child was exposed to significantly affected intelligence quotients in children with FASD. This further demonstrates the complexity of FASD symptomatology and the many factors influencing each individual’s cognition.

**Effects of Comorbid FASD and Maltreatment Exposure on Cognitive Variability**

While there are limited data on the effects of comorbid FASD and maltreatment on cognition, current evidence suggests that the co-occurrence of these conditions can have compounding effects. Henry et al. (2007) found that children who experienced comorbid FASD and trauma exposure demonstrated significantly lower scores on measures of multiple cognitive tests of memory, motor skills, visual processing, attention, and general IQ compared to children who only experienced trauma. More studies should be conducted to further analyze possible confounding and complicating effects of these comorbidities. However, as both of these conditions are associated with reduced functioning in multiple areas, it is hypothesized that additional studies of comorbid trauma exposure and FASD status will also result in decreased cognitive outcomes (Hyter, 2007).

**Language in Children who have Experienced Trauma and FASD**

As stated previously, language and cognition are separate but closely-related processes. Individuals who experience deficits in cognition often have co-occurring difficulties in language (Traxler, 2012). Accordingly, children who experience trauma exposure and FASD are at an
increased risk of experiencing impairments in multiple areas of language because they have higher rates of cognitive difficulties. Their neurological deficits further increase their probability of linguistic impairment. Furthermore, children who experience maltreatment have an additional risk because they are often exposed to unstimulating language environments and may not have had as many opportunities for positive interactions with others (Yehuda, 2016).

As language is critical to academic and vocational functioning, it is important to understand how children who have experienced trauma and FASD use it. Currently, there is a lack of literature about the linguistic functioning of children in these populations. The studies that are available do not provide detailed analyses of this populations’ skill profiles. The literature characterizing the specific aspects of linguistic functioning is especially limited. A brief summary of the available data on the linguistic characteristics of children who have experienced trauma and FASD is provided below.

**Syntax and Semantics**

**Effects of maltreatment on syntax and semantics.** Children who have experienced complex trauma exhibit distinctly lower scores on measures of grammar and vocabulary. These linguistic deficits are seen in children of many different ages. Toddlers under the age of three who had experienced neglect showed a higher prevalence of language delays. Rates of language impairment were especially heightened if these children had additional risk factors like lower socioeconomic status and lower intelligence quotients (Sylvestre & Merette, 2010). Multiple sources demonstrate that school-aged children also exhibited lower scores on standardized tests of semantics and syntax. Sylvestre, Bussières, and Bouchard (2016) found that individuals with maltreatment exposure had deficits on multiple tests of syntax and semantics in their meta-
Another meta-analysis had similar results. Participants who experienced maltreatment exhibited lower scores on standardized tests of receptive vocabulary, expressive language, and receptive language than other school-aged children with similar socioeconomic statuses. In this study, tests of language referred to tests that assessed both syntax and semantics. The investigators did not find enough relevant data on expressive vocabulary to meaningfully analyze group differences (Lum, Powell, Timms, & Snow, 2015).

However, there is some additional experimental evidence suggesting that productive vocabulary may be significantly impacted by trauma exposure. Viezel et al. (2014) found that children who experienced trauma demonstrated deficits in verbal comprehension and vocabulary production on the Verbal Comprehension Index of the Wechsler Intelligence Scale for Children. Richardson et al. (2015) found further experimental evidence demonstrating that children who experienced trauma exhibited deficits in both syntax and semantics in their retrospective study. They found that about 74% of participants with “significant trauma exposure” exhibited receptive language delays and 67.9% demonstrated expressive language delays. Hyter (2012) found that about 43% of participants with trauma exposure had significant semantic delays and 67% of her participants with trauma exposure had syntactic delays at CTAC. Manso, Sanchez, and Alonso (2009) provide some more specific details about maltreated children’s syntactic and semantic functioning. They analyzed a large sample of 6-to 18-year-old children who had been maltreated and were currently living in a Spanish residential facility. Analysis was conducted with the Bateria de Lenguaje Objetiva y Critical 4 (BLOC) Screening Test (Puyuelo, Renom, & Solanas, 2003). The participants in this study demonstrated higher rates of linguistic impairment in syntax, morphology, semantics, and pragmatics. They also exhibited specific morphosyntactic impairments using personal pronouns, possessives/reflexives, irregular past/future tense verbs,
and deriving new words from existing words. As with Kozumi and Takagishi (2014), this result must be generalized with caution because the children were living in an institution and may have demonstrated poorer outcomes than the general population of children who experienced maltreatment. Additional data are needed to determine what specific areas of semantics and syntax are affected in the general population of children with trauma exposure.

**Effects of FASD on syntax and semantics.** Children with FSAD were also found to have deficits in measures of syntax and semantic language. Many of these studies indicated that age may have a significant effect on syntactic and semantic skills. Wyper and Rasmussen (2011) found that individuals with FASD who were between the ages of 5 years old and 13 years old demonstrated significant differences on several tests of receptive and expressive grammar and vocabulary when compared with typically developing peers. Younger children had significantly reduced scores on the Relational Vocabulary and Sentence Imitation subtests of the Test of Language Development (TOLD)-Preschool:3rd Edition (Newcomer and Hammill, 1997) and older children were significantly delayed on the Word Ordering, Grammatic Comprehension, and Malapropisms subtests of the TOLD-Intermediate:3rd Edition (Newcomer & Hammill, 1997). There is additional evidence to support this finding from Proven, Ens, and Beaudin (2014). They found that over 65% of 5-to 18-year-old Canadian participants with FASD demonstrated severe linguistic impairment as indicated by their performance on the Clinical Evaluation of Language Fundamentals-4th Edition (CELF-4: Semel, Secord, & Wigg, 2003). An additional 20% of their sample experienced mild or moderate linguistic impairment. Younger participants had higher scores than older participants. Findings from Bruce (2008) suggest that language may be more impaired than general cognition in this population. In this study, 8- to 10-year-old Canadian children with FASD had significantly higher rates of “impaired scores” on the
CELF-4 compared to their rates of impaired scores on tests of nonverbal intelligence, indicating that they have linguistic impairments in these areas. More information is needed to determine which specific domains of syntax and semantics are most affected by FASD.

**Pragmatic Language**

In addition to delays in syntax and semantics, children who have experienced maltreatment and individuals with FASD are at an increased risk of demonstrating pragmatic language deficits. Pragmatic language involves many skills including the ability to use Grice’s (1975) Maxims in conversation, produce a clear story, use language for a variety of purposes, and alter prosody to best fit a listener. Pragmatic language is strongly associated with social cognition and executive functioning. Executive function helps children inhibit their impulse to say things that others may find offensive, organize conversations, and maintain a topic. Social cognition helps individuals determine what another person might think or feel, which allows them to choose a response that best matches the other person's affect. Because children with FASD and those who may have survived complex trauma often experience deficits in both social cognition and executive functioning, they are at an increased risk of pragmatic language impairment (Hyter, 2012). In addition, maltreatment exposure introduces an additional risk to the development of pragmatic language. By its nature, maltreatment limits the number of positive social interactions experienced by the child. Like any skill, children must practice social language to learn how to use it. As a result, having a limited number of positive opportunities to engage in social interactions may result in decreased pragmatic skill. Maltreatment exposure could also teach children maladaptive social linguistic practices. For example, children may learn that it is acceptable to yell at other people after
watching their caregivers yell at others (Yehuda, 2016). Because of their multiple risk factors, many aspects of pragmatic language should be analyzed in these populations.

**Non-narrative pragmatic language skills of children with trauma exposure.** A meta-analysis found that children with maltreatment exposure demonstrated significantly lower scores than controls on several standardized tests of pragmatic language deficits (Sylvestre, et al., 2016). This result has also been supported by several experimental studies.

Manso, Sanchez, Alonso, and Barona (2010) analyzed the language of 74 Spanish children (ages 6-8 years old) who had been placed in residential care as a result of maltreatment. These children demonstrated significant deficits in pragmatic language on the BLOC-Screener. On this test, children are given scenarios and the intention of a certain character. They are then asked to pretend that they are the characters in the scenarios and use language to express the character's intention. This test seeks to determine if children can correctly use a wide range of communicative functions. Overall, 65 of the 74 children who had been maltreated received scores that were in the “emergency and alarm range”, implying that their pragmatic language functioning was impaired. Participants demonstrated particularly salient pragmatic impairments when asking questions and expressing disagreement to an authority figure. There is further evidence of limited use of communicative functions in 12- to 17-year-old Spanish children in residential care who had been maltreated. This study found that participants exhibited difficulty using language to get someone’s attention, make requests, express dislike, and disagree with authority figures. Additionally, participants demonstrated difficulty maintaining a topic during conversation (Manso, Sanchez, Alonso, Romero, & Merino, 2016). Again, institutionalization may have affected results and must be generalized with caution because of this confounding variable. Hyter (2012) provides further evidence to support the existence of pragmatic language
impairment in this population. Specifically, she demonstrated that children with maltreatment exposure had reduced understanding of other people’s communicative intentions and perspectives and difficulties planning prosocial outcomes to their interactions on the Pediatric Examination of Educational Readiness at Middle Childhood 2 (PEERAMID-2: Levine, 1988). Together, these studies provide evidence that children with maltreatment exposure have significant impairments in multiple domains of non-narrative pragmatic language. However, additional research is needed to determine if other specific aspects of non-narrative pragmatic skills are affected by maltreatment and to further explore the nuances of pragmatic language in children with maltreatment exposure.

**Narrative abilities of children who experienced maltreatment.** In addition to the previously mentioned risks of impaired executive function, social cognition, and reduced language skills, children who experienced maltreatment are at an additional risk of narrative deficits, because they demonstrate an increased number of illogical thought patterns in narrative discourse. Toth, Stronach, Rogosch, Caplan, and Cicchetti (2011) found that maltreated children used more inappropriate causal utterances, inappropriate reasoning in non-causal utterances, and utterances where statements are made and then refuted during narrative tasks. This use of illogical thought may reduce the appearance of organization in their communication and affect their ability to clearly organize thoughts into a logical narrative.

Few studies were available that just considered maltreatment and narrative ability; however, there is some preliminary evidence demonstrating that this population may have deficits in narrative production. Hyter (2012) found that children who had experienced maltreatment had high rates of impaired narrative cohesion and organization. She also noted that participants had difficulty providing prosocial outcomes to stories. Ayoub et al. (2006) assessed
ability to retell complex narratives and to represent moral attributes of characters. Ability to produce a complex narrative was measured by determining if the child passed certain story complexity levels. Separate scores were calculated for general complexity of stories and ability to present moral attributes of characters. According to the authors, “To successfully pass a story at a particular level of complexity, the participant must be able to attend to the story and accurately represent the characters, verbally or nonverbally, as nice or mean and the various component parts of the story. Each child receives a skill level score for correct completions,” (p.685).

They found that children who were older than 48 months and experienced maltreatment were unable to retell narratives about nice and mean people with the same level of complexity as non-maltreated controls. However, they retold more complex narratives than children who did not experience maltreatment before the age of 48 months. This study also provided some evidence demonstrating that children who experienced maltreatment may have a negative bias when telling stories. Participants with maltreatment exposure retold stories about “mean people” at the same level of complexity as non-maltreated children, but had significantly lower complexity scores on narratives describing “nice people”. Additional research is needed to confirm these results and to determine more specific details about the narrative abilities of children with trauma exposure.

**Non-narrative pragmatic language skills of children with FASD.** Children with FASD also show reduced social language skills. Bruce (2008) found that children with FASD had higher percentages of impaired scores on the Test of Pragmatic Language (Phelps-Terasaki & Phelps-Gunn, 1998). This exam assesses pragmatic language by presenting pictures of social situations to children. After they are given a chance to view the entire picture, participants are
asked how the characters should respond to the situation or to determine the meaning of what a character said. Additionally, children with FASD had lower scores on the Children's Communication Checklist (Bishop, 2006), which assesses children's pragmatic functioning through caregivers’ observations of behaviors. This study suggests that children with FASD exhibit poorer pragmatic functioning in multiple contexts. Olswang, Svensson, and Astley (2010) found that elementary school students with FASD spent more time engaged in passive, disengaged, and irrelevant social communication behaviors than typically developing peers. Additionally, children with FASD have demonstrated more linguistic variability in their social communication performance compared to typically developing peers. They changed the type of social communication more frequently and less appropriately (Kjellmer & Olswang, 2013). Collectively, these results indicate that individuals with FASD also have wide-spread pragmatic impairments.

**Narrative abilities of children with FASD.** Preliminary evidence suggests that children with FASD have difficulty producing narratives. Thorne and Coggins (2016) found that 6- to 14-year-old children who were diagnosed with FASD had higher rates of cohesive narrative referencing errors compared to peers without FASD. An additional study found that children with FASD were more likely to use ambiguous nominal referencing in narrative retell compared to typically developing peers (Thorne, Coggins, Olson, & Astley, 2007). Additional research is needed to completely understand their narrative skills and to determine if other aspects of narrative production are impaired.

**Comparing Pragmatic Language Impairments to Impairments in Syntax and Semantics**

There is some conflicting literature about which linguistic domains are more impacted by trauma and FASD. Manso et al. (2009) found that children who have survived trauma exhibit
greater deficits in pragmatic language than morphology, syntax, or semantics. However, there is some stronger evidence demonstrating that children with maltreatment exposure are equally likely to have impairments in all areas of language. Sylvestre et al. (2016) utilized a meta-analytic review and found that children with maltreatment exposure received lower scores than controls on all tests of language and did not demonstrate significantly different scores on standardized tests of expressive syntax/semantics, receptive syntax/semantics, and pragmatics. The largest effect sizes, $g=0.67$, were demonstrated with tests of expressive syntax/semantics and the smallest effect sizes were exhibited on tests of pragmatic language, $g=-0.48$.

Furthermore, children with FASD were found to have impairments in pragmatics, syntax, and semantics, but did not demonstrate significantly greater impairments in any of these linguistic domains (Bruce, 2008). Additional research is needed to fully understand how each linguistic domain is affected by trauma exposure and FASD. Data collection from larger samples of children in these populations as well as information from non-standardized tests of syntax and semantics (e.g., language samples and parent reports) may provide a more nuanced understanding of language in these populations.

**Factors Influencing Linguistic Variability**

Currently, few studies have analyzed factors contributing to different linguistic outcomes in children with trauma exposure and children with FASD. They are limited in both the type of exposures and diagnoses studied as well as the sample sizes, types of associated language studied, and the various types of severity, chronicity, and frequency of maltreatment. Additional research is required to parse out the many factors that affect language development in these populations. Below, a summary of the available literature is provided below.
Factors influencing Linguistic Variability in Children with Trauma Exposure

Syntax and semantics. Sylvestre et al. (2016) found no significant differences on measures of receptive and expressive syntax/semantics amongst children with different types of maltreatment exposure and linguistic performance when they conducted a meta-analysis of the available literature. They also found that children who had earlier maltreatment exposure tended to have worse linguistic performance on measures of expressive syntax/semantics, receptive syntax, and pragmatic performance. Limited data are available on the severity and multitude of trauma on language development. Richardson, Black-Pond, Henry, and Sloane (2008) found that children exposed to multiple types of trauma were more likely to demonstrate developmental delays in receptive language compared to children who had experienced one type of traumatic experience. However, experiencing multiple types of maltreatment was not associated with significant delays in expressive language. As with other studies, the majority of participants experienced multiple types of trauma, making it difficult to compare children with multiple types of maltreatment exposure to those with only one type accurately. Additionally, Maguire and colleagues’ (2015) systematic review found evidence to support that increased severity of neglect was associated with lower receptive vocabularies. However, more studies are needed to confirm this finding. Little information is available about how increased severities of different types of maltreatment affect receptive vocabulary, or if increased severity affects other aspects of linguistic development. Further research is needed to parse out the complicated effects of chronicity, severity, and type of trauma exposure on linguistic variability.

Pragmatic language. Ayoub et al. (2006) found that age, severity, and frequency of trauma exposure had significant interactions on narrative retelling abilities of children. Namely, children with more severe trauma exposure and more frequent trauma had lower pass rates on
narrative retell tests than non-maltreated children at younger ages. Specifically, they found that after the age of 40 months, children with the highest severity had passed significantly lower level stories than children without maltreatment exposure. These children also demonstrated an altered developmental trajectory. Children with high severity maltreatment exposure exhibited lower level pass rates than younger children without maltreatment. Children with lower severity maltreatment passed higher level stories than their younger non-maltreated peers. After the age of 45 months, children with higher frequencies of maltreatment demonstrated significantly lower pass rates compared to non-maltreated peers. Children with high-frequency maltreatment passed the lowest level stories among all of the other children with maltreatment exposure. This study only measures narrative performance, so additional research is required to fully understand the effects of trauma frequency and severity on pragmatic language. Additional research about trauma exposure must be conducted in order to untangle the multiple factors that influence linguistic variability, especially in highly variable tasks such as narrative discourse. As stated previously, Sylvestre et al. (2016) found that earlier age of exposure had a significant effect on pragmatic language scores on standardized tests, while the type of maltreatment exposure was not significantly associated with significant differences in pragmatic language function. However, more information about severity and frequency should be analyzed to determine how children function linguistically.

Factors Influencing Linguistic Variability in Children with FASD

Again, limited research has been conducted on this topic and more information will be needed to parse out the many factors influencing linguistic performance in children with FASD. Proven, Ens, and Beaudin (2014) found no significant differences in performance on the Clinical Evaluation of Language Fundamentals-4 when they compared children with alcohol-related
neurodevelopmental disorder and children with partial FAS. More information is needed to confirm this result and to see if children with different FASD diagnoses demonstrate difficulties on pragmatic language tests and other tests of linguistic development. There is an additional need to understand how physical, environmental, and personal factors affect linguistic performance in children with FASD.

Influence of Comorbid of FASD and Trauma Exposure on Language

Syntax and semantics. Coggins et al. (2007) evaluated the syntax and vocabulary skills of school-aged children who experienced prenatal alcohol exposure of which 84% of these children also experienced “clinically meaningful levels of abuse/neglect” (p. 123). To analyze linguistic performance, several comprehensive standardized tests were used. Participants demonstrated a wide-range of scores with over 31% of their sample scoring within the mildly impaired range and about 40% in the moderately-severely impaired range. While limited, there is some evidence showing that comorbid FASD and trauma exposure may have a compounding effect on syntactic or semantic performance. Preliminary evidence demonstrates that children who had a diagnosis of both FASD and trauma exposure demonstrated more deficits on general measures of linguistic functioning as well as on measures of expressive and receptive language compared to children who had only experienced trauma exposure (Henry et al., 2007). This is further confirmed by Hyter (2012), who found that children who experienced comorbid FASD and maltreatment exposure showed significantly greater deficits in syntax, phonological awareness, semantics, and following verbal directions when compared to children who had only experienced maltreatment. However, the effect size between groups was small, suggesting that the differences were not large. Additional research is needed to fully determine how these complex factors influence language development.
**Pragmatic language.** Hyter (2012) and Coggins both found that children with trauma exposure and comorbid FASD and children with either trauma exposure or FASD both have significantly reduced pragmatic language functioning. However, current evidence, although limited, suggests that children with comorbid FASD and maltreatment exposure do not demonstrate significantly lower pragmatic language skills when compared with peers who have only experienced trauma exposure or only have FASD. Hyter (2012) did not find statistically significant differences between children who had been exposed to trauma and had comorbid FASD and those who only had trauma exposure on multiple aspects of pragmatic functioning including: conversational skills, second-order belief attribution, narrative skills, and the ability to understand other people’s intentions. Additionally, Coggins, et al. (2007) also did not find significant differences in narrative skills when they compared children with FASD and those with FASD and co-occurring trauma exposure. However, comparison group sizes were uneven, which may have affected results. It was also a descriptive study, so additional analyses should be conducted to compare groups more sensitively. These results indicate that each condition negatively affects pragmatic language skills, but comorbidly FASD and trauma exposure do not have a compounding effect. Additional research will be needed to confirm this result as few studies have assessed how FASD status and trauma exposure affects specific areas of pragmatics, or have compared the language profiles of children with multiple trauma exposures to those with comorbid FASD. This result could also be associated with the more qualitative nature of pragmatic assessment. Many of these tests placed clients into a "had or did not have deficits category." The severity of the presenting pragmatic and narrative language skills was not accounted for in these studies. Pragmatic analyses that quantitatively measure the severity of impairment might be able to more sensitively compare children in these populations.
Coggins and colleagues (2007) found that over 73% of 7- to 12-year-old children with FASD, a majority of whom experienced comorbid trauma, were unable to adequately provide the age-appropriate coherence and cohesion to produce a story that provided adequate information to the listener. This was further supported by Hyter (2012). Her data also demonstrated that children with comorbid FASD and trauma exposure had reduced ability to produce a narrative with cohesion and organization. She also found that these children had difficulty providing prosocial outcomes to characters in stories. These studies both suggest that children with comorbid FASD and maltreatment have narrative deficits. However, further research must be done to untangle the complex interaction of many factors affecting their narrative performance and to fully understand the nuanced differences in various narrative skills.

**Academic and Vocational Outcomes for Children with FASD and Trauma Exposure**

Children with FASD and maltreatment have many factors that put them at an increased risk of low academic and vocational achievement. Some of these factors include their poorer social environment and cognitive difficulties. In addition to helping individuals overcome these challenges, an improved understanding of the linguistic functioning of children with FASD and maltreatment exposure could help professionals working with these individuals ameliorate these negative outcomes. Impaired language functioning is associated with long-term deficits in academic achievement (Johnson, et al., 1999). This is expected as comprehending, expressing, and using language is necessary to access most of the academic curriculum and to interact with others. Having reduced linguistic functioning also puts individuals at risk of experiencing legal difficulties. Specifically, linguistic deficits could cause individuals to make false confessions and not fully understand the charges being levied against them, which can result in misinformed decisions about sentencing. Linguistic impairments could also prevent individuals from
understanding current laws and having appropriate conversations with police officers, which puts those individuals at a greater risk of arrest (Minnesota Organization on Fetal Alcohol Syndrome, 2015; Fast & Conry, 2009). Bryan and colleagues (2007) found that 66-90% of juvenile offenders in their sample had below average language skills. In addition, males with language impairments were found to have higher rates of arrest and convictions as well as higher rates of parent-reported delinquency compared to non-language impaired males (Brownlie, et al., 2004). Accordingly, individuals with both FASD and maltreatment exposure are at an additional risk of court involvement because of their previously described decreased linguistic and cognitive performance.

**School Performance**

**Scores on academic achievement measures.** As scores on intelligence quotients tests and examinations of language skill are significantly associated with scores on tests of academic achievement, it is not surprising that children in these populations often receive lower scores on these examinations. Maltreated children generally have lower scores on tests of academic achievement when compared to children with similar SES backgrounds and ages (Coohey, Renner, Hua, Zhang, & Whitney, 2011; Kurst, Gaudin, Howing, & Wodarski, 1993) Children with FASD who had unknown maltreatment statues also scored lower on the Spelling and Arithmetic sections of the Wide Range Achievement Test-3rd Edition (Jirikowic, Olson, & Kartin, 2009; Brown & Connor, 2013).

**Special education services received.** Several studies demonstrate that children who experienced maltreatment were more likely to be referred to special education services. Jonson-Reid, Drake, Kim, Poterfeild, and Han (2004) found that compared to controls, children who experienced maltreatment were twice as likely to be referred to special-education services.
Their results indicate that school-aged children who experienced sexual abuse had the lowest rates of special education enrollment and children who experienced physical abuse had the highest rates of special education enrollment, even when other risk factors were accounted for. They also found that different maltreatment types were associated with different reasons for special education referral. Specifically, children who experienced physical abuse had significantly higher rates of serious emotional disturbance. Children who experienced neglect had higher rates of intellectual disability. In addition, children who experienced sexual abuse were more likely to be diagnosed with a learning disability, but these rates were not statistically significant, only approaching significance. There are many factors that affect special education enrollment, and certain groups may be more likely referred for services despite similar cognitive/behavioral functioning. This study also found that being African American and male was also found to be associated with higher rates of special education referral, so it is important to interpret this result with caution as this rate may reflect many factors. Children who experienced FASD were also at an increased risk of special education referral compared to typically developing peers. A large study of children with FASD found that about 40% were enrolled in special education classes or were in both special education and general education classes. Additionally, the majority of participants in this study who were in general education classes only received tutoring outside of the classroom (Brown & Connor, 2013). The reasons for referral were not specified in this article.

**Other academic measures.** Children who experienced maltreatment and FASD also demonstrated reduced functioning in other aspects of academics. Shonk and Cicchetti, (2001) found that compared to peers with similar socioeconomic economic statuses, 5- to 12-year-old children who have experienced maltreatment demonstrated significantly lower rates of school
attendance, lower grade retention, higher rates of academic failure, and greater use of special services. They also have higher rates of behavioral maladjustment (both externalizing and internalizing behaviors) as well as difficulty with academic engagement, social competencies, and ego-resiliency. Additionally, 4- to 8-year-old maltreated children were ranked as “less likable” when compared to their peers in rating scales filled out by teachers and their classmates (Anthonysamy & Zimmer-Gembeck, 2007). Finally, Leiter (2007) found that children who experienced maltreatment had reduced school attendance and grade point averages compared to non-maltreated controls. School attendance was found to be the most affected area and was the least assisted by child welfare intervention. Children who experienced physical abuse spent fewer years in school and were less likely to graduate high-school compared to non-maltreated peers when age, gender, disability, and confounding variables were controlled for. They were also found to have higher rates of academic failure and lower academic achievement (Tanaka, Georgiades, Boyle, & MacMillan, 2015). Children with FASD were also more likely to fail a grade, be reported as disruptive, have higher school truancy, and have difficulty getting along with peers (Brown & Connor, 2013; Coles, Taddeo, & Millians, 2011).

Court Involvement

Poorer academic performance is associated with higher rates of incarceration. Engaging in school disciplinary procedures and being less engaged in school, in general, is associated with higher frequencies of court-involvement (Rocque & Paternoster, 2011). Since children with FASD and children who experienced maltreatment tend to have poorer academic outcomes and have additional risk factors such as poor social functioning, higher incarceration rates are expected. Findings from Fast and Conry (2009) support this. They stated that there is a need to provide court-involved children with FASD with a comprehensive assessment of their
intelligence, adaptive functioning, and other cognitive outcomes in order to determine their competence to stand trial. Given that individuals who have been exposed to maltreatment have similar cognitive and linguistic profiles, information about both groups' linguistic functioning could help professionals develop more sensitive assessment measures and help individuals in these populations navigate the court systems more effectively.

**Maltreatment and court-involvement.** According to the National Bureau of Economic Research (2017), experiencing childhood maltreatment doubles a person's odds of incarceration. This correlation was observed in twin studies as well as studies of the general population. Currie and Tekin (2012) also found that experiencing childhood maltreatment doubles a person's odds of engaging in a non-drug related crime. Similar figures were found for rates of violent crimes by Topitzes, Mersky, and Reynolds (2012). Their longitudinal study demonstrated that individuals from Chicago who experienced maltreatment before they were 11 years old were twice as likely to commit violent offenses in adulthood/adolescence than controls matched for SES, age, ethnicity, gender, and neighborhood poverty level.

In addition to increasing a person’s risk of adult court-involvement, Ryan and Testa (2005) found that within the juvenile population, "substantiated victims of maltreatment average 47% higher delinquency rates relative to children not indicated for abuse or neglect,” (p.228). Furthermore, they found that maltreated children who enter out-of-home placements have higher rates of delinquency compared to non-maltreated children and that experiencing recurring maltreatment also increases a child's risk of delinquency. This supports earlier findings that provided evidence that children who had experienced maltreatment also had increased rates of juvenile delinquency (Lemmon, 1999).
There is also some preliminary data about the types of maltreatment most represented in the court-involved population. A survey of incarcerated juvenile males found that 44.7% experienced physical trauma as minors, 12% experienced sexual trauma as minors, and an additional 9.6% experienced both physical and sexual trauma as minors (Wolff & Shi, 2012). This was a smaller sample that utilized a self-report survey, so there is a higher probability of response bias. While limited in its scope, it does provide some preliminary evidence that different types of maltreatment may result in higher rates of court involvement and shows the need for future studies about the various types of maltreatment represented in the juvenile system.

**FASD and court-involvement.** The literature on FASD and court involvement is relatively limited because the rate of FASD is under-diagnosed in general. Despite this, individuals with FASD face many risk factors making them vulnerable to incarceration/delinquency, including increased maltreatment exposure, deficits in executive functioning, and poor communication. The limited research demonstrates that people with FASD are at a much higher risk of court involvement. The Minnesota Fetal Alcohol Association (2015) found that individuals with FASD are at a significantly increased risk of delinquency and incarceration. This is further confirmed by Paley and Auerbach (2010) who found that a higher proportion of adolescents and adults with FASD experienced court involvement. They hypothesized that this increased rate of court involvement is related to this population's poor impulse control and risk-taking behaviors.

**Purpose of Current Study**

To help improve these outcomes, it is important to fully understand the cognitive and linguistic functioning of children with exposure to complex trauma and comorbid FASD. As
stated previously, data about the linguistic profiles of children who have experienced complex trauma and FASD are very limited. Few studies have been conducted about specific aspects of pragmatics, semantics, and syntax associated with these conditions. There are even fewer data about how the number of trauma exposures and comorbid FASD affects them. This study will address some of these missing elements in the literature by analyzing retrospective data gathered from The Children’s Trauma Assessment Center of Southwest Michigan. Participants’ scores on the Hyter and Jackson Pragmatic Protocol (PP-R: Hyter & Jackson, 2010) and the Clinical Evaluation of Language Fundamentals Screening Test 5th Edition (CELF-5: Wigg, Secord, & Semels, 2013) were used to analyze language skills. Specifically, analyses will be conducted to answer three questions:

1. Which specific areas of pragmatics, syntax, and semantics are affected by trauma exposure?
2. Does experiencing different numbers of trauma exposures result in significantly different scores on the PP-R?
3. Do participants with comorbid FASD status demonstrate lower scores on PP-R and the CELF-5 Screening Test than participants who have only experienced trauma exposure?
CHAPTER II
METHODS

Data Collection Source

To analyze the effects of trauma and FASD on language development, a retrospective study design was utilized. The Western Michigan University Human Subjects Review Board approved a procedure to collect data from the charts of participants who attended the Children’s Trauma Assessment Center of Southwest Michigan (CTAC) in Kalamazoo, Michigan (see approval letter in Appendix A). CTAC utilizes a transdisciplinary model to analyze the physical health, cognition, socio-emotional health, motor skills, psychological well-being, language skills, and visual-motor skills of children who have been exposed to trauma and to alcohol in utero.

To obtain the information needed to analyze these skills, each child is given a series of standardized and informal assessments. These assessments are conducted by examiners with various qualifications, including both undergraduate and graduate student interns as well as fully-licensed professionals from the disciplines of occupational therapy, speech-language pathology, social work, clinical psychology, and medicine. Approximately twenty percent 20.9% (n=17) of the pragmatic language assessments in this study were conducted by speech-language pathology graduate students and 79.1% (n=62) were conducted by other trained professionals. Before administering CTAC assessments, every examiner receives at least 8 hours of training to improve adherence to evaluation protocols. To further ensure that various examination procedures are performed correctly, two trained staff members or graduate student interns perform the assessment. Outside of the room, several additional professionals observe the assessments through a two-way mirror. Scores are then calculated and rechecked by another
CTAC staff member after examinations are complete. Data from assessments are then analyzed to create a full diagnostic report with recommendations and stored in secure charts (Children’s Trauma Assessment Center, 2017).

**Measures and Forms**

For the purposes of this study, data were collected from tools that measured linguistic performance, general intelligence, types of trauma exposures, numbers of trauma exposure, and FASD status. Additional tools were utilized to determine the participants’ trauma exposure history and the presence of conditions that would affect their cognitive and linguistic development. The CTAC Case History Form (Children’s Trauma Assessment Center, 2017) was utilized to determine the child’s age and gender. It also provided information about any additional diagnoses such as autism, cerebral palsy, prenatal drug exposure, or hearing impairments that could affect language development. The presence of these conditions could have presented confounding variables to the study and participants with these conditions were not included in data analyses. The CTAC Trauma Screening Checklist (Henry, Black-Pond, & Richardson, 2014), Kaufman Brief Intelligence Test 2nd Edition (KBIT-2: Kaufman & Kaufman, 2004), and the University of Washington’s 4 Digit Diagnostic Code (Astley, 2004) were utilized to create comparison groups based on independent variables (number of trauma exposure types and FASD diagnostic status). The linguistic tests, the Clinical Evaluation of Language Screening Test-5th Edition (CELF-5: Wigg & Semel, 2013), and Hyter and Jackson’s (2010) Pragmatic Protocol (PP-R) were used to analyze the dependent variables (linguistic skills in semantics, syntax, and pragmatics). A brief description of each measure is provided below.
Case History Forms

Case history forms were utilized to determine which participants would be analyzed in the data set. The case history form is written before the child is assessed by the CTAC team. It details a child's past experiences as reported by interviewees and discloses any additional diagnoses/interventions the children have been given. The history is written in a standard form presenting information from the caseworkers, the child's documents, interview of caregivers, and interviews with the child's caseworkers. It presents the child or caregiver's main concerns, trauma history, developmental history, social-emotional functioning, and behavioral functioning with previously collected data (Children's Trauma Assessment Center, 2017). Data from the case history were used to determine which participants were analyzed in this study. Participants with a history of other neurodevelopmental, visual, and hearing deficits would have presented confounding variables and were excluded from the study. Some examples of excluded diagnoses include autism spectrum disorder, Down syndrome, cerebral palsy, hearing loss, visual impairment, fragile X syndrome, Rett’s syndrome, epilepsy, intellectual disability, traumatic brain injury, and apraxia of speech.

Individuals with psychological disorders such as oppositional defiant disorder, depression, anxiety, attention-deficit disorders, and PTSD were included in the study because these disorders commonly co-occur in individuals who experienced trauma. Several large studies found that children with trauma exposure typically demonstrate higher rates of clinically diagnosed mental health disorders and attention disorders compared to the general population (Cook et al., 2011; Greenson et al., 2011; Henry, Sloane, & Black-Pond, 2007). They also demonstrated an increased number of symptoms associated with mental health disorders in several large-scale experimental studies (Cecil, Viding, Barker, Guiney, & McCory, 2014; Cook
et al., 2011; Richardson et al., 2008). CTAC administrators typically include a comprehensive evaluation to determine if an individual is showing symptoms of these disorders as a part of standard assessment protocol. This psychological assessment is included because these features are strongly associated with trauma exposure (Children's Trauma Assessment Center, 2016). This provides further evidence supporting the inclusion of participants with mental health disorders in this study. Furthermore, higher rates of mental health disorders are also expected because the majority of children in this study had experience with the Foster Care System. Approximately 90% of the children assessed by CTAC are involved with or are alumni of the Foster Care system (Children's Trauma Assessment Center, 2017). Both children in the Foster Care System and adult alumni of this system demonstrate significantly higher rates of mental health disorders when compared to the general population (National Council of State Legislators, 2016; Pecora, Jenson, Romanelli, Jackson, & Ortiz, 2009; Polihronakis, 2008). As a result, these disorders were considered to characterize the cognitive profile of individuals with trauma exposure and thus were included in the analyses. For a full list of included and excluded diagnoses, please refer to Appendix B.

CTAC Trauma Screening Checklist

After utilizing case history information to determine if participants were to be included in the analysis, information from the CTAC Trauma Screening Checklist (Henry, Black-Pond, & Richardson, 2014) was utilized to organize participants into different comparison groups. The Trauma Screening Checklist is comprised of three different sections: Known or Suspected Trauma Exposures, Behavioral Signs of Trauma, and Emotional Signs of Trauma. For the purposes of this study, only data from the Known or Suspected Trauma Exposure section were collected. This form is completed by caregivers, caseworkers, external clinicians, or CTAC
staff before the assessment. After the assessment, CTAC staff members include any additional information about the child’s trauma exposure identified during the assessment. This form documents the different types of traumatic events a child has been exposed to or has been suspected of being exposed to. To record trauma exposure, examiners select items from a list of different types of complex trauma including physical abuse, sexual abuse, emotional abuse, neglect, lengthy separation from parents, multiple foster home placements, exposure to domestic violence, maternal stress/fetal alcohol exposure, or other traumatic experiences. CTAC staff members place a mark next to a type of trauma the child has experienced or has been suspected of experiencing. Researchers recorded the types of trauma the child experienced and then counted the total number of trauma exposures recorded for each child. Children were compared based on the number of different types of trauma exposures experienced (e.g., a child who experienced both abuse and neglect was considered to have two trauma exposures, and a child who only experienced neglect had only one trauma exposure).

**FASD Diagnostic Grid**

CTAC has been designated by the Nation's Fetal Alcohol Syndrome Diagnostic as a Prevention Network to diagnose FASD (Children’s Trauma Assessment Center, 2017). To accurately diagnose FASD, the University of Washington’s Diagnostic Code was utilized. This code ranks each child’s growth, facial features, neurological dysfunction, and prenatal exposure to alcohol on a scale of 1-4. A rating of 1.0 indicates an absence of that feature of FASD and a rating of 4.0 indicates that this feature is highly present. To be counted as a person with FASD in this study, individuals had to have a score of 3 or 4 on the growth, facial features, and neurological dysfunction categories. Individuals were also considered to have FASD if the CTAC onsite pediatrician utilized the diagnostic label of FASD when describing the child’s
symptomatology. Information about the growth and facial features of each child was collected by a behavioral pediatrician, and information about the neurological dysfunction was collected from a series of tests given on the day of the assessment by other professionals. The transdisciplinary team discussed these results and then assigned each category with its diagnostic ranking.

**Kaufman Brief Intelligence Test-2nd Edition**

Standard scores on the Kaufman Brief Intelligence Test 2nd edition (KBIT-2: Kaufman & Kaufman, 2004) were collected and analyzed to provide a general overview of a child's intellectual functioning. The KBIT-2 provides verbal and nonverbal intelligence quotients for individuals ages 4 years old to 90 years old. Information about the child’s KBIT-2 scores was used to match participants with similar intelligence quotient scores to provide an additional level of control during analysis.

**Clinical Evaluation of Language Fundamentals Screening Test-5th Edition**

The CELF-5 Screening Test is a quick test of expressive and receptive syntax and semantics. It is used to identify children ages 5 years old to 21 years and 11 months old who may need a full evaluation of their expressive and receptive language. To identify these children, the screening test compares "norm-based criterion scores by age." These criterion scores determine if the child's performance seems typical for their age, or if additional testing will be needed (Wigg, Secord, & Semel, 2013). In this study, the number of children in each comparison group who received “passing scores” was calculated along with percent differences for each subtest. Different ages utilize different subtests, so these comparisons were only made amongst children who had similar ages. Younger children (5-8 years old) complete the Word Structure, Word Classes, Following Directions, and Recalling Sentences subtests. The Word Structure subtest assesses syntactic skills by having children change the tense of a word to fit the appropriate
sentence. The semantic skills of younger children are assessed in the Word Classes subtest by having children identify which words “go together.” Pictures are used to improve comprehension and attention. The Following Directions subtest and Recalling Sentences subtest both assess working memory and syntax skills. The first, Following Directions, examines the receptive aspect of these skills by asking children to follow oral directions (e.g., point to the circle, then the square). The second, Recalling Sentences requires examinees to repeat sentences of varying complexity verbatim. This assesses the test takes ability to remember and repeat expressive language. Older children complete the Following Directions, Recalling Sentences, Sentence Assembly, Semantic Relationship, and Word Classes subtests. Following Directions and Recalling Sentences are the same subtests previously described. The Word Classes subtest also uses the same instructions for both younger and older children, but includes more difficult age-appropriate vocabulary for older children. Sentence Assembly assesses syntactic skills by having children assemble two separate sentences using the same set of phrases. Finally, Semantic Relationships assesses comprehension of semantics by having the child answer questions about vocabulary items provided (e.g., an hour is longer than which one of these: a minute, a day, a second, or a morning?).

**Hyter and Jackson’s Pragmatic Protocol-Revised**

The Pragmatic Protocol-Revised is a standardized assessment of social language skills. It is not norm-referenced, rather, it gives children a score based on the number of times they use social language that is appropriate to the situation or answer questions about social language usage correctly. After numerical scores are calculated, examiners are asked to rate aspects of narrative development qualitatively to analyze social language abilities. For this study, raw scores were converted to z-scores in order to compare scores among children. There are three
different versions for different age groups: one for 4- to 6-year-old children, one for 6- to 9-year-old children, and one for children who are 9-15 years old. Since children ages 5-15 years old were included in this study, all versions of the protocol were used.

Every version of The Pragmatic Protocol-Revised analyzes narrative skills (story retell and story generation), belief attribution skills, and conversational skills. However, different ages are assessed in different manners with different tests. The only exception to this is the Conversation subtest, which was assessed using the same method on each age group. The assessment protocol requires the clinician to initiate and record an informal exchange with the child outside of the testing environment. After the clinician has a conversation with the child, they are asked to listen to the recording and then mark if the child followed Grice’s Maxims (1975) of Quantity (responses should provide conversation partners with enough information to meet the conversational demand), Relation (responses should be related to the previous topic of conversation), and Manner (statements should be easily understood and unambiguous) in their discussion. Children are given 1 point if they followed a certain aspect of that Maxim. For example, if an individual was observed taking turns in a conversation, they would receive a 1 for that aspect of the Quantity section of the Conversational Subtest. They would receive a score of 0 if this aspect was not observed in their conversation. After the score is recorded, each child is given a total score out of 10.

After their conversation skills are analyzed, narrative retell skills are examined using the book *Frog Where Are You?* by Mercer Mayer for children ages 4-6 years and 6-9 years. Older children, ages 9-15 years old, are asked to retell the plot of their favorite movie or TV show. Like the Conversation subtest, children are given a score of 1 if they followed certain aspects of narrative retell, or a 0 if they did not. They are then given a total score. Children over the age of
6 years and 6 months are also given the Narrative Generation task. In this task, participants are asked to tell a story about a problem that someone their age would encounter and how they could solve it. Examiners determine if the child used prosocial, undetermined, or antisocial plans and outcomes. They also mark if the story was easy to follow.

After narrative skills are assessed, social cognition is analyzed on the PP-R. Children ages 4-6 receive the Crayon Box Content task and Ball Location Task which were adapted from the Sally-Anne task (Baron-Cohen, Alan M. Leslie, & Uta Frith, 1985). These tasks examine a child’s ability to perform first-order belief attribution by presenting a child with different scenarios using verbal narrative and physical props and then asking the child questions about what the other person might think or believe. Children who are 6-9 years old are given the “John and Mary Test” (Sullivan, Winner, & Hopfield, 1995), which analyzes both first-order and second-order belief attribution by asking children questions about a scenario presented with verbal narration and physical props. Finally, older children (9-15 years old) children are given the Juan and Maria Test (Hyter & Black-Pond, 2005), which analyzes a child’s ability to utilize first-order and second-order belief attribution by having them answer questions about a scenario presented verbally without physical props.

Children ages 9-15 years old are also assessed in two additional areas of social communication. Specifically, the ability to produce expository text and differentiate literal from nonliteral statements. To assess expository discourse, clients are asked to tell the examiner how to play their favorite sport or game (Nippold, Hesketh, Duthie, & Mansfeld, 2005). They are then given points to determine if they utilized the proper structure, content, and coherence in their explanation, just like the conversation and narrative retell subtests. Finally, their ability to differentiate literal from nonliteral statements is measured using the Strange Stories task (Happé,
1995). In this task, children are verbally presented with scenarios and then asked to determine if the individual in the scenario is joking, pretending, lying, or being sarcastic. If the child gives a logical explanation for their choice, they are given a score of 1. If they do not, they are given a score of 0 for that question. The total number of points is then summed. For more information, please refer to Table 1.

**Data Collection**

Using these aforementioned measures, information from charts was gathered using a standardized procedure developed specifically for this thesis. It required those collecting data to recount many of the scores to ensure that individuals accurately recorded scores. For more information about this process, please refer to Appendices C and D. This procedure was recorded on a color-coded Microsoft Word Document designed to collect data for this purpose (Appendix C). The author and two occupational therapy graduate students were trained on this data entry process utilized a checklist to document each step of data collection, which is provided in Appendix D. One additional speech-language pathology graduate student was also trained on data collection and helped provide inter-rater reliability.

Intra-rater reliability was found to be 97.30% for the first rater, 96.36% for the second rater, and 100% for the third rater. Approximately 20% of the sample was also rechecked for interrater reliability There was 93.5% agreement between the first rater and the additional speech-language pathology graduate student, 81.78% agreement, between the first rater and the second rater, 96.94% agreement between the first rater and the third rater, and 99.15% agreement between the first rater and the second rater. To ensure fidelity, a professor from the Western Michigan University Department of Speech, Language, and Hearing Sciences oversaw the collection process and ensured that the agreed upon procedure was followed.
Table 1

Hyter and Jackson’s (2010) Pragmatic Protocol-Revised

<table>
<thead>
<tr>
<th>Age-Range</th>
<th>Discourse Tests</th>
<th>Social Perspective Taking Tests</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.0-6.06 years</td>
<td>Hyter and Jackson’s Conversation Test of Grice’s (1975) Maxims</td>
<td>Crayon Box Test</td>
</tr>
<tr>
<td></td>
<td>Retell <em>Frog Where Are You?</em> by Mercer Mayer</td>
<td>Ball Location Test</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(Baron-Cohen et al., 1985)</td>
</tr>
<tr>
<td>6.07-9.06 years</td>
<td>Hyter and Jackson’s Conversation Test of Grice’s (1975) Maxims</td>
<td>“John and Mary Test”</td>
</tr>
<tr>
<td></td>
<td>Retell <em>Frog Where Are You?</em> Mercer Mayer</td>
<td>(Sullivan et al., 1995)</td>
</tr>
<tr>
<td>9.07-15.11 years</td>
<td>Hyter and Jackson’s Conversation Test of Grice’s Maxims</td>
<td>Juan and Maria Test (Hyter &amp; Black-Pond, 2005)</td>
</tr>
<tr>
<td></td>
<td>Narrative Retell: Retell your favorite book or TV show</td>
<td>Strange Stories task (Happé, 1995)</td>
</tr>
<tr>
<td></td>
<td>Expository Task (Nippold et al. 2005).</td>
<td></td>
</tr>
</tbody>
</table>

**Data Analysis**

Statistical Package for the Social Sciences (SPSS) was utilized to code and analyze data. To ensure data input was accurate, three graduate students trained on data entry participated in the input collaboratively. One person read the data, another person put the data into SPSS, and the third person oversaw the process. Each individual exchanged roles regularly to reduce fatigue and ensure accuracy. Statistics were then calculated with recommendations from Pallant (2010),
Fields (2013), and Lomax and Hahs-Vaughn (2012). Descriptive analyses of the data were conducted to characterize the sample and compare it to other populations of children with trauma exposure. To compare items, PP-R subtest scores were converted into z-scores (if applicable) and CELF-5 subtest scores were converted into percent error scores. Scores from the Perspective Taking Assessments were not converted into z-scores because participants could only earn between 1 and 5 points. Participants with z-scores above 1.0 on these perspective-taking measures still demonstrated significant impairments and therefore their original raw scores were assessed using the qualitative scoring guide. Percent error scores allow the researcher to determine how different a score is from a known or accepted value. For example, 0% error score would indicate the participant had the same score as the expected total score. It is calculated by taking the absolute value of the difference between the participant’s score and the total possible correct divided by the total possible correct. The result is then multiplied by 100 to yield a percentage (Appalachia State University, 2017). Percent error scores greater than or equal to 50% will be referred to as elevated scores for purposes of clarity. Some CELF-5 subtests did not have any participants who received a percent error score of exactly 50% and so the lowest percent error score over 50% (either 56%, 57%, or 60%) was considered the elevated score.

After scores were converted, researchers determined which subtests had a higher percentage of participants with low scores (less than -1.00 standard deviation or a percent error greater than or equal to 50%). In addition, researchers looked at individual skill elements on individual PP-R subtests (e.g., landscape of consciousness on the narrative retell subtest). The percentage of individuals with “inconsistent or absent” scores on individual skill was assessed using Hyter and Jackson’s (2010) qualitative scoring guide. These calculations allowed researchers to determine which items were more difficult for participants.
Then researchers compared the PP-R Conversation and Narrative Retell subtest performances among participants with different ages, numbers of trauma exposure, and KBIT scores using a Kruskal-Wallis Test. This test was utilized because data violated several assumptions of linear models required to avoid error in analyses of variance tests. Specifically, data were not normally distributed, contained outliers, were leptokurtic, violated homogeneity of variance, and did not have equal comparison groups. Fields (2013) recommends performing a Kruskal-Wallis Test or a robust F test when confronted with these violations to decrease the risk of Type II and Type I errors. Accordingly, a Kruskal-Wallis Test was utilized to account for this variability.
CHAPTER III

RESULTS

Participants

After reviewing the charts of 236 individuals, data were collected from 79 eligible participants between the ages of 5 years old and 15 years and 11 months old. The majority (56.80%, n=45) were between the ages of 9 years and 7 months old and 15 years and 11 months old. Only a small percentage (4.82%, n=4) of participants had FASD and could not be included in analyses because this number was not large enough to yield an accurate comparison. It was also not representative of the typical percentages of participants with co-occurring trauma exposure and FASD in previous studies conducted at CTAC, the site of data collection. Other studies found that typically 30-40% of participants with trauma exposure had comorbid FASD (Henry et al., 2007; Hyter, 2012; Price et al., 2017). Therefore, the third research question cannot be addressed at this time.

Many participants had additional mental health and cognitive diagnoses; 55.70% (n=44) had posttraumatic stress disorder, 21.52% (n=17) had a diagnosed behavioral disorder, 13.92% (n=11) had an anxiety disorder, and 58.23% (n=46) had an attention disorder. Their mean score on the KBIT-2 was 94.90, which is within one standard deviation of the mean. Participants had a mean of 7.94 trauma exposures and over 68.40% of the sample (n=54) received between 6-10 exposures. A full description of the participants’ demographic information is provided below in Table 2.
Research Question 1: Specific Areas of Language Affected by Trauma

Scores on the Subtests of the CELF-5 Screening Test

Overall, the 76 participants who took the CELF-5 Screening Test had high pass rates. Specifically, 78.95% (n=60) received a passing score. The results of individual subtests were analyzed using the percent error score described in the Methods Chapter. Percent error scores were utilized to determine how different a participant’s score was from the accepted subtest score. For example, if individuals could receive 10 points on a subtest and they received all 10 points, then they would have a percent error score of 0%. This is because their score is the same
as the accepted score. If they received 5 out of the 10 possible points, they would have a percent error score of 50%. If they received 0 of 10 points they would have a percent error score of 100% because their score was 100% different than the accepted score of 10. For purposes of this study, percent error scores were considered to be elevated if they were greater than or equal to 50%. To determine if a subtest was difficult for participants, researchers calculated the percentage of individuals who received a 50% error score or higher. There are a few exceptions to this because some subtests did not have any participants who received a percent error score of exactly 50%. As a result, the next lowest percent error score greater than 50% (respectively, 56%, 57%, or 60%) was then considered the elevated score. The percentages of individuals with percent error scores greater than or equal to 56%, 57%, or 60% were calculated to determine if that subtest was difficult for participants.

The first two subtests assessed in this manner, Word Structure and Word Classes, were only given to children between the ages of 5 years old and 8 years and 11 months old. Only a small percentage of the 34 younger participants who completed this task had percent error scores that were greater than 50%. About seventeen percent (17.14%) of participants (n=6) had a 56% error score or greater on Word Structure and 14.29% of participants (n=5) had a 60% error score or greater on the Word Classes Subtest. Three additional subtests, Sentence Assembly, Semantic Relationships, and Word Classes, were given to 45 children who were over the age of nine years. A large percentage of older students demonstrated elevated percent error scores. Specifically, 62.22% (n=28) had a percent error score greater than or equal to 50% on Sentence Assembly, 22.22% (n=10) had a percent error score that was equal to or greater than 57% on Semantic Relationships, and 46.67% of participants (n=21) had percent error scores greater than or equal to 50% on Word Classes.
Two additional subsets, Recalling Sentences and Following Directions, were administered to participants who were 5-15 years old. These subtests analyze working memory in addition to language comprehension and syntax. Seventy-nine participants completed the Following Directions subtest and 78 completed the Recalling Sentences subtest. A high percentage of participants had elevated percent error scores on these subtests. On the Following Directions subtest, 40.26% of participants (n=31) had percent error scores greater than or equal to 60%. Thirty-three point three-three percent of participants (n=26) had percent error scores greater than or equal to 57% on Recalling Sentences. A summary of these results can be found in Table 3.

**Scores on the Subtests of the PP-R**

**Discourse Subtests.** All ages were eligible to complete the first two discourse subtests of the PP-R, Narrative Retell and Conversation. Out of 79 eligible participants, 61 completed conversation and 55 completed narrative retell. Overall, the majority of participants had z-scores that were greater than or equal to 1.0, but many participants had inconsistent or absent scores on individual elements of these subtests. On Conversation, 16.39% of participants (n=10) had z-scores less than -1.0. However, 26.23% of participants (n=16) had inconsistent or absent scores on Grice’s (1975) Maxim of Quantity, 26.98% (n=17) had impaired scores on tests of Grice’s (1975) Maxim of Relation, and 20.00% (n=13) had impaired scores on Grice’s (1975) Maxim of Manner. On the Narrative Retell, 18.18% of participants (n=10) had z-scores less than -1.0. Despite relatively high intact total scores, many participants had difficulty utilizing cohesion coherence, and landscape of consciousness on this subtest. Thirty-three point eight nine percent (n=20) of the 59 participants who had scores for the cohesion element exhibited inconsistent or absent skills.
Twenty-nine point eight two percent (n=17) of the 57 participants with scores for the cohesion element of Narrative Retell demonstrated inconsistent or absent skills. Finally, 60 participants had scores for the landscape of consciousness portion of this subtest, 51.67% (n=31) of which were in the inconsistent or absent range.

Only children over the age of 9 years and 7 months old were eligible to complete the Expository subtest and 18 out of 46 children in this age group did so. In addition, 18 participants had scores for the content element and 19 students had scores for the structure and coherence elements.

Overall, a larger percentage of participants had lower scores on this test. Twenty-two point two-two percent (n=4) had z-scores less than -1.0. Each aspect of expository discourse tested (content, structure, and coherence) presented participants with a similar degree of difficulty.

Forty-four point four four percent (n=8) had inconsistent or absent content scores, 42.11% (n=8)
had inconsistent or absent structure scores, and 52.63% (n=10) had inconsistent or absent coherence. A summary of the discourse subtests is provided in Table 4.

Table 4

Summary of the PP-R Discourse Assessments

<table>
<thead>
<tr>
<th>PP-R subtest</th>
<th>Age assessed</th>
<th>% of Participants with z-scores ≤ -1.0</th>
<th>% Participants with inconsistent/absent scores on specific elements of this subtest</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conversation</td>
<td>5 to 15 years old</td>
<td>16.39% n=10</td>
<td>26.23% (n=16) Quantity 26.98% (n=17) Relation 20.00% (n=13) Manner</td>
</tr>
<tr>
<td>Narrative Retell</td>
<td>5 to 15 years old</td>
<td>18.18% n=10</td>
<td>33.89% (n=20) Cohesion 29.82% (n=17) Coherence 51.67% (n=31) Landscape of Consciousness</td>
</tr>
<tr>
<td>Expository Discourse</td>
<td>9 years to 15 years old</td>
<td>22.22% n=4</td>
<td>44.44% (n=8) Content 42.11% (n=8) Structure 52.63% (n=10) Coherence</td>
</tr>
</tbody>
</table>

**Social Perspective Taking Subtests.** Next, the social perspective taking subtests were analyzed. Only a small number of children in this study were young enough to complete the Ball Location and Crayon Box Content subtest. Six children completed the Ball Subtest and seven completed the Crayon Box subtest. A high percentage of young participants had difficulty on both of these subtests, but more had difficulty on the Ball subtest. Twenty-eight point five seven
percent of participants (n=2) did not pass the Crayon Box subtest and 50.00% of participants (n=3) did not pass Ball subtest. Participants who were six years and seven months old and older took two different belief attribution tests that were scored in the same way. Sixty-seven participants completed this first-order subtest and 22.38% (n=15) received an inconsistent or absent score on this test. A greater proportion of participants had inconsistent or absent scores on the second-order belief attribution measure. Fifty-two point one seven percent (n=36) of the 69 participants who completed it received an inconsistent or absent score. Thirty-seven children over the age of nine years and six months old completed the Strange Stories Subtest. Overall, most children received high scores on this subtest. Only 9.52% of participants (n=4) answered more than two questions incorrectly. However, high percentages of participants were unable to identify two specific communicative intents. Namely, 21.95% of participants (n=9) did not identify sarcasm and 35.14% (n=13) did not identify joking. A summary of the Social Perspective Taking Subtests of the PP-R is provided in Table 5.

Answer to Research Question 2: How does Number of Exposures Affect PP-R Results?

A Kruskal-Wallis Test was conducted to compare scores on the Narrative Retell subtest and Conversation subtest among participants who had different numbers of trauma exposures. Tests were two-sided with 95% confidence intervals. While the independent variable of this study was the number of trauma exposures, additional Kruskal-Wallis tests were conducted to compare PP-R subtest performance amongst individuals with different ages and KBIT-2 scores. This procedure was completed to ensure that these variables did not have additional relationships with PP-R scores and to compare them with previous subtests.
Table 5

Summary of PP-R Scores for Perspective Taking Tests

<table>
<thead>
<tr>
<th>PP-R subtest</th>
<th>Age assessed</th>
<th>% of Participants with Impaired Scores</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Crayon Box Content</strong></td>
<td>4 to 6 years and 6 months</td>
<td>28.57% (n=2)</td>
</tr>
<tr>
<td><strong>Ball Location</strong></td>
<td>4 to 6 years and 6 months</td>
<td>50.00% (n=3)</td>
</tr>
<tr>
<td><strong>First-Order Beliefs</strong></td>
<td>6 years seven months to 15 years old</td>
<td>22.38% (n=15)</td>
</tr>
<tr>
<td><strong>Second-Order Beliefs</strong></td>
<td>6 years seven months to 15 years old</td>
<td>52.17% (n=36)</td>
</tr>
<tr>
<td><strong>Strange Stories</strong></td>
<td>9 to 15 years old</td>
<td>9.52% (n=4)</td>
</tr>
</tbody>
</table>

*Additional Areas of Deficit in this Subtest:*

21.95% (n=9) sarcasm and 35.14% (n=13) joking

Three comparison groups were contrasted with this method to assess differences between participants with different numbers of trauma exposures. The first comparison group contained individuals with 0-5 exposures (less than 1.0 standard deviation below the mean), the second group had 6-10 exposures (within 1.0 standard deviation above the mean), and the last group had 11-15 exposures (greater than 1.0 standard deviation above the mean). No significant differences were found amongst groups for conversation $H(2)=2.63, p=0.268$. However, narrative retell scores were significantly different amongst individuals with different numbers of trauma exposures $H(2)=6.154, p=0.046$. Pairwise analyses found that individuals with 11-15 trauma exposures did not have significantly lower scores on narrative retell than those with 0-5 trauma exposures ($p=0.276, r=0.337$) and those with 0-5 trauma exposures did not have significant differences in narrative retell scores than those with 6-10 exposures ($p=0.594, r= -$)
Individuals with 6-10 trauma exposures did have significantly higher scores than those with 11-15 exposures. Moderate effect sizes were present, $p=0.04$, $r=0.314$.¹

To compare individuals with different ages, comparison groups were created based on age groups of each PP-R assessment measure. The first group had individuals who were 5 years old to 6 years and 6 months old. The second group had individuals who were between the ages of 6 years and 7 months old and 9 years and 6 months old. The last group was comprised of individuals who were 9 years and 7 months old or older. No significant differences were found, $H(2)=2.805$, $p=0.246$ for Narrative Retell and $H(2)=1.644$, $p=0.440$ for Conversation. Finally, individuals with different composite KBIT-2 scores were divided into groups. Those with scores below 85 (1.0 standard deviation below the mean) were grouped together. Those with scores between 86-100 (within 1.0 standard deviation below the mean) were another group. Those with scores between 101-130 (above the mean) were also grouped together. Again, no statistically significant differences were found, $H(2)=3.254$, $p=0.197$ for narrative retell and $H(2)=4.343$, $p=0.114$ for conversation. A summary of the Kruskal-Wallis Test results is provided in Table 6.

¹Kruskal-Wallis Test results were recorded using recommendations from Fields (2013).
Table 6

Results of the Kruskal-Wallis Test for Participants with Different Numbers of Exposures

<table>
<thead>
<tr>
<th>PP-R Test</th>
<th>Overall Results of H-Test</th>
<th>Pairwise Analyses</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Conversation</strong></td>
<td>H(2)=2.63, p=0.268</td>
<td>No Significant Differences</td>
</tr>
<tr>
<td><strong>Narrative Retell</strong></td>
<td>H(2)=6.154, p=0.046</td>
<td>No Significant Differences:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>11-15 trauma exposures and 0-5 trauma exposures</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(p=0.276, r=0.337)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0-5 trauma exposures and 6-10 trauma exposures</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(p=0.594, r= -0.063)</td>
</tr>
<tr>
<td></td>
<td><strong>Significant Differences</strong></td>
<td>6-10 trauma exposures to 11-15 trauma exposures</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(p=0.04, r=0.31)</td>
</tr>
</tbody>
</table>
CHAPTER IV
DISCUSSION

The aforementioned data are interpreted and contextualized below. Any differences from previous studies are examined along with their implications. Factors that limit the generalization of this study will also be explained. Finally, findings of this study will be used to generate suggestions for future research along with a summary of the discussion.

Research Question 1: What Specific Areas of Language are Affected by Trauma?

Because the current literature provided strong evidence that individuals with trauma exposure have linguistic deficits in syntax, semantics, and pragmatics (Hyter, 2012; Lum et al., 2015; Manso, et al., 2009; Sylvestre et al., 2016), it was predicted that the participants would also have impairments in these areas. The results of this study generally supported this hypothesis. Participants received scores on assessments of these linguistic areas that indicated that they had clinically significant impairments. However, these language impairments were more apparent when specific elements of each assessment subtest were delineated. Unlike the aforementioned studies, participants in this study generally had intact overall test scores. However, many individuals had scores that would be considered “inconsistent or absent” on individual skill elements of the PP-R or had high percent error scores on specific subtests of the CELF-5 Screening Test. These results and their implications will be reviewed below.

Implications of CELF-5 Screening Test Results

Because the CELF-5 Screening Test is only meant to screen language skills, high percent error scores and failures to meet pass criterion on this measure only indicate the need for further testing and therefore are not definitive evidence of linguistic impairment. Future research should be conducted with more sensitive assessment measures to gain a comprehensive understanding...
of the syntactic and semantic skills of children with exposure to complex trauma. A summary of these results and their implications are provided in the following paragraphs.

Significance of Overall Pass-Rates on CELF-5. The majority of the participants (78.95%, n=60) in this study received a passing score on the CELF-5 Screening Test. This assessment measure has adequate specificity and sensitivity to differentiate individuals with language impairments and recommend that they receive further testing (Wigg et al., 2013). This indicates that individuals with language impairments typically do not meet the pass criterion. In previous studies conducted at CTAC, participants exhibited high rates of language impairments as evidenced by lower overall scores on linguistic tests. Richardson et al. (2015) demonstrated that children who experienced trauma exhibited deficits in both syntax and semantics in their retrospective study. They found that about 74% of participants with “significant trauma exposure” exhibited receptive language delays and 67.9% demonstrated expressive language delays. Hyter (2012) found that about 43% of participants with trauma exposure had significant semantic delays and 67% of her participants with trauma exposure had syntactic delays. Based on the results from these previous studies, it was predicted that a larger percentage of participants would have failed to meet the pass criterion on the CELF-5 Screening Test. However, the majority of participants in the current study passed the screener and only 21.05% (n=16) did not meet the pass criterion. The different results may be the result of different measures utilized. Hyter (2012) and Richardson et al. (2015) used the PEERAMID-2, a more comprehensive measure that assessed more linguistic skills. It assesses phonologic skills, which could have also impacted overall language scores in Richardson and colleague’s (2015) study. It also includes a generative naming portion and some portions that require individuals to comprehend longer lines and paragraphs of text. Both utilize different memory skills which may be impaired in children
with trauma exposure (Bücker et al., 2012). These different skill representations may be the reason for the different results but additional evidence will be required to explore this possibility fully. Finally, the lower performance exhibited in assessments of Richardson et al. (2015) and Hyter (2012) may be also associated with the different administration times utilized by each assessment. The PEERAMID-2 has a longer administration time. Because individuals with trauma exposure have high rates of attention disorders (Ouyang et al., 2008), the longer administration time could have also impacted scores. Further research is needed to completely understand how attention impacted performance on both of these measures.

**Significance of Results on Individual Subtests on the CELF-5.** While differences in overall score may not have reflected previous studies, a careful evaluation of performance on CELF-5 Screening Test subtests supports some previous findings and provides new suggestions for future directions in research. Subtest raw scores were converted to percent error scores to place each subtest on the same numerical scale and the percentage of participants with elevated percent error scores (over 50%) was calculated to find this result. Participants had elevated percent error scores on several subtests. These elevated scores were considered clinically relevant because they alert practicing clinicians to evaluate this skill further with additional assessments. All of the individuals in the study were eligible to complete two such subtests and the majority did so. Many had elevated percent error scores on these measures. Following Directions and Recalling Sentences, could be completed by all individuals in this study. Forty point two six percent of the participants (n=31) had percent error scores greater than or equal to 60% on the Following Directions subtest and 33.33% (n=26) of participants had percent error scores greater than or equal to 57% on the Recalling Sentences subtest. These skills are important because they are frequently utilized in schools. Often, children must write down
information that they hear verbatim and follow verbal directions (Wigg et al., 2013). The high number of participants with elevated percent error scores on these subtests indicates that these individuals require additional testing to ensure that they can follow oral directions and repeat sentences verbatim. This result supports findings from Hyter (2012) who found that about 43% of individuals with trauma exposure had difficulty following verbal instructions.

Few studies have directly measured a child’s ability to repeat sentences, but the difficulty with the Recalling Sentences Subtest may reflect syntactic impairments found by other linguistic studies (Henry et al., 2007, Hyter, 2012, Manso et al, 2009; Sylvestre, 2016). In addition to linguistic skills, both of these subtests also measure working memory, which has been found to be impaired in children with trauma exposures (Bücker et al., 2012; DePrince et al., 2009). Accordingly, the increased numbers of individuals with elevated percent error scores on these subtests also indicate the need for additional assessment of auditory working memory. It may provide supplemental evidence demonstrating the existence of working memory deficits in children with trauma exposure.

Five different subtests were used to further analyze syntax and semantics amongst participants. Generally, younger children had lower percentages of participants with elevated percent error scores. Only 17.14% (n=6) obtained percent error scores above 56% on the Word Structure Subtest and 14.29% (n=5) of participants earned percent error scores above 60% the Word Classes Subtest. These subtests assess both grammar and semantics, indicating that younger children typically would not be referred for additional testing of these specific skills. Conversely, a higher percentage of older individuals had elevated percent error scores on two subtests that measured syntax and semantics. Namely, 62.22% of participants (n=28) had a percent error score greater than or equal to 50% on Sentence Assembly, and 47.73% of
participants (n=21) had a percent error score greater than or equal to 50% on Word Classes. A smaller but still significant percentage of participants (22.22%, n=10) had large percent error scores on the Semantic Relations Subtest. It is unknown why a smaller percentage of individuals received elevated percent error scores on this test. One possible explanation could be the participants’ familiarity with the type of question asked. Comparison questions are frequently utilized in educational testing (Wigg et al, 2013). Perhaps participants were more familiar with this type of assessment and therefore received better scores. However, additional research will be needed to provide a more nuanced understanding of this factor and determine if any additional factors are impacting this result.

These results support earlier findings from Manso et al. (2009) who found that more participants exhibited impaired syntax scores than impaired semantic scores (respectively, 48.7% had impaired syntax scores and 40.3% had impaired semantic scores). In the current study, both age groups had more participants with elevated percent error scores on syntax subtests than semantic subtests. A greater percentage of younger participants had more difficulty on the Word Structure Subtest (17.64%, n=6) compared to the Word Classes Subtest (14.71%, n=5). A larger percentage of older participants (62.22%, n=28) had elevated percent error scores on the Sentence Assembly subtest compared to their scores on the Word Classes Subtest (47.73%, n=21) or the Semantic Relations Subtest (22.22%, n=10). Like the findings of Manso et al. (2009), more sensitive statistical comparisons of these skills are needed to determine the magnitude of these differences. Additional analyses of more comprehensive language tests are also needed to provide a more robust evaluation of skills beyond what these screening tests can assess.
In addition to analyses exploring differences in syntactic and semantic skills, future research should also determine how age influences these skills. A larger percentage of older participants had elevated percent error scores on their CELF-5 Screening Test subtests than younger participants. Because different age-groups received different subtests, a full statistical comparison of syntactic and semantic performance could not be conducted. However, these results indicate the need to explore the interaction of age, trauma exposure status, and syntactic and semantic impairment in greater detail. Other studies have found age-related differences in other linguistic skills. Ayoub et al. (2006) found a statistically significant interaction between age, narrative retell skills, and maltreatment exposure status. Their study found that older children with maltreatment exposure had significantly lower pass rates on measures of narrative retell than younger children with maltreatment exposure. Could this age-based skill discrepancy also occur on syntactic and semantic assessments? These results indicate the need for additional testing to explore this possibility.

**Implications of PP-R Results**

**Discourse Assessments.** Hyter (2012), Ayoub et al. (2006), Sylvestre et al. (2016), and Manso et al. (2010) found that children with trauma exposure have deficits in narrative skills and conversation skills. They also found that children with maltreatment exposure received lower scores on general tests of pragmatic language. Results of the discourse tests further demonstrate the existence of impaired pragmatic skills in children with trauma exposure. However, unlike previous studies, participants had intact overall scores in most areas of pragmatics assessed with the PP-R. On Narrative Retell, only 18.18% (n=10) had z-scores less than -1.0. However, a high percentage of participants did not demonstrate key narrative skills on this subtest. Specifically,
33.89% (n=20) had inconsistent or absent cohesion, 29.82% (n=17) had inconsistent or absent coherence, and 51.67% (n=31) had an inconsistent or absent landscape of consciousness. Missing any of these narrative skills could greatly impact functional performance, resulting in narratives that fail to provide listeners with key information, even if other skills are present. Therefore, this result indicates that participants had narrative impairments despite having relatively high overall scores on this subtest. Similar results were found in the Conversation Subtest. Only a small percentage of participants (16.39%, n=10) had z-scores that were less than -1.0. However, many individuals demonstrated inconsistent or absent presentations of Grice’s Maxims of Quantity (26.23%, n=16) and Relation (26.98%, n=17). An additional 20.00% (n=13) had failed to exhibit or inconsistently exhibited Grice’s Maxim of Manner. In addition, 22.22% (n=4) of the older participants that completed the expository language subtest had z-scores that were less than -1.0. All specific areas of expository language assessed had similar percentages of participants with low scores. Namely, 42.44% (n=8) had inconsistent or absent content scores, 42.11% (n=8) had inconsistent or absent structure scores, and 52.63% (n=10) had inconsistent or absent coherence scores. Like narrative retell, having impaired scores in any one of these elements of the Conversation or Expository discourse subtests could result in clinically significant functional impairments, even if other discourse elements are present.

Again, differences in results may be associated with the different measures used. The PP-R was designed to allow CTAC staff members to quickly comment on specific aspects of pragmatic language. Missing a few points on the overall score could indicate a more pressing pragmatic language impairment than the overall subtest score would suggest. The PP-R only gives individuals 1 to 4 points for demonstrating a key aspect of a pragmatic skill (e.g., the
landscape of consciousness aspect of the Narrative Retell subtest). However, many of measures utilized by the other authors assign multiple points (usually more than 10) for each component of a pragmatic skill. As a result, overall scores on these assessments may have been more influenced by the absence of specific skills than the PP-R. In addition, future studies that compare performance on various pragmatic tests are required to gain a more informed understanding of how linguistic performance is represented by each of these measures.

**Social Perspective Taking Assessments.** Several studies have found that children with maltreatment exposure had impaired first-order and second-order belief attribution (Luke & Banerjee, 2013; O'Reilly & Peterson, 2015). The results of this study supported their findings. A high percentage of children under the age of 6 years and 6 months had difficulty on first-order belief tests. In total, 28.57% (n=2) of participants did not pass the Crayon Box Subtest and an additional 50.00% (n=3) of participants did not pass Ball Subtest. Similar results were found for older children, as many individuals had difficulty with both tests of belief attribution. However, only a small number of children completed this assessment, so additional studies are needed to further explore the perspective taking abilities of younger children. Specifically, 23.53% (n=15) of participants received an inconsistent or absent score on the first-order belief subtest and 52.86% (n=36) received an inconsistent or absent score on the second-order belief subtest. A higher percentage of individuals were expected to have difficulty on the second-order measures because first-order belief attribution develops before second-order belief attribution (Hollebrandse, van Hout, & Hendriks, 2014). Accordingly, more individuals are expected to demonstrate improved performance on this measure as they mature. The final subtest was administered to the oldest participants (9-15 years old) in the sample. Only 9.52% (n=4) received
two points or less on the Strange Stories subtest overall. However, a larger percentage of participants (35.14%, n=13) did not identify joking and an additional 21.95% (n=9) did not identify sarcasm. Again, this is clinically significant because being unable to identify joking and sarcasm in daily life could have significant functional implications for children. This provides additional evidence that individuals with trauma exposure have additional difficulty identifying other individuals’ intentions.

Hyter (2012) also found that individuals with trauma exposure have increased deficits identifying other individuals’ intentions. However, she found that participants in her study had a higher rate of overall impairment in this area with approximately 79% of her sample demonstrating perspective taking impairments. The different percentages of individuals with impairments may be the result of the measurements utilized by each study. Hyter (2012) analyzed the percentage of individuals who had difficulty with any aspect of perspective taking, while this study analyzed specific skills within the larger category of social perspective taking. The results of this study would have more closely resembled results from Hyter (2012) if it had also calculated the total percentage of participants with impairments in any aspect of social perspective taking.

**Research Question 2: How does Numbers of Trauma Exposures Affect PP-R Scores?**

Few studies have compared the pragmatic language skills of individuals with different numbers of trauma exposures, so results from studies on the effects of different numbers of trauma and general language skills were utilized to form the research hypotheses. Richardson et al. (2008) found that children who were exposed to multiple types of trauma were more likely to demonstrate developmental delays in receptive language than children who had
experienced one type of trauma. However, experiencing different numbers of maltreatment was not associated with statistically significant differences in delayed expressive language. These researchers analyzed language in general, rather than pragmatic language specifically, so it was unknown how pragmatic language would be impacted. However, the pragmatic language measures in the current study assessed were primarily expressive and therefore it was more likely that these expressive pragmatic language skills would not be influenced by exposure status. The current study utilized a Kruskal-Wallis Test and found that individuals with different numbers of exposures had significantly lower scores on Narrative Retell subtest ($H(2)=6.154$, $p=0.046$), but not on the Conversation subtest ($H(2)=2.63$, $p=0.268$). Furthermore, the only statistically significant differences on the Narrative Retell test were between individuals with 6-10 trauma exposures and those with 11-15 trauma exposures. Children who had 11-15 trauma exposures had lower overall scores. A moderate effect size ($r=0.314$) was found for this group. Analyses of the control variables were also conducted.

Age and scores on the KBIT-2 were not associated with statistically significant differences in PP-R scores. However, most of participants had IQ scores within 1.0 standard deviation of the mean. A larger sample that includes children with more diverse cognitive profiles might show significant associations between KBIT-2 score and PP-R scores on narrative retell and conversation. Also unlike previous studies investigating narrative retell, age, and trauma exposure, children with different ages did not have significantly different scores on measures of narrative retell or conversation. This conflicts with findings from Ayoub et al. (2006). This difference may be because the majority of the participants in this study were between the ages of 6 years and 7 months and 15 years old, while Ayoub et al (2006) had more participants that were younger than 6 years old in their study. Looking at more children outside
of these age ranges will allow for a more complete understanding of the relationship between age and language performance in children with exposure to complex trauma and should be a focus of future studies.

Additional future analyses are required to determine why individuals had significant results in narrative retell, but not conversation. One possible reason for this difference could be linked to the executive functioning skills required for each task. Individuals with trauma exposure have higher rates of executive functioning impairments (Cook et al., 2012; DePrince et al., 2009; Henry et al., 2007). Current research suggests that executive functioning is associated with performance on narrative retell tests in children (Friend and Bates, 2014). These executive functioning impairments could influence performance on the Narrative Retell Subtest. Furthermore, some evidence suggests that some specific executive functioning skills are more severely impacted by increased numbers of trauma exposures. Richardson et al. (2008) found that individuals with greater numbers of trauma exposure had significantly lower scores on tests of sequencing, an executive function, than those with only one exposure. This executive functioning skill is also important to the development of narrative retell as individuals must be able to put events in order to retell a story. Few studies have been conducted analyzing the effects of executive functioning on tests of conversational abilities. However, it may have a weaker impact on conversation scores than narrative retell scores. Additional research is required to determine the relationship between executive functioning and conversation before researchers can fully understand how narrative retell, executive functioning, and conversation are influenced. In addition, research will be needed to determine how the different types of language analyzed could have impacted results.
Because Richardson et al. (2008) investigated language in general and this study only conversation and narrative retell skills, future studies should conduct additional analyses on the relationship between the number of trauma exposures and scores on specific tests of syntax, semantics, and pragmatics. Furthermore, the number of exposures per group also could have affected results. While Richardson et al. (2008) compared individuals with one type of trauma exposure to those with two, three, four, and five types of trauma exposures, participants in the current study had a greater number of exposures per group. None of the participants had just one type of trauma exposure and the majority of the participants had over five trauma exposures. As a result, Richardson’s groups could not be recreated. It is suspected that the different numbers of exposure are associated with the measures used. While Richardson and colleagues used the same operational definition of trauma as the current study, their measure only accounted for five different types of exposures on their checklist. The CTAC Trauma Screening Checklist accounts for 15 types of trauma and includes institutional trauma exposures, such as separation from a parent. This may have resulted in the elevated numbers of exposures in the current study. It is possible individuals with 11-15 exposures would have had lower scores on general tests of expressive language. It is also possible that individuals with only one exposure would have had significantly lower scores on both PP-R subtests than individuals with multiple trauma exposures. To explore these possibilities, future studies should utilize comparison groups with both low numbers of trauma exposures like Richardson et al. (2008) and high numbers of trauma exposures like the current study to more sensitively compare individuals with varying numbers of exposures. This will allow for a more complete understanding of the relationship between the number of trauma exposures experienced and the language scores in different domains of syntax, semantics, and pragmatics.
Research Question 3: How Does FASD Status Influence PP-R Scores?

As stated previously, there were not enough individuals with FASD and comorbid trauma exposure to create comparison groups to sensitively analyze the skills of individuals with comorbid FASD and trauma exposure. Only 4.82% (n=4) of participants originally collected met the diagnostic criteria. Accordingly, these individuals were excluded from the study and this question was not answered. Other CTAC studies have found that 30-40% of individuals with trauma exposure have FASD (Henry et al., 2007; Hyter, 2012). This difference may be the result of the exclusionary criteria used in this study. This study excluded individuals with co-occurring exposures to other drugs and neurological conditions while the aforementioned studies did not. This may have resulted in many of participants with FASD being excluded from the current study, thus resulting in a smaller percentage of participants. In addition, changing diagnostic criteria may have also resulted in a lower number of participants with FASD. While the same FASD Diagnostic Grid created by Astley (2005) was utilized in both the current study as well as studies by Henry et al. (2007) and Hyter (2012), the diagnostic criteria for FASD was updated in 2016 to more sensitively rank FASD characteristics (Hoyme et al., 2016). Future studies of FASD rates in children with trauma exposure should be conducted to more sensitively parse out these factors and provide a nuanced understanding of how these factors affect FASD diagnosis.

Limitations

Efforts to limit confounding variables were described throughout Chapter 2. Despite this, several factors limit the conclusions that can be drawn from these results. A discussion of these limitations is provided below. Key aspects include features of the research sample and characteristics of the examinations utilized.
Participants

Participants were collected from a clinical sample from primarily the Midwest. All of the individuals in this study were referred to CTAC to assess difficulties possibly stemming from previous trauma exposures. Because the individuals in the study were referred to CTAC to improve their functioning in a variety of ways, they may have additional impairments not found in the general population of trauma-exposed children. In the future, studies comparing children recommended to CTAC and other trauma assessment centers to the general population will help determine how representative they are of the trauma-exposed children in the general population. In addition, an increased number of individuals in the current study would increase statistical power and strengthen analyses. Particularly, having more children under the age of 6 years and 6 months and more children with comorbid FASD would allow for some helpful additional analyses and a more representative assessment of their skills.

Examinations Used

Several limitations of this study are a direct result of the examinations utilized. This study was a retrospective study and thus researchers had to analyze language with the tests and procedures predetermined by CTAC. In addition to an understanding of an individual’s linguistic skills, the CTAC staff must provide a gestalt picture of an individual’s cognitive, socioemotional, behavioral, and physical health. Therefore, the tests utilized were designed to quickly describe possible deficits and create recommendations for further testing rather than provide a comprehensive measure of language as a whole. They were not norm-referenced and accordingly have limitations to their interpretation. Future assessments should utilize norm-references measures to more sensitively compare individuals with trauma exposure to typically developing peers.
As stated previously, the CELF-5 Screening Test compares participant scores to age-based criterion score and is only meant to determine if the individual needs further testing. It is not made to determine if the individual has a language impairment. As a result, limited conclusions can be drawn from this measure. Additional testing will be needed in the future for a more thorough measurement of syntactic and semantic skills in children with trauma exposure.

The PP-R has the child perform certain pragmatic language task and the examiner gives the child a point for each age-appropriate skill exhibited during the subtest. Using this method, researchers can determine if participants demonstrate a series of age-appropriate pragmatic language skills. However, pragmatic skills by their very nature are heavily dependent on context. For example, children may demonstrate an increased number of pragmatic skills while interacting with their parents and less appropriate pragmatic skills while interacting with peers. The PP-R only tests one context, children talking with unfamiliar adults in a formal test environment. Accordingly, additional tests that observe the children in multiple contexts will help provide a more comprehensive picture of individual’s language performance.

**Directions for Further Research**

In addition to the suggestions listed above for additional assessment measures and increased sample size and variability, future research should also focus on determining effective language intervention strategies for this population. Information from this study and previous studies demonstrate that individuals with trauma exposure often exhibit impaired linguistic performance in pragmatics, syntax, and semantics. However, few studies focus on treatment for this specific population of children. As a result, future studies should utilize information about specific linguistic deficits in this population and determine which available treatments result in significant functional improvements. Treatment suggestions from, “A Model of Trauma-
Informed Care” (Hyter & Ciolino, 2017) could be adapted to create a protocol and its effectiveness could be assessed. Furthermore, additional research on literacy and other academic language skills of children who have survived traumatic experiences is also needed. This will inform professionals about specific language deficits experienced by children with trauma exposure. As stated earlier, language impairments could be contributing to the poor academic outcomes and high rates of court-involvement exhibited by children with trauma exposure. Building upon the results of this study and developing sensitive treatments to help address the specific linguistic needs of individuals with trauma exposure could help serve as a protective measure to improve outcomes for individuals with trauma exposure.

**Summary of Conclusions**

This study provides further evidence of specific impairments in children with trauma exposure. While future studies with more comprehensive examinations will be needed to expand upon these results, this study indicates that many individuals with trauma exposure experience language impairments. Despite these high overall scores on the PP-R and CELF-5 Screening Test, individuals exhibited clinically significant low scores on several individual skills evaluated on these tests. Specifically, individuals exhibited greater difficulty on the CELF-5 subtests of Sentence Recall and Following Directions and older individuals had difficulty with the Sentence Assembly and Word Classes subtests. In addition, participants demonstrated specific narrative skill impairments in landscape of consciousness, cohesion, and coherence. These were accompanied by specific conversational impairments demonstrated by violations of Grice’s Maxims of Quantity, Relation, and Manner. Additionally, older children had impairments in all areas of expository language tested. Evidence of impaired social perspective taking was found in every test utilized. Younger children had higher rates of impairments in both first-order belief
tests, but a greater percentage of participants had low scores on the Ball Subtest. However, only a small number of individuals were eligible to take these subtests so additional studies are needed to evaluate their perspective taking skills. A large portion of older children also demonstrated impaired first-order and second-order belief attribution skills, as well as difficulty recognizing joking and sarcasm in a communication scenario.

Differences in these results may be caused by the different measures utilized for testing, as other studies utilized more comprehensive measures to analyze language in multiple domains and compared them with standardized scores. In addition, the current measures were not norm-referenced and could not directly compare skills of participants with trauma exposure to typically developing peers. Therefore, additional assessments should be utilized in future studies to gain a clearer understanding of the linguistic skills of children with exposure to complex trauma.

In addition, individuals who were exposed to different numbers of trauma exposures had significantly lower scores in narrative retell, but not in conversation. This may be due to the type of language assessed, the number of trauma exposures per comparison group, or the executive functioning skills required for each test. High numbers of trauma exposures in each group or the fact that expressive pragmatic language was tested in each group may have also influenced results. Additional research will be needed to compare individuals with different amounts of trauma exposure on various measures of language to expand upon these results. Future studies should also have an increased number of participants to increase statistical power of analyses. Because this study provides evidence to further support the existence of language impairments in individuals with trauma exposure, future research should both expand upon these results and additionally test the effectiveness of language intervention in the specific areas of linguistic deficit described above. Considering the limited number of studies pertaining to this topic, this
study provides some additional guidance for other researchers who wish to explore the relationship between complex trauma exposure, FASD, and language exposure. Thus, it is an important contribution to a relatively new area of study for speech-language pathologists.
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Appendix A

Human Subjects Institutional Review Board
Date: March 6, 2017

To: Yvette Hyter, Principal Investigator
   Christel Ciolino, Student Investigator for thesis

From: Amy Naugle, Ph.D., Chair

Re: HSIIRB Project Number 17-03-01

This letter will serve as confirmation that your research project titled “Language Profiles of School-Age Children Who Have Experienced Maltreatment” has been approved under the exempt category of review by the Human Subjects Institutional Review Board. The conditions and duration of this approval are specified in the Policies of Western Michigan University. You may now begin to implement the research as described in the application.

Please note: This research may only be conducted exactly in the form it was approved. You must seek specific board approval for any changes in this project (e.g., you must request a post approval change to enroll subjects beyond the number stated in your application under “Number of subjects you want to complete the study”). Failure to obtain approval for changes will result in a protocol deviation. In addition, if there are any unanticipated adverse reactions or unanticipated events associated with the conduct of this research, you should immediately suspend the project and contact the Chair of the HSIIRB for consultation.

Reapproval of the project is required if it extends beyond the termination date stated below.

The Board wishes you success in the pursuit of your research goals.

Approval Termination: March 5, 2018
Appendix B

List of Inclusionary and Exclusionary Developmental Disabilities
List of Inclusionary and Exclusionary Developmental Disabilities

List of Exclusionary Developmental Disabilities

- Autism Spectrum Disorder
- Traumatic Brain Injury
- Cerebral Palsy
- Premature Delivery/its complications
- Deafness/Hearing Impairment
- Blindness/Low Vision
- Any Genetic Disorder
- Meningitis
- HIV Positive
- Seizure Disorder
- Hydrocephaly
- Child has Shunt installed
- Any specific brain malformation
- Cancer (in childhood); chemo affects brain development
- Exposure to non-alcoholic drugs in utero, suspected is enough to exclude: cocaine, meth, marijuana, cigarettes/nicotine (even if not confirmed)
- Seizure Disorder when FASD is not specified
- Diabetes Type 1
- Brain Infections
- Tumors of any kind on brain
- Brain Bleed

List of Inclusionary Developmental Disabilities

- Pragmatic Language Disorder
- ADD/ADHD
- Language Impairment
- ODD
- Mood (depression, anxiety, bipolar disorder)
- Personality Disorders (narcissistic personality disorder, etc.)
- PTSD
- Depression
- Asthma
- Allergies
- Seizure Disorder when FASD is Specified
- Alcohol exposure
- Trauma-related disorders
- Cystic Fibrosis

All Highlighted diagnoses should be recorded under Cognitive status.
Appendix C

Data Collection Record Form
<table>
<thead>
<tr>
<th>Code:</th>
<th>Cognitive Status</th>
<th>BRIEF Self Report</th>
<th>BRIEF Parent Form</th>
<th>VMI</th>
<th>Sensory Profile 2</th>
<th>Score for CSE-S Screener</th>
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<tr>
<td>Type of Trauma Exposure:</td>
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<tr>
<td>1. Physical Abuse</td>
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<td>2. Neglect</td>
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<td>3. Emotional Abuse</td>
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<td>4. Domestic Violence Exposure</td>
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<td>5. Other Violence Exposure</td>
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<td>6. Sexual Abuse</td>
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<td>7. Parental Substance Abuse</td>
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<td>8. Incest</td>
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<td>9. Exposure to Drug Activity</td>
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<td>10. Prevention/Drug Abuse Exposure</td>
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<td>11. Separation from parent</td>
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<td>12. Placement outside of home</td>
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<td>13. Loss of Significant People</td>
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<td>14. Multiple Abuse</td>
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<td>15. Other</td>
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<tr>
<th>Number of Events</th>
<th>Data from the A-RF</th>
<th>T-Scores</th>
<th>T-Scores</th>
<th>Standard Score</th>
<th>Short Form 2</th>
<th>Cutoff Criteria (for age):</th>
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<td>1. Verbal:</td>
<td>Behavioral Regulation Index</td>
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<td>Avoiding:</td>
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<td>Landscape of Consciousness</td>
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<td>9-15 years</td>
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<td>Not appropriate</td>
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<tr>
<td></td>
<td>Did not Record</td>
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<td>1. Prosocial</td>
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<tr>
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<td>2. Undetermined</td>
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<tr>
<td>3. Difficulty</td>
<td>3. Antisocial</td>
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<td>2. Inconsistent</td>
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<tr>
<td>3. Difficulty</td>
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Appendix D

Data Collection Checklist
Data Collection Checklist

1) Get encrypted flash drive from Dr. Hyter’s lab

2) Unlock CTAC office on 4th floor

3) Return Key to Donna and retrieve files from Med Records

4) Sign out finals

5) Take files to 4th floor

6) Open File on Secure Flash Drive or 1 Drive File See below

Secure Flash Drive

a) Insert Flash Drive and click on Veracrypt software
b) Click on any slot and click “select file”
c) Click on “Thesis” and click on select “encrypted”
d) Click Mount
e) Enter Password
f) Click on "No Name" Drive
g) Open blank data collection form "Data Collection Record Form 5-8"

****Note: if using a windows computer this is not necessary, simply type in password and open with BitLocker*** Passwords are in briefcase.

7) Open “Data Coding Form Final” on OneDrive
a) Record file number
b) Give file an assigned code based on order it was pulled (first file pulled is number 1)
c) Put document in web layout (click view, then web layout) if not done already
d) Ignore 3rd column for now

8) Save Data Record Form 5-8 with code (e.g., first file will be “001_data_collection”)
   a) Open Data Record Form as usual
   b) Click File
   c) Click Save as
   d) Type in filecode_data_collection (e.g. 001_data_collection)
e) Hit save

9) On the newly saved Data Record Form 5-8, write the file’s code under “Code”
10) Open File to the 1st page of Left-Hand Side
   a) record age ______
   b) Save ______
   c) If child is older than 15.11 or younger than 5.0 discontinue collection (should not happen if you only use the list from Donna)
      i) Don’t Save work ______
      ii) Delete File from Encrypted Flash Drive ______
      iii) Empty Recycling Bin ______

11) Flip to 1st page of Trauma Referral
    a) Record gender ______
    b) Save ______

**** Reminder: Before recording any additional data points write “did not score” if no score is recorded for any 1 question. Put did not record if on any additional data point and write Did not record under subtest total

12) Now go to the Report in the Back of the File

13) Check to make sure Client has at least 2 of the Assessments being collected (VMI, BRIEF, KBIT, CELF, Pragmatic Profile, Sensory Profile):
    a) If they are there, collect that data____
    b) If they are NOT there...
       i) Don’t Save work ______
       ii) Delete File from Encrypted Flash Drive ______
       iii) Empty Recycling Bin ______

14) Go to Case History section of report and briefly read it through, the medical section with “current diagnoses” will be very helpful. Look for the occurrence of comorbid developmental disabilities or has been exposed to non-alcoholic drugs in utero (See Approved/Non-Approved Diagnoses Form) ______
    a) If yes, Discontinue Data collection:
       i) Don’t Save work ______
       ii) Delete File from Encrypted Flash Drive ______
       iii) Empty Recycling Bin ______
    b) If no, record Mental Health Diagnoses (mood disorders, behavioral disorders, etc.) under “Cognitive Status” ______
    c) Save Document __________
15) Flip to about 2/3rd of the way through the report, look for “**Trauma Screening Checklist.**”
   a) No Trauma Screening Checklist Discontinue Data Collection
      i) Don’t Save work ______
      ii) Delete File from Encrypted Flash Drive ______
      iii) Empty Recycling Bin ______
   b) If **Trauma Screening Checklist** is there….
      - Highlight each trauma exposure listed in child’s checklist on your document under *Type of Trauma Exposures* ______
      - Count the number of highlighted trauma exposures on your checklist ______
      - Count the number of trauma exposures recorded in the file_______
      - Count the Number of Trauma Exposures in the Chart_______
      - Compare your number and chart number _______
      - Write Final Number of exposures Under “*Number of Trauma Exposures*” on data record from ________
      - Save Document ______

16) Flip to the end of the report and look for “**FASD Diagnostic Grid**”
   a) If child has a 3 or 4 in the Growth, Face, and Brain columns (needs all 3), highlight “*Trauma + FASD*” at the top of *Trauma Status* in data record form ______
   b) If child has previous diagnosis of FASD from CTAC but does not have a 3 in all categories, Highlight “*Trauma + FASD*” on chart ______
   c) If child does not have a 3 in each category, highlight “*Trauma Only*” ______
   d) Save Document ______

17) Flip to beginning of Chart under section with all the testing forms
18) Go to **KBIT-2**
   a) Record Verbal *Standard* Score ________
   b) Record Nonverbal *Standard* Score ________
   c) Record Composite *Standard* Score ________
   d) Save Document ________

19) Go to **CELF-5**
   a) Flip through test to make sure child did the correct subtests per age
      i) Children 5-8yrs do Subtests A through E____
      ii) Children 9-21yrs do Subtests CD through H ___
      iii) If child did the wrong series of subtests...
           I. Write did not record under score and only record data from the
              subtests that they were eligible to complete.
   b) Record Child’s Score ____
   c) Record Criterion Score Needed to Pass______
   d) Mark Y/N to denote if Child Met Criterion ______
   e) Go through Each Subtest....
      i) Count the total number correct per subtest ______
      ii) Recount total number per subtest________
      iii) Record Scores in Data Collection Form ______
      iv) Add all subtest scores together and add them up ______
      v) Compare total on chart to total on data record form______
      vi) Recount as necessary ______
      vii) If Subtest not age-appropriate, Highlight N/A ______
   f) Save Document ________

   ****Note: Sometimes recorded **CELF-5** totals do not match subtest scores, if that is the case use
   your own total calculated from the subtest****

20) Go to the **Pragmatic Protocol** ______
    a) Look at Scorer to see if it’s an SLP student scoring using list of past CTAC
       interns “**CTAC SLP Scorers 2016**” and write Y/N accordingly ________
           i) If no scorer recorded, go to the front of the document where you found
              ages and gender and look at names of examiners using list of past CTAC
              interns/staff and record Y/N accordingly ________

21) Now go through Pragmatic Protocol Subtests :
a) If Child does not have a score for a subtest…
   - Highlight “not appropriate” under subtest heading if child are too young/old for a certain subtest
   - Put N/D if the examiner didn’t do a certain subtest in large print at the top
   - Black out everything Under Subtest Heading

b) If a score is reported for Subtest that is too young/old for a participant...
   - Highlight "Not Appropriate"
   - Record Scores as usual
   - Save

22) If only one question isn't scored under stube st, write “did not score” if no score is recorded for any 1 question. Put did not record if on any additional data point and write Did not record under subtest total

a) Conversation
   I. Count the total number of 1’s for quantity, relation, and manner
   II. Recount
   III. Count total score for each subtest by adding each sub-score
   IV. Recount and see if it matches the number recorded by original scorer
   V. Record under total score
   VI. If not matching, Recount and make sure that numbers under subtests add up to total, changing number under “total score” if necessary
   VII. Enter it again under “Raw Score”
   VIII. Save

b) Narrative Retell
   I. Count the total number of 1’s for Initiating Event, Goal, Attempts, Cohesion, Coherence, Landscape of Action, & Landscape of Consciousness
   II. Recount
   III. Count total score for each subtest by summing all sub-score
   IV. Recount and see if it matches the number recorded by original scorer
   V. Record under total score
   VI. If not matching, Recount and make sure that numbers under subtests add up to total, changing number under “total score” if necessary
      I. Enter it again under “Raw Score”
      II. Save

c) Skip Narrative Retell and Narrative Generation for now

d) Expository Sequence (9-15 only)
   I. Count the total number of 1’s for content, structure, and coherence
   II. Recount
   III. Count total score for each subtest by adding each sub-score
IV. Recount and see if it matches the number recorded by original scorer ______

V. Record under total score ______

VI. If not matching, Recount and make sure that numbers under subtests add up to total, changing number under “total score” if necessary ______

VII. Enter it again under “Raw Score” ______

VIII. Save ______

e) 1st Order Belief Tasks Crayon box (4-6 only)
   I. Record if Child got a 0 or a 1 on this subtest ______
   II. Recount ______
   III. Count total score for each subtest by adding each sub-score ______
   IV. Recount and see if it matches the number recorded by original scorer ______
   V. Record under total score ______
   VI. If not matching, Recount and make sure that numbers under subtests add up to total, changing number under “Total” if necessary ______
   VII. Enter it again under “Raw Score” ______
   VIII. Save ______
   IX. If a score is reported for Subtest that is too young/old for a participant...
       I. Highlight “Not Appropriate” ______
       II. Record Scores as usual ______
       III. Save ______

f) 1st Order Belief Ball location (4-6 only)
   I. Record if Child got a 0 or 1 on this subtest ______
   II. Recount ______
   III. Count total score for each subtest by adding each sub-score ______
   IV. Recount and see if it matches the number recorded by original scorer ______
   V. Record under total score ______
   VI. If not matching, Recount and make sure that numbers under subtests add up to total, changing number under “Total” if necessary ______
   VII. Enter it again under “Raw Score” ______
   VIII. Save ______
   IX. If a score is reported for subtest that is too young/old for a participant...
       I. Highlight “Not Appropriate” ______
       II. Record Scores as usual ______
       III. Save ______

g) 2nd Order Belief (6-9; 9-15)
   I. Count the total number of 1’s for 1st order and 2nd order ______
   II. Recount ______
   III. Count total score for each subtest by adding each sub-score ______
   IV. Recount and see if it matches the number recorded by original scorer ______
   V. Record 1st and 2nd Order Beliefs Separately under “Total” ______
VI. If not matching, Recount and make sure that numbers under subtests add up to total, changing number under “total score” if necessary ______

VII. Enter it again under “Raw Score” ______

VIII. Save ______

h) Strange Stories (9-15)
   I. Count the total number of 1’s for pretending, joking, lying, or being sarcastic (do not record double bluff) _______
   II. Recount _______
   III. Count total score for each subtest by adding each sub-score _______
   IV. Recount and see if it matches the number recorded by original scorer _______
   V. Record under total score _______
   VI. If not matching, Recount and make sure that numbers under subtests add up to total, changing number under “total score” if necessary ______
   VII. Enter it again under “Raw Score” ______
   VIII. Save _______

23) Ignore z-score Section

24) Now go to “Scoring and Interpretation” under Summary and Highlight Appropriate label under Qualitative for each subtest (Save after each one)

A. Conversation
   I. Quantity ______
   II. Relation ______
   III. Manner ______

B. Narrative Retell
   IV. Initiating Event ______
   V. Goal ______
   VI. 3 Attempts ______
   VII. Cohesion ______
   VIII. Coherence ______
   IX. Landscape of Action ______
C. Go to end of Data Collection Sheet - Find Landscape of Consciousness

X. Thoughts ______
XI. Feelings ______
XII. Predictions ______
XIII. Inferences ______

D. Narrative Generation (at end of document)

XIV. Plans ______
XV. Outcomes ______
XVI. If both antisocial and prosocial are highlighted check undetermined ______
XVII. Easy to Follow Y/N ______

E. Expository

XVIII. Content ______
XIX. Structure ______
XX. Coherence ______

F. 1st Order Belief Crayon Box ______
   XXI. not on older children’s PP, dont worry about recording it over the age of 6;6)

G. 1st Order Belief Ball Location ______
   XXII. (not on older children’s PP, dont worry about recording this if they are over the age of 6;6)

H. 2nd Order Belief

XXIII. 1st Order ______
XXIV. 2ND Order ______

1. Strange Stories

XXV. Pretend ______
XXVI. Joke/Tease ______
XXVII. Lie ______
XXVIII. Sarcasm ______
XXIX. Exclude Double Bluff

25) Go to Coding Form
   a) Write “yes” next used ______
   b) Record Any Unclear Instances or things you’d like to ask the committee about in writing in this space ______
   c) Save Coding Form ______
   d) Save Data_Collection_Form ______

26) Save in Encrypted Flash Drive ______
   a. Coding form ______
   b. Data Collection Form ______

**** Only do Next Steps if you’re done collecting for the day ****

27) Remove Flash Drive by……
   a) Click on Veracrypt software ______
   b) Select Encrypted ______
   c) Click Dismount ______
   d) Right click on flash drive and click eject ______

28) Return Files to Medical Records ______
   a) If Med Records is closed, place them in CTAC office and Donna will make sure that they are returned safely.
   b) Please, try to put files back in CTAC cabinet in alphabetical order from previous times. It saves Med Records a lot of time. If you get busy or behind send Christel
an email at christel.g.cioino@wmich.edu and I will come in the next day to put them back on the shelf.

29) Make Sure Room is Clean and Locked _________