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# Adverse Childhood Experiences: the Impact of Toxic Stress and Complex Trauma on the Developing Child

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# ADVERSE CHILDHOOD EXPERIENCES: THE IMPACT OF TOXIC STRESS AND COMPLEX TRAUMA ON THE DEVELOPING CHILD

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## Abstract

Adverse childhood experiences have been found to increase the likelihood of immediate and long-term negative impacts on children. Adverse childhood experiences are complex traumatic events that can produce a powerful stress response in a child's brain and body, which has the potential to influence their development. Children with adverse traumatic experiences are at an increased risk for altered neurodevelopment due to the influence of toxic stress. Research has shown this altered development to be associated with many negative outcomes, including adopting health risk behaviors, disease, behavior problems, and social, emotional and cognitive impairment. These negative outcomes have the potential to impact children and their performance in school. Children with complex traumatic experiences are at greater risk for increased learning and behavior problems, decreased executive functioning skills, lower academic performance and engagement decreased social competencies and increased academic risk behaviors. It's imperative that teachers are aware of the potential impact adverse childhood experiences have on children and seek to understand how to best support students dealing with complex trauma.

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# CHAPTER I: Introduction

Meet Amara, an eleven-year-old girl who is halfway through her 6th-grade year. Amara lives with her mom and younger brother in a poor neighborhood in Minneapolis. Her father has been in jail for a year for physically abusing her and her mother. Amara's father would frequently drink too much then come home and hit and verbally abuse Amara and her mom. Amara remembers hiding downstairs with her younger brother one evening when her dad came home with a gun, threatening and screaming at her mom. Amara knows two people in her community who have been murdered.

Amara, her mom, and brother have had to move three times in the past two years, first from their apartment, then to a homeless shelter for a few months after Amara's mom lost her job, and finally into subsidized housing. Amara's mom currently works two minimum wage jobs, which leaves Amara in charge of watching her brother at home alone most nights and weekends. Amara's mom tries to be involved and supportive of Amara and her brother, but she doesn't have a lot of time and is dealing with depression. Lately, Amara has been getting into trouble at school. Amara hasn't been able to focus and doesn't feel like coming to school or trying anymore. Just last week she was suspended for fighting with a peer and this year has received multiple office referrals for arguing with teachers, aggression, defiance, and non-compliance. Amara has frequently been yelled at and sent out of the classroom to the office. Because Amara has moved and changed schools twice in the last three years and often has to stay home with her brother, Amara has had a tough time making and keeping friends. Amara is struggling academically, and her teachers are talking about referring her to special education. Amara feels angry and distrusts adults at school; she doesn't want to go to school and feels anxious.

If Amara's teachers knew what she had been through, if they only knew what barriers Amara faces every day simply to get to school, maybe they would treat her differently. If her teachers knew about adverse childhood experiences (ACEs), what complex trauma was, the toxic stress response and the impact these things have on Amara's development and life, maybe they would respond to her behaviors in an alternate way. If they knew Amara had an ACE score of 6, rather than punishing her maybe they would focus on establishing a relationship with her, hold her to high expectations, teach her mindfulness and create a classroom environment that is sensitive to trauma, where Amara feels physical and emotionally safe. Maybe school could become a place where Amara is supported, understood and known.

**Current State of U.S. Youth**

Youth today certainly aren't immune to problems and struggles in our nation. Poverty, changing family configurations, mental health issues, community violence, substance misuse, and other social factors have increased the burden on today's children. In 2016, 8.1 million families were living in poverty; the poverty threshold for a family of three people was $19,105, a family of four was $24,563 (U.S. Census Bureau, 2017). Additionally, the U.S. Department of Health and Human Services received 7.4 million referrals to child protective services (CPS) for maltreatment in 2016. National estimates of children who received a CPS investigation increased 9.5% from 2012 – 2016 (3,472,000 investigated cases) (U.S. Department of Health and Human Services, 2018). Furthermore, data from the Center for Disease Control's National Survey of Family Growth in 2010 revealed that the probability of first marriages lasting at least a decade was 69%, and twenty years was only 54% (Copen, Daniels, Vespa & Mosher, 2012). In 2010, five million adults were abusing alcohol and had at least one child under the age of eighteen living in their home (Substance Abuse and Mental Health Services Administration, 2010). These

tough situations are just a few of the hardships many of our youths face and carry with them to and from school each day. National databases propose that 26% of U.S. youth will either experience or witness a traumatic event before the age of four (National Center for Mental Health Promotion and Youth Violence Prevention, 2012). Other studies and data have this rate up as high as one in three children (Felitti et al., 1998). Keeping this in mind, it's imperative that teachers today understand how these adversities impact daily life for children so that they can better support them.

**Connections: ACEs, Trauma, and Stress**

Adverse childhood experiences (ACEs) is a term that came about after a famous CDC study was conducted in 1998 by Dr. Vincent Felitti and colleagues. ACEs are traumatic experiences that a person faces during childhood that are out of their control and occur within their family and caregiving system. There are three categories of ACEs and, depending on the study or organization, 8 – 10 adverse experiences that fall within these categories. Category one is abuse and includes physical, emotional and sexual; category two is neglect and includes physical and emotional; and category three is household dysfunction and includes maternal depression, parental incarceration, domestic abuse, maternal mental health issues, divorce, and substance abuse in the home (Burke, Hellman, Scott, Weems & Carrion, 2011; Felitti et al., 1998; Hunt, Slack & Berger, 2016). Amara, from the previous story, has an ACE score of six. She has experienced: physical abuse, verbal abuse, domestic violence and substance abuse in the home, incarcerated parent, and maternal depression; not to mention the fact that she also has been homeless and has been exposed to community violence. When children go through trauma, this impacts all areas of development: social, emotional, physical, relational, neurological, etc.

(Burke et al., 2011; Cook, Blaustein, Spinazzola, & van der Kolk, 2003; Felitti et al., 1998; Shonkoff & Garner, 2012).

The term trauma refers to an event that an individual experiences as physically or emotionally harmful, where they perceive their own life or the life of someone they care for as threatened (Pickens & Tschopp, 2017). There are three types of trauma: acute, chronic and complex (National Child Traumatic Stress Network, 2003). Acute refers to a single incident, chronic is repeated and prolonged exposure to trauma, and complex trauma refers to multiple, chronic traumatic events happening within the caregiving structure. Adverse childhood experiences are complex trauma; the abuse, neglect, separation, and/or violence is coming from parents and caregivers. Complex trauma is as its name defines, very complex; research has identified seven domains of impairment that can occur when a child faces complex trauma: attachment, biology, dissociation, behavioral control, cognition, self-concept and affect regulation (Cook et al., 2003).When a child experiences this type of trauma, the impact is great; it causes the brain and body to go through a severe, intense and/or prolonged stress response, which can be classified as toxic stress (National Scientific Council on the Developing Child, 2014; Shonkoff & Garner, 2012; Teicher et al., 2002). Toxic stress is an extreme stress response that impacts brain development and other facets of health. Although the body's physiological stress response is a system designed for good, to keep us safe and out of harm, this response can become harmful when it's activated frequently, intensely, and/or for an extended period of time. (Burke et al., 2011; Hunt, Slack & Berger, 2016; Pickens & Tschopp, 2017; Teicher et al., 2002).

Researchers have found that when an individual experiences continual stress and recurring trauma, the "fight or flight" response, or "survival mode" that our brain and body exhibit are activated faster, more frequently and for longer periods of time, (Cook et al., 2003;

Teicher et al., 2002) and the thinking, planning, learning, language parts of our brain are slowed down (Shonkoff & Garner, 2012). This keeps children in a heightened state of arousal or survival. In applying these adaptations to school settings, school can become a very difficult place (Jimenez, 2016; Pickens & Tschopp, 2017;); some refer to this as being "too scared to learn" (LaCoe, 2013, p. 11). Therefore, it's not surprising to learn that research shows children with elevated ACE scores face significant challenges when it comes to school performance, including increased learning and behavior problems, decreased executive functioning skills, lower academic performance and engagement, decreased social competencies, and increased academic risk behaviors (Bethell, Newacheck, Hawes & Halfon, 2014; Hunt, Slack & Berger, 2017; Pickens & Tschopp, 2017; Shonk & Cicchetti, 2001).

In summary, adverse childhood experiences are complex traumatic events that can produce a toxic stress response, potentially impacting a child's development and influencing their performance in the classroom. Thus, educators and those working closely with youth must understand how trauma impacts a child, what it looks like in and out of the classroom, and what behaviors and strategies can be implemented to best support them.

**Research Questions**

The review of the literature seeks to answer the following: What are the impacts of adverse childhood experiences on a child's development? How do ACEs and related trauma impact their developing brain, physical health, psychological and mental health? What outcomes emerge in children who have experienced ACEs and what are the likely causes of these outcomes? Additionally, how do complex trauma and toxic stress relate to ACEs and how is all of this manifested in children in the classroom?

Given the prevalence of trauma, maltreatment, and stress on today's youth, this literature review aims to investigate the scope and magnitude of the impacts ACEs and complex trauma on child development. The history of ACEs is studied, the physiological stress response is examined, alterations in brain development are explored, and an in-depth analysis of impairment from complex trauma is conducted. Finally, to make this review applicable and useful, the specific outcomes of trauma in the classroom are examined, in an effort to fully explain and understand how trauma presents and manifests itself in children in the classroom.

# CHAPTER II: Literature Review

To locate the literature for this thesis, searches of EBSCO MegaFILE, ERIC, Academic Search Premier, Research Gate, National Center for Biotechnology Information, and the Center on the Developing Child at Harvard University were conducted from 1998 – 2017. Articles that were considered were written after the original ACE Kaiser study in 1998. The keywords that were used in these searches were "adverse childhood experiences," "complex trauma," "maltreatment," "toxic stress," and "educational impact of adverse childhood experiences." The structure of this chapter is to review the literature on the impacts and outcomes of adverse childhood experiences on child development and school performance.

## Adverse Childhood Experiences

First published in 1998, the Adverse Childhood Experience (ACE) study was directed by Dr. Vincent Felitti and Dr. Robert Anda. Though this study was simple, it revolutionized our understanding of childhood experiences and their impact on the long-term health of adults. The ACE study surveyed 9,508 adults who were patients of Kaiser Permanente Health Appraisal Clinic in San Diego, between 1995 and 1997. These patients were asked to complete a questionnaire regarding traumatic experiences during childhood. This study examined seven categories of adverse childhood experiences. These categories of traumatic experiences included: psychological abuse, physical abuse, sexual abuse, violence against the child's mother, living with household members who were substance abusers, living with family members who were mentally ill or suicidal, and having a parent who was ever imprisoned. The responses of the patients were then analyzed together with their medical histories to measure adult risk behavior, health status, and disease.

The results of this study were astonishing; 52% of participants reported having one or more adverse childhood experiences, and 6% reported having four or more ACEs. An ordered association was discovered between the number of categories of traumatic childhood exposures (where the ACE score comes from) and the number of adult health risk behaviors and diseases that were studied. People who had an ACE score of four or higher were 4 to 12 times more likely to experience health risks of alcoholism, drug abuse, depression and suicide attempts. These same people were also two to four times more at risk for smoking and poor self-rated health. The study also revealed this same relationship between an elevated ACE score and presence of certain diseases such as ischemic heart disease, cancer, lung, and liver disease. The prevalence and risk increased for smoking, obesity, physical inactivity, depression and suicide attempts, as the amounts of childhood exposure grew. Another alarming piece of information found in this study was that for individuals indicating any single category of exposure, the probability of exposure to further categories ranged from 60% - 90%. This means that individuals who are exposed to one category of childhood abuse or household dysfunction are also at an increased risk for exposure to additional categories. Thus, the overall effect of these adverse childhood experiences on adult health is powerful and cumulative. People who had a higher ACE score in general exhibited greater health risk behavior, lower health status and higher presence of disease (Felitti et al. 1998).

Nadine J. Burke and colleagues (2011), inspired by the original ACE study, decided to evaluate how trauma impacted child development. Their study was one of the first to look at ACE categories and their association with negative outcomes among youth. Many ACE studies previously had focused on the impact of ACE scores on adulthood. Burke and colleagues conducted a study in which they examined the relationship between the prevalence of ACE

categories in an urban low-income pediatric population and both physical and psychological outcomes: learning and behavior problems and obesity. Seven hundred and one medical charts were reviewed for patients of two pediatric physicians at Bayview Child Health Center. The number of traumatic experiences was totaled and coded according to nine ACE categories. Each category that was recognized as a traumatic event received a score of 1. Total scores ranged between 0 – 9. This information was then analyzed to determine the frequency of an ACE score of one or higher along with the presence and rate of each type of ACE in the given population. Data indicating the presence of learning/behavior problems and obesity were taken from the medical charts. For this study, obesity was defined as having a body mass index greater than 85%, and the presence of learning/behavior problems was attained through clinical measurements from the child's doctor. Logistic regressions were used to calculate the risk of having learning/behavior problems and obesity in relationship with having an ACE score greater than or equal to one, and greater than or equal to four.

The data revealed an association between ACE scores of four or greater and an increased chance of learning/behavior problems, along with obesity, when compared to children with an ACE score of 0. Specifically looking at learning/behavior problems, 2.3% of students with an ACE score of 0 had behavior problems, while 51.2% of students with an ACE score of 4 or higher showed learning/behavior problems. The prevalence of overweight and obesity was 45.2% in those with an ACE score of 4 or higher and 31.3% in those with an ACE score of 0. The results show an association between higher ACE scores and physical and/or psychological problems (Burke et al., 2011). Researchers concluded that this study presents significant findings and warranted further research. They recognized that the design of reviewing retrospective medical charts could have led to possible selection bias; additionally, there was a strong

possibility of sampling bias because parents were probably less likely to report abuse to a primary care provider (who is a mandated reporter). This may have resulted in an underreporting of ACE categories. However, they concluded that there is a need for general screenings of ACEs in medical facilitates that serve youth. Because of the association found between ACE scores and learning/behavior problems and obesity, those working with children need to be aware of the potential influences ACEs may have on these two common childhood problems.

In 2013, in another study designed after the CDC-Kaiser ACE study, Flaherty and colleagues (2013) further examined the relationships between preceding adverse childhood experiences (ACEs) and somatic complaints and health problems in early adolescence. The timing of the adverse experience was also evaluated. This was a longitudinal study of 933 children who were reported as being at risk for maltreatment throughout the United States by the Consortium for LONGitudinal Studies of Child Abuse and Neglect (LONGSCAN). These children were interviewed at ages 4, 6, 8, 12, and 14. In this sample of children, only 8.7% had never experienced any of the determined adversities in their first 14 years of life, while the majority had experienced three or more of the adversities. This prevalence of adverse experiences is higher than the general population, due to the fact that the children were drawn from the LONGSCAN consortium. Results showed a graded relationship with "illnesses requiring a doctor" for children with 2 or more adverse exposures. This strong relationship was also found between the number of adversities and "any reported health problem." Overall, children who had faced adverse experiences were at a greater risk for somatic complaints, overall poor health (as reported by their caregiver), and "any health problem." This study also showed that recent adversities showed stronger negative health outcomes (Flaherty et al., 2013).

Researchers Dr. Vincent Felitti and colleagues (1998) created the original ACEs pyramid, an illustration designed to show the early hypothesis of how ACEs impact adult health (**Figure 1).** Adverse Childhood Experiences were at the base, leading to social, emotional, and cognitive impairment, leading to the adoption of health risk behaviors, leading to disease, disability, and social problems, leading to early death at the top. Although there was evidence for this information and it was proving to be true, there were significant scientific gaps relating to how adverse childhood experiences led to the outcomes evidenced by the study participants. Because this first ACE study revealed a new train of thought about trauma and its impact on the brain and body, much research has been conducted in this area since. The original pyramid has been revised **(Figure 2)** to reflect new understandings of the early childhood brain and body development and the impact of trauma, through the mechanism of toxic stress (Shonkoff & Garner, 2012). Research on the biology of stress is showing that healthy development can be disrupted by extreme or sustained activation of stress response systems in the body and the brain, which can have damaging effects on learning, behavior and health across the lifespan (Cook, 2005; Flaherty, 2013; National Scientific Council on the Developing Child, 2014; Shonkoff & Garner, 2012; Teicher, Anderson, Polcari, Anderson, & Navalta, 2002).

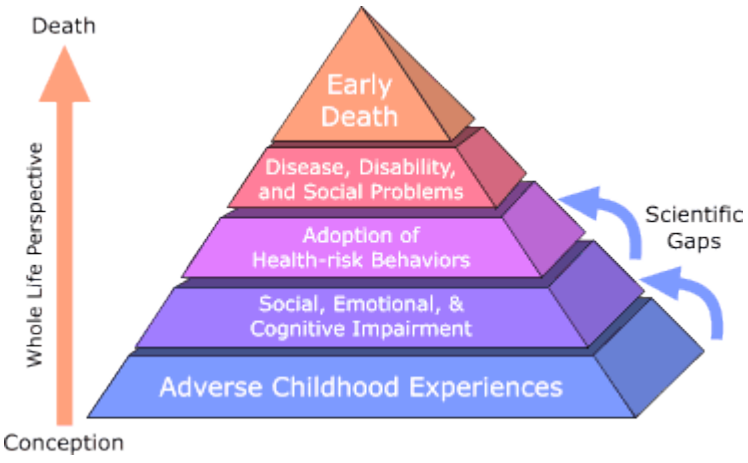

*Figure 1.* Original ACE Pyramid. Shows potential influences throughout the lifespan of adverse childhood experiences. Reprinted from "Relationship of Childhood Abuse and Household Dysfunction to Many of the Leading Causes of Death in Adults: The Adverse Childhood Experiences (ACE) Study," by V.J. Felitti, R. F. Anda, D. Nordenberg, D. F. Wiliamson, A.M. Spitz, V. Edwards, M.P. Koss, and J.S. Marks, 1998, *American Journal of Preventive Medicine, 14*(4), p. 256.

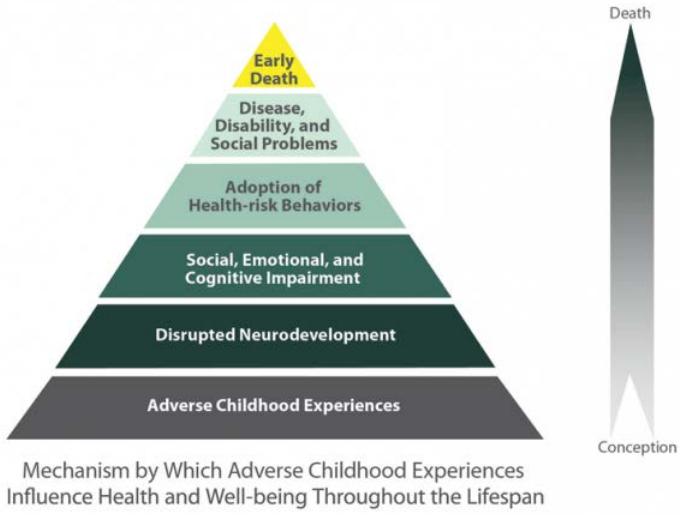


*Figure 2.* Revised Centers for Disease Control and Prevention ACE Pyramid. Mechanisms by which adverse childhood experiences influence health and well-being throughout the lifespan. Reprinted from *Centers for Disease Control and Prevention, n.d.* Retrieved January 01/14/2018, from https://www.cdc.gov/violenceprevention/acestudy/about.html

**Stress Response**

When an individual encounters a novel or threatening situation, the brain and body respond in a number of different ways. The response begins with the brain: eyes, ears or both send information to the amygdala, which interprets the images and sounds. The brain is wired to keep us safe and protect us from threats; when the amygdala perceives danger, it sends a distress

signal to the hypothalamus, which communicates with the rest of the body through the autonomic nervous system. The hypothalamic-pituitary-adrenocortical axis and synthetic-adrenomedullary system are activated; this causes a heightened level of stress hormones to be released throughout the brain and body, including corticotropin-releasing hormone, cortisol, norepinephrine, and adrenaline (Shonkoff & Garner, 2012). Adrenaline is a hormone that is key to the body's short-term immediate stress response, boosting energy supply and increasing heart rate, blood pressure, breathing, attention focus, and pupil dilation. Cortisol is the hormone related to the body's long-term response to stress, mobilizing energy stores, controlling the release of adrenaline, increasing blood pressure, and inhibiting growth, immune, digestive and inflammatory response (Teicher et al., 2002). The frontal lobes of the brain, specifically the pre-frontal cortex, which is responsible for impulse control and decision-making, work to monitor the stress response, ensuring that the individual is making the best decision in response to the perceived threat (Pickens & Tschopp, 2017). This whole process is part of what the National Scientific Council on the Developing Child at Harvard University (2014) identifies as the stress response: how the body responds to stressors. Developing the skills to cope with mild or moderate stress is a significant part of healthy child development, as all individuals will likely encounter situations throughout their life that will elicit stress. Not all stress is destructive; stressful events can be bearable and even advantageous depending on a variety of factors. Duration, frequency, intensity, timing, and context (whether it’s controllable, and a supportive adult is involved) all play a role in determining the impact the stressful experience will have on an individual (National Scientific Council on the Developing Child, 2014).

The National Scientific Council on the Developing Child (2014) proposes a taxonomy of three types of stress responses: positive, tolerable and toxic. The positive stress response is the

physiological state that is short and mild-moderate in scale. The physical response includes a brief increase in heart rate and slight changes in the body's stress hormone levels. This stress is an ordinary part of life and discovering how to adjust and manage is an important part of development. An essential component of positive stress is the presence of a caring and responsive adult who helps the child handle the stressor and learn how to control and manage well. When a caring adult is providing support, stressors such as getting an immunization, entering a new daycare setting, or dealing with frustration all can be positive stressors and provide an opportunity for a child to develop the capacity to cope with stressful situations later in life well (NCSD, 2014).

Tolerable stress is a more severe stress response that is associated with non-normative experiences that raise a larger threat and has the potential to negatively impact the architecture of the growing brain (Shonkoff & Garner, 2012). Tolerable stress response could occur after a family member dies, a severe illness or injury, divorce of parents, or a frightening accident; but always in the context of continuing and supportive relationships with caring adults. This buffering protection from the supportive adult reduces the risk that the circumstance will produce the extreme and extended activation of the stress response system. These adult relationships help develop and grow the child's adaptive coping skills, their sense of control and encourage a return to baseline status (National Scientific Council on the Developing Child, 2014).

The third and most dangerous stress response is called toxic stress, which results in intense, frequent or lengthy activation of the body's stress response system. Stressful experiences that are chronic, uncontrollable and/or experienced without the buffering protection from supportive adult relationships often produce the toxic stress responses. When a threat or stressor overwhelms an individual, their limbic system may keep the stress response activated at a high

level, which interferes with the frontal lobes' ability to operate, contributing to a constant mental state of survival mode (Pickens & Tschopp, 2017). Toxic stress can impact developing brain architecture (Shonkoff, Boyce & McEwen, 2009; Teicher et al., 2002), as well as disrupt organ and metabolic systems (Flaherty et al., 2013; Shonkoff & Garner, 2012). These disruptions can result in anatomical changes and physiologic dysregulations that are possible precursors for later learning and behavior difficulties and are possible roots of physical and mental illness (Bethell, Newacheck, Hawes, & Halfon, 2014; Shonkoff & Garner, 2012). Risk factors for toxic stress in childhood include neglect, abuse, extreme poverty, family violence, substance abuse, and parental mental health problems (Shonkoff, Boyce & McEwen, 2009). The risk factors in the original ACE study by Dr. Vincent Felitti, Dr. Robert Anda and colleagues (1998) include many of the aforementioned stressors (child abuse or neglect, parental substance abuse, maternal depression) that are capable of invoking a toxic stress response, linking toxic stress and adverse childhood experiences (ACEs).

**Toxic Stress and the Developing Brain**

The early childhood brain is at an amazing stage of its life. From birth to age 5, the brain is rapidly growing and developing, making this a critical time period for opportunity and also great vulnerability (Jimenez et al., 2016). In 2007, the National Scientific Council on the Developing Child at Harvard University published a paper about early experiences and how they shape brain architecture. The authors argue that the quality of a child's early environment and accessibility of appropriate and nurturing experiences is vital in shaping the strength or weakness of the brain's architecture. These factors, in turn, impact how well the child is able to think and regulate emotions. Hence, healthy, stimulating and positive experiences result in brain architecture that operates at its full genetic potential, and children who are more likely to thrive and grow up to be

healthy, contributing adults (Shonkoff & Garner, 2012). Similarly, persistent adversity leads to weakened brain architecture with decreased capabilities (National Scientific Council, 2007; Shonkoff & Garner, 2012; Teicher et al., 2002).

During early development, the brain is especially malleable (plastic), and although the brain can adapt and change throughout its life, this process becomes more difficult with age (National Scientific Council, 2007). Neuroplasticity is the method in which our brains are shaped and adapted by experiences. In children under five, two significant processes are underway: synaptic plasticity (strength of synapses or connections between brain cells) and cellular plasticity (the number of connections between brain cells). Because of this plasticity, the fetal, infant and early childhood brain are vulnerable to environmental and chemical influences (Shonkoff & Garner, 2012).

One important environmental and chemical influence is toxic stress. Many studies have shown that persistently elevated levels of stress hormones can disrupt developing brain architecture (Cowell et al., 2015; Davidson & McEwen, 2012; Shonkoff & Garner, 2012; Teicher et al., 2002). The neural circuits for coping with stress are especially malleable (plastic) during fetal and early childhood periods; how easily these circuits are activated, and how they are controlled and shut off are molded by early experiences. Toxic stress experienced during this early and critical period affects the brain's circuits and hormone responses in a way that shapes an overly reactive or "slow to shut down" stress response system. One example of how this manifests itself in children who experience toxic stress is that children may feel threatened by or respond quite impulsively to situations where no actual threat is present (Loman & Gunnar, 2010).

Dr. Mary Teicher of Harvard Medical School and colleagues (2002) examined the developmental neurobiology of childhood stress and trauma from maltreatment. Childhood maltreatment is a common adverse experience (ACE) that causes early exposure to stress, which can program the individual to display enhanced stress responsiveness. Exposure to intense or persistent stress during childhood can have a huge impact on the development of the brain's structure and function because it's happening during a time period where the brain is going through an enormous number of changes. The brain contains billions of neurons and trillions of synaptic connections. A person's genetics order the basic architecture of the brain, but genetics alone do not determine everything, like the specific wiring of every neural connection. The human brain is intended to be molded into its more final formation with all of its connection patterns through early experiences. Much of this happens in the first few years of life; in fact the brain triples in mass from birth to age 5 (Teicher et al., 2002).

Because so much is changing in the brain in its early years of development, Dr. Mary Teicher and colleagues researched two topics in this study. The first was the effect of early experience on the development of the brain at molecular, cellular and behavioral levels. The second was the effects of childhood maltreatment on neuromorphology (nervous system formation, structure, and shape), functional brain activity, and neuropsychiatric health (mental health and diseases related to diseases of the nervous system). They initially hypothesized that early stress induced a number of alterations in typical brain development, equating early stress as a toxic agent that hampered with the normal progression of development. This influence would produce an altered and impaired brain.

These researchers found, through use of electroencephalography (EEG) data and imaging, that the brain indeed developed along an alternate pathway when exposed to early and toxic

stress. Researchers examined adults who had been exposed to childhood trauma and who had a current diagnosis of PTSD or dissociative identity disorder. They found specific physical differences included the reduced volume of the left section of the hippocampus, which influences memory storage and retrieval and increases an individual's likelihood of developing generalized anxiety and panic disorders. Another change occurred in the amygdala in its size and activation; this impacts memory of emotions, fear conditioning, control of aggressive, oral and sexual behaviors, and regulation of the fight-or-flight response. Other examples included: reduced size of the corpus callosum (causing weakened communication between the two hemispheres of the brain and decreased hemispheric integration), and altered development of the prefrontal cortex (executive functioning skills). These changes have been known to lead to an increased risk for mental health concerns such as depression, PTSD, and ADHD (although early abuse produces brain changes that mimic key aspects of ADHD) (Teicher et al., 2002).

Upon studying these impacts of stress, researchers re-evaluated their initial view. They proposed that rather than the brain being "damaged" by exposure to early and severe stress, it had developed along a *stress-responsive pathway*. The brain is very adaptable and complex; it is designed to be shaped and molded through life experiences. Throughout the human species, intense stress has been a part of early life experience; thus the changes observed in brain development brought on by these stressors are not just forms of damage because the brain was too weak or not able to cope with the physiological stress response. Instead, the brain is adaptively coping by following an alternate developmental pathway. The purpose of these modifications is to help the individual manage high levels of stress or deprivation, which they can expect to encounter throughout their whole life. The brain is selecting an alternative developmental pathway that will best match the wiring and configuration to the environment

that, based on early experiences, it expects to survive and reproduce in (Teicher et al., 2002). For example, imagine a child being born into a malicious and stress-filled environment. It is going to be extremely important that he is able to maintain a constant state of alertness and suspiciousness that will allow him to sense threats or danger. He will need to be able to quickly enable fight-or-flight response and react aggressively without hesitation to survive. This reframes the observed brain changes as adaptations to promote survival. The changes in the amygdala and limbic irritability fosters flight-fight response and aggressive defense; the hippocampal changes produce a more powerful stress response. Diminished hemisphere maturation, reduced corpus callosum size and weakened hemisphere integration enhances a person's ability to quickly and dramatically change into powerful, angry and aggressive states when threatened with danger or loss. On the one hand, these adaptations are made to help an individual survive; on the contrary, they are not ideal for survival in a more neutral environment. Over long periods of time, this can put an individual at increased risk for disease, social isolation, hostility, depression, and substance abuse (McEwen, 2002).

Pediatricians Dr. Jack Shonkoff and Dr. Andrew Garner (2012) confirmed Dr. Mary Teicher's findings of the impact toxic stress has on developing brain architecture. Additionally, they found that chronic stress, caused by significant adversity (like childhood maltreatment, ACEs, and trauma), can lead to loss of neurons and neural connections in the hippocampus and prefrontal cortex. Functional consequences of this lead to increased potential for fear and anxiety, hyper-responsive or chronically activated physiologic stress response, less top-down control (executive functioning), and impaired memory and mood control. Overall, Shonkoff and Garner were so moved by their findings on stress's impact on the developing brain that they urged a paradigm shift for the entire field of pediatrics, suggesting that many adult diseases are

in fact developmental disorders that begin in early life. They urged colleagues to develop effective strategies to reduce the early childhood adversities that lead to lifelong impairments in learning, behavior, and health (Shonkoff & Garner, 2012).

**Complex Trauma**

The National Council of Juvenile and Family Court Judges defines trauma as "an event that is experienced by an individual as physically or emotionally harmful because the individual perceives his life or the life of someone he loves as threatened" (Pickens & Tschopp, 2017, p. 1). Some examples of trauma include community violence, domestic violence, neglect, physical abuse, sexual abuse, psychological maltreatment, natural disaster, serious medical illness, loss of loved one, and terrorism. The National Child Traumatic Stress Network describes three broad categories of trauma: acute, chronic and complex. Acute trauma refers to a single incident (serious accident, natural disaster, crime victim, etc.). Chronic trauma is repeated and prolonged exposure (domestic violence, abuse, war, etc.) Complex trauma refers to a child's experience of numerous traumatic events that are happening inside of their caregiving structure, the social environment that is to theoretically be a source of security and stability for a child. Usually, complex trauma exposure refers to simultaneous or consecutive incidences of child maltreatment (emotional abuse, neglect, sexual abuse, physical abuse, witnessing domestic violence) that are chronic and start in early childhood (Cook et al., 2003). Complex trauma has the twofold problem of a child's exposure to a traumatic event along with the immediate and long-term impact this exposure has on the child (Cook et al., 2003). Additionally, the negative impact that comes from that initial traumatic experience, such as emotional dysregulation, loss of a safe base, and inability to detect or respond to danger cues, frequently leads to succeeding trauma exposure (physical and sexual abuse, community violence, etc.) and cumulative impairment

(psychiatric and addictive disorders, chronic medical illness, etc.) (Cook et al., 2003; Cook et al., 2005).

**Connecting Adverse Childhood Experiences, Toxic Stress, and Complex Trauma**

The original ACE study done by Dr. Feletti and colleagues (1998) examined seven categories of traumatic experiences: psychological, physical, or sexual abuse; violence against mother; or living with household members who were substance abusers, mentally ill or suicidal, or ever imprisoned. Much research has been done since 1998 surrounding the concept of adverse childhood experiences, and further categories of traumatic experiences have been included. Depending on the study or organization, traumatic experiences also include verbal abuse, physical neglect, emotional neglect, and parental separation or divorce (About the CDC-Kaiser ACE study, n.d.; Adverse childhood experiences, 2017). All of these traumatic experiences (also often referred to as childhood maltreatment), qualify as complex trauma: they are chronic and/or happening within the caregiving structure. When a child experiences trauma, their brain, and body exhibit a physiological stress response (National Scientific Council on the Developing Child, 2014; Shonkoff & Garner, 2012; Teicher et al., 2002). Complex trauma is chronic. Therefore the child experiences a severe, frequent or extended activation of the body's stress response system – this is toxic stress. When a child's brain and body remain in this heightened state of stress due to ongoing adversity, this impacts brain development and other aspects of overall health and well-being (Burke et al., 2011; Hunt, Slack & Berger, 2016; Pickens & Tschopp, 2017; Teicher et al., 2002). Therefore, adverse childhood experiences are complex traumatic events that can cause a toxic stress response, which impacts a child's development.

A 2017 study conducted by Brown, Rienks, McCrae, and Watamura examined the extent to which experiences of adversity and different types of maltreatment co-occur in this vulnerable

group of children. This study was conducted in hopes of better understanding, identifying needs and tailoring practices to meet these needs of maltreated children. This study used cross-sectional data collected from caregivers, children, and caseworkers from the National Survey of Child and Adolescent Well-Being. The sample for this study was 5870 children, birth to age 18, who were investigated for child maltreatment, including those cases where maltreatment was found and those where maltreatment was not found. The sample was divided into four groups based on development: infants (birth – 23 months), preschool ages (2 – 5 years old), school age (6 – 10 years old), and adolescents (11 – 18 years old). Data obtained from this survey were used to provide indicators of exposure to ten ACEs (physical neglect, emotional neglect, physical abuse, sexual abuse, emotional abuse, caregiver treated violently, caregiver mental illness, caregiver divorce/family separation, caregiver incarceration).

Given that the sample included a highly vulnerable population (children investigated for maltreatment) the number of children with ACE exposure was significantly high. Therefore, when researchers grouped children into classes, each class included children with at least one ACE. Based on the data from children, caregivers and caseworkers, the most common reported ACES for infants were: caregiver divorce (63%), caregiver substance abuse (57%), caregiver treated violently (47%) and neglect (46%). For preschool age children, most common ACES included: emotional abuse (65%), caregiver divorce/separation (54%) physical neglect (53%) and caregiver treated violently (50%). For school-age children, most common ACEs were: emotional abuse (70%), caregiver divorce (59%), physical neglect (53%) and caregiver treated violently (43%). For adolescents, most common was emotional abuse (83%), caregiver divorce/separation (65%), physical neglect (56%) and physical abuse (51%). Overall results of this study show that these sample children experienced multiple forms of maltreatment in

addition to other forms of early adversity. Researchers performed a statistical analysis to create "classes" that grouped children together with similar exposure and data at like developmental levels. For example, infants were grouped into three classes; class 1 included physical neglect, emotional abuse, and caregivers who were treated violently, meaning every infant in this group experienced not only physical neglect but also emotional abuse and had a caregiver that was treated violently. At the preschool level this class of children was exposed to the same core ACEs, but by the school age level, this class also included higher exposure to emotional neglect. Across developmental levels, children tended to be clustered based on three groupings of ACEs. First, physical neglect, emotional abuse, and caregivers who were treated violently co-occurred; the authors linked this with earlier research that connected domestic violence in the home to an increased risk for child maltreatment (English, Thompson, White & Wilson, 2015). Second, clusters were formed based on the risk of exposure to multiple forms of family dysfunction (caregiver mental illness, substance abuse and divorce). Third, emotional abuse and caregiver divorce co-occurred in this sample; authors believed this could be related to overall poorer well-being in adults who have experienced divorce (Amato, 2014).

There has been a lot of research about maltreatment, but maltreatment is frequently defined or reduced to physical, sexual and emotional abuse/neglect (Cicchetti, Flynn & Rogosch, 2014; Cowell, Cicchetti, Rogosch & Toth, 2015; Mezzacappa, Kindlon & Earls, 2001). What this study revealed is that many of these children also experience a number of other adverse experiences, which may be why there is such negative impact found from childhood maltreatment. Overall, this study warrants much further research but also reveals several implications for those working with youth who may have experienced maltreatment. This classification of children into groups offers insight into the complexity of early adverse

experiences and could guide improvements in practices that meet the needs of these vulnerable children and families. In general, this study exposes us to the possibility of "vulnerable" children being exposed to multiple co-occurring forms of adversity, which further confirms the connection between ACEs, complex trauma, and toxic stress, and exemplifies the importance of understanding how this impacts a child's development.

**Domains of Complex Trauma**

In 2005, Dr. Alexandra Cook and colleagues completed a comprehensive review of the literature surrounding complex trauma. They reviewed research surrounding the immediate and long-term consequences of childhood exposure to maltreatment and other traumatic experiences. Researchers found seven primary domains of impairment that are observed in exposed children, which have been adopted by the National Child Traumatic Stress Network: attachment, biology, affect regulation, dissociation, behavior regulation, cognition and self-concept (Cook et al., 2003, Cook et al., 2005). This impairment is considered to happen during development, which impacts later life. Complex trauma exposure results in damaged core abilities for self-regulation and interpersonal relatedness (Cook et al., 2005). When a child is young, their caregiver's ability to self-regulate helps them regulate bodily and behavioral responses through a process called "co-regulation." This contributes to the attainment of self-regulatory capabilities. The absence of sustaining regulation with a primary caregiver puts a child at increased risk for insufficient development of the ability to self-regulate physical and emotional states (Schore, 2002). This problem extends from childhood into adolescence and adulthood. Children exposed to complex trauma such as maltreatment, family violence or loss of caregivers often meet diagnostic criteria from the *Diagnostic and Statistical Manual for Mental Disorders*, fifth edition *(DSM V)* for not only posttraumatic stress disorder (PTSD), but also depression, attention-deficit/hyperactivity

disorder (ADHD), oppositional defiant disorder (ODD), conduct disorder, anxiety disorders, sleep disorders, communication disorders and reactive attachment disorder (Cook et al., 2005).

**Attachment**. The first domain of impairment is attachment. Early relationships with caregivers provide a context in which a child can grow their earliest model of self, others, and self in relationship to others. These models form a base upon which a child grows many developmental capabilities, including a sense of agency, distress tolerance, curiosity, self-regulation, and expressive and receptive communication (Cook et al., 2005). When the child-caregiver relationship is a source of trauma, this healthy development of an attachment relationship is greatly impacted. Of children who experience maltreatment, 80% of them develop insecure attachment patterns (Cook et al., 2003). When children cannot rely on their caregiver to be responsive to them, they become distressed easily and have difficulty collaborating and interacting with others because their own internal resources are inadequate. When attachment is disrupted, a child will be at risk for increased susceptibility to stress, inability to regulate emotions without external assistance, and altered help-seeking behaviors (excessive help-seeking/dependency or social isolation). Other symptoms of impairment in attachment include problems with boundaries, distrust and suspiciousness, and difficulty with perspective taking (Cook et al., 2005).

**Neurobiology**. The second domain of impairment is biology, specifically neurobiology. The brain is designed to be molded not only by genetic information but also by external stimuli (Cook et al., 2003; National Scientific Council, 2007; Shonkoff & Garner, 2012; Teicher et al., 2002). Because of this and the fact that the early child brain is rapidly growing and developing between birth and age 5 (Jimenez, 2016; Teicher, et al., 2002), trauma experienced during this time period has significant impacts on brain development (Cook et al., 2003; Cowell, Cicchettti,

Rogosch & Toth, 2015; Davidson & McEwen, 2012; Shonkoff & Garner, 2012; Teicher et al., 2002). Because complex trauma likely causes a toxic stress response, the effects of toxic stress on the developing brain occur when a child experiences complex trauma. Additionally, during toddlerhood and early childhood, there is a slow shift from primarily relying on the right hemisphere (the feeling and sensing part of the brain), to more left hemisphere dominance (thinking, reasoning, language, long-range planning) (Cook et al., 2003; De Bellis et al., 2002). A child slowly learns how to orient to both what's happening externally, and what they are thinking internally. They aren't simply responding reflexively to the stimulus, they start to think and then react. Stress and trauma interfere with left and right hemisphere integration. When a child has not fully developed this integration, they may respond in "irrational" ways to stress, acting out of their emotional right brain, more than their analytical left brain, and responding with extreme helplessness, confusion, withdrawal and rage (Cook et al., 2003; Teicher, et al., 2002).

**Affect regulation**. The third domain of impairment from complex trauma is in the area of affect regulation, which is due to difficulty with self-regulation from impairment of attachment and neurobiological development. Affect regulation is the ability to identify internal emotional experiences. In order to perform this skill, an individual needs to be able to distinguish between states of arousal, understand these states, and apply suitable labels (happy, scared, etc.) (Cook et al., 2005). Predictable responses from caregivers to a child's needs provides a framework for the child to begin to differentiate emotional experience and responses. Children learn to interpret non-verbal cues through pairing others' affective expressions with behaviors (Beeghly & Cicchetti,1994; Cook et al., 2003). When children are provided with inconsistent models of affect and behavior (e.g., laughter and smiles paired with rejection behavior or violent behavior),

or with inconsistent response to affective display (e.g., child's anguish is not met with nurture, but rather with rage, neglect or neutrality), there is no framework to interpret experience. Therefore, children struggle to differentiate between and label different affective states (Beeghly & Cicchetti,1994; Cook et al., 2003). Additional symptoms of impairment in affect regulation include difficulty communicating wishes and needs and problems knowing and describing internal states.

**Dissociation.** The fourth impairment from complex trauma is in the area of dissociation. Dissociation is a significant piece of complex trauma in children and is defined by Dr. Cook as "failure to integrate or associate information and experience in a normally expectable fashion" (2005, p. 394). Hence, thinking and emotions are separated, bodily sensations can be outside conscious awareness, and repetitive behavior can take place without realization. Dissociation starts as an attempt at protection, but in the realm of devastating and overpowering trauma, can become a problematic disorder (Cook et al., 2003).

**Self-concept.** The fifth impairment is in a child's self-concept. The development of a sense of self is largely influenced by early caregiver relationships. As a child grows and develops, they develop their sense of identity. Positive life experiences and responsive, sensitive caretaking allow the child to develop a sense of self that is largely worthy and competent (Cook et al., 2003). However, in contrast, when a child does not have these positive experiences but rather experiences harm and/or rejection by significant people in their life, they fail to develop this positive sense of self and instead view themselves as ineffective, helpless, deficient and unlovable. These children are also more likely to expect rejection and disapproval from others, more likely to view negative experiences as their own fault, and have problems asking for and responding to help and support from others (Cook et al., 2005).

Cicchetti, Flynn, and Rogosch (2014) examined the impact of childhood maltreatment on contribution to low self-worth, low relationship quality and externalizing and internalizing behavior symptoms during early to late adolescence. Maltreatment in the caregiving structure impacts the child greatly by disrupting the environment that they go to for their basic need of security and protection; this communicates to children that they lack value and worth. Researchers hypothesized that childhood maltreatment would predict low self-worth, low-quality relationships with mothers and peers, and internalizing and externalizing symptoms. Six hundred thirty-five youth participated in this multi-wave investigation on the developmental results of childhood maltreatment. The sample included 407 maltreated youth and 228 non-maltreated youth; 376 of these participants were male, 259 were female. In this study, childhood maltreatment involved abuse (physical, sexual and emotional) and neglect by a child's caregiver or another responsible adult, and was identified by the Department of Human Services. The youths from the group that was identified as non-maltreated represented low-income families from a demographically comparable area. Youth were assessed three times, the first wave between ages 7 – 9, the second wave at ages 13 – 15, and final wave at 15 – 18.

The adolescents were given a variety of assessments including self-report questionnaires on self-worth, maternal and peer relationship quality and internalizing and externalizing behavior symptoms. Self-worth was assessed through the Self-Perception Profile for Adolescents and was completed during the second and third wave. This measured participants' holistic perception of personal value and overall competence. Relationship quality was measured through the Inventory of Parent and Peer Attachment during the second and third wave. This measured maternal and peer relationship quality through a self-report questionnaire on perceptions of these relationships in the area of mutual trust, quality of communication and extent of anger and alienation.

Symptomatology was assessed through the Youth Self Report, measuring internalizing (anxious, depressed, withdrawn, somatic complains) and externalizing (aggressive and rule-breaking behavior) symptoms.

Differences between maltreated youths and non-maltreated youths were examined, and results of this study revealed, as predicted, that childhood maltreatment predicted low self-worth, low relationship quality and internalizing and externalizing behaviors in adolescents. Maltreated youth were more likely to develop feelings of worthlessness and inadequacy about themselves, have more anger, reduced trust and poor communication in maternal relationships, and experience internalizing symptoms (like anxiety and depression) and externalizing symptoms (Flynn, Cicchetti & Rogosch, 2014). Researchers identified strengths of this study as longitudinal data from children, ethnically diverse sample, and a strict and sophisticated analytic approach was used to simultaneously measure multiple consequences of childhood maltreatment over time. Limitations included: unexamined demographic characteristics like caregiver education level and household size which may have influenced results and data which were obtained through self-report questionnaires – and authors suggest further research should be done to converge methods (behavior observation, parent input, teacher input, etc.). Overall this study confirms prior research that describes early, chronic, severe and co-occurring maltreatment subtypes as factors that produce long-term personal, interpersonal and psychological problems (Cicchetti & Rogosch, 2012; Shonk & Cicchetti, 2001).

**Behavior regulation.** The sixth domain of impairment is in the area of behavior regulation. Impact on behavior regulation from complex trauma is manifested in both under controlled and over controlled behaviors (Cook et al., 2005). This is due to a variety of factors but may represent a child's defensive adaptation to the overwhelming stress from the traumatic

experience. For example, a child may re-enact certain aspects of their trauma (aggression, self-injurious behaviors, controlling relationship dynamics, etc.) as an unconscious stress reaction to a reminder of the trauma; behaviors may be an attempt to gain some form of control, evade unbearable levels of emotional arousal, or an attempt to attain acceptance and intimacy (Cook et al., 2005). Oftentimes youth experiencing trauma are in an unstructured and unsafe environment; this not only increases their likelihood of further exposure but also contributes to their development of survival coping strategies, which provide an immediate sense of security or escape (Pickens & Tschopp, 2017). These strategies are a byproduct of a survival mindset that a child develops in an attempt to manage the traumatic stress; they believe that these behaviors are the best way to maintain safety. Examples of these include aggressive behavior, substance abuse, self-harm behavior, over-sexualized behavior, regressive behavior, and feeling excessively depressed or anxious. The combination of the traumatic stress behavioral reaction and survival coping strategies often reflect dysregulated behavior (Pickens & Tschopp, 2017).

Because toxic stress and trauma is also associated with disrupted development of the pre-frontal cortex (Shonkoff & Garner, 2012; Teicher, 2012), deficits in executive functioning skills of the brain (planning, organizing, working memory, flexible thinking, inhibition control, etc.), often exist in children who have experienced trauma (Cook et al., 2003; Kim-Spoon, & Deater-Deckard, 2016; McClelland et al., 2007, Mezzacappa, Kindlon & Earls, 2001). One consequence of this is an increase in impulsive responses, like anger and aggression.

Ford and colleagues (2000) wanted to determine if there was an association between PTSD symptoms from trauma and impulse control disorders like Attention Deficit Hyperactivity Disorder (ADHD) and Oppositional-Defiant Disorder (ODD). Youth ages 6 – 17 who were admitted to Dartmouth Hitchcock Medical Center outpatient child psychiatry clinic were

screened for enrollment in this study; a total of 165 participated. Researchers selected participants with a diagnosis of ADHD, ODD or adjustment disorder, who also had data concerning trauma and PTSD symptoms. Researchers excluded participants from the study if other significant psychiatric disorders were diagnosed (bipolar disorder, severe obsessive-compulsive disorder, etc.,). Parents and children completed interviews and behavior checklists (Child Behavior Checklist, PTSD Checklist for Children-Parent Report, Traumatic Events Screening Inventory) regarding behavior problems, social competence, and posttraumatic stress symptomatology. Results revealed that early trauma was significantly associated with the development of impulse control disorders, like ADHD, ODD and adjustment disorders (Ford et al., 2000). Trauma exposure was also linked to elevated PTSD symptoms for Children with ODD, ADHD and adjustment disorders. These findings suggest that many children with disruptive behavior disorders have potentially experienced traumatic maltreatment and have been facing undetected PTSD.

In 2001, researchers Mezzacappa, Kindlon and Earls examined executive functioning in 126 boys ages 6 – 16, through a series of performance tasks. All of the boys attended either public schools or private therapeutic schools for children with emotional and behavioral problems. Of the 126 boys, 25 were classified as therapeutic abused, 52 as therapeutic non-abused, and 48 as public school. Researchers compared these three groups using observations of behavior during testing, teacher ratings of behavior, and performance tasks which addressed their ability to inhibit an act in progress and avoid responses associated with negative consequences – two abilities requiring executive functioning skills. The authors looked at differences in symptoms, behaviors and task performance. On the task performances, children with histories of abuse, despite increasing age, exhibited significantly lower abilities to avoid responses that were

associated with adverse consequences; they showed lower levels of impulse control. Findings indicated that child abuse negatively impacts the expected developmental progress of certain executive functions, which can have implications for the development of poor self-control.

Researchers Hunt, Slack, and Berger (2017) examined the relationship between ACE exposure in early childhood (prior to the age of 5) and the prevalence of behavior problems overall in children in middle childhood by the age of 9. They hypothesized that there would be a positive relationship between ACE exposure and behavioral problems (both internal and external). Researchers used data from the Fragile Families and Child Wellbeing Study (FFCW) in 1998 – 2000. Nearly 5,000 children and families participated in this study. Interviews were conducted within 24 hours of child's birth, then again via phone at age 1, 3, 5 and 9. In-home family interviews were also conducted at ages 3, 5 and 9. Eight categories of adverse childhood experiences (emotional neglect, physical neglect, emotional abuse, physical abuse, parental domestic violence, parental anxiety or depression, and parental substance abuse or incarceration) were examined and ACE exposure prior to the age of 5 was evaluated. Interviewers recorded the presence of behavior problems, both internalizing behaviors and externalizing behaviors. Authors then examined whether early childhood exposure to ACEs would predict behavior problems at age 9 and whether increasing counts of ACEs were associated with increases in behaviors.

Hunt and colleagues found that there was a strong association between exposure to childhood adversity and the amount of externalizing and internalizing behavior displayed by the child at the age of 9. Of the two types of behaviors, this study found on average a stronger association between ACE exposure and externalizing behaviors, than internalizing behaviors. They also found that when examining clinical levels of behaviors, children with an ACE score of

three or higher were more likely to display behaviors that warranted professional attention, compared to children with an ACE score of 2 or lower. A similar pattern was observed for ADHD diagnosis. Each additional ACE was associated with greater odds that a child would have an ADHD diagnosis when compared to children with 0 ACEs. The authors also examined the individual influences of each adverse experience and its predicting outcome. All ACEs had some influence on a least one behavioral outcome. Although some ACEs were found to have larger associations with certain behavioral outcomes than others, the association between each ACE and an outcome was not as large as the association found between cumulative ACEs and behavioral problems. These findings suggest that children with ACE exposure are more likely than those without, to exhibit both internalizing and externalizing behaviors.

A study conducted in Finland in 2013 by researchers Isohookana, Riala, Hakko and Rasanen examined the association of adverse childhood experiences to suicidal behavior and mortality in 508 Finnish adolescents (ages 12 – 17) who needed critical psychiatric hospitalization between April 2001 and March 2006. The adolescents were interviewed during their time at the hospital by physicians using the Schedule of Affective Disorder and Schizophrenia for School-Age Children Present and Lifetime, to assess DSM-IV criteria for psychiatric diagnoses and suicidal behavior (suicidal ideation, non-suicidal self-injury (NSSI) and suicide attempts). Data regarding ACEs, such as domestic violence, and parents' divorce, death, employment status, psychiatric and substance-related problems were obtained through the European Addiction Severity Index.

The associations found between suicidal behavior and ACEs in all areas were not statistically significant for boys. However, results for girls revealed a strong link between exposure to sexual abuse and an increased risk of NSSI and suicide attempts. Of the girls with

NSSI, one in three had been a victim of sexual abuse, and more than half had been exposed to parental divorce. The cumulative number of ACEs was linked with an increased risk of NSSI and suicide attempts in females. Overall these findings contribute to the literature and research surrounding the negative impacts and associations of ACE exposure and adverse health outcomes.

**Cognition.** The final domain of impairment from complex trauma is in cognition. Since brain development is at a peak during infancy and early childhood, it's predictable that stress and trauma experienced during this time period would impact developing brain architecture, and thus a child's cognitive functioning. There are also many factors that influence and vary the impact these experiences have on children.

Researchers Cowell, Cicchetti, Rogosch and Toth (2015) discovered that the timing and chronicity of the maltreatment is an important varying factor. Researchers examined the effects of childhood maltreatment on neurocognitive functioning based on the developmental timing of the maltreatment (onset, chronicity, and recency). In upstate New York, they conducted a study with a sample of children ages 3 – 9, including 228 maltreated low socioeconomic status (SES) children and 142 non-maltreated low SES comparison children. These children completed 10 different tests that measured inhibitory control, working memory, attention and motor control. This study revealed that maltreated children, on average, performed more poorly than non-maltreated children on inhibitory control and working memory tasks, two cognitive functions that are very important for the development self-control.

Cowell et al. (2015), also discovered that children who were maltreated during infancy had significantly worse performance than those who were mistreated later in life, eluding to the idea that timing of adversity matters in the development of self-control. The authors pointed out

that maltreatment in infancy provides a clear example of early life stress and its negative impact on a child's brain development. The chronicity of the maltreatment was also studied. Children who experienced maltreatment during a single period of development performed similarly to non-maltreated peers. However, children who experienced chronic maltreatment (3+ periods of development) performed significantly worse. Overall, onset and chronicity of maltreatment play an important role in the early development of inhibitory control and working memory, two important cognitive functions that influence a child's performance in and outside of the classroom (Cowell et al., 2015). Because cognitive functioning is greatly related to academic performance in school-age children, this domain will be examined in greater depth in the following section.

Conclusively, the impact that these impairments have on a child extends into all environments of their life: home, school, work, and relationships with family, peers, friends strangers, co-workers, etc. The next section will examine further how these adverse and traumatic experiences manifest themselves in youth in the classroom. Whether it's a child with an elevated ACE score, a maltreated child, a child who's been through trauma, or a child with a stressful and difficult home life, whatever the label may be, these children are sitting in classrooms with adults who have the potential to make a positive or negative impact. It is imperative that adults recognize and understand what the effects of trauma may look like.

**Adverse Childhood Experiences, Toxic Stress, and Trauma: Impact on School Performance**

Complex trauma can manifest itself in the classroom in countless ways. The range of student responses to trauma varies greatly based on individual and environmental factors. Some youths handle and recover from traumatic events more quickly and with minimal adverse

reactions because they have a variety of individual and environmental protective factors in place. Examples of these factors include problem-solving and stress management skills, connection with health support system, family modeling healthy response to stressful events, preserved feeling of control, and access to mental health resources (Pickens & Tschopp, 2017). These factors can help bring the child a sense of safety and foster resilience, which is the ability to remain intact after challenging life experiences (Meichenbaum, 2006). However, for many youths, these support systems are not in place, and their ability to manage stress healthfully becomes compromised (Willis & Nagel, 2015). Various situations that were formerly manageable now induce feelings of being physically or emotionally unsafe. The school environment presents itself with several opportunities that can trigger a traumatic stress reaction – or an extreme response to a supposed threat (Pickens & Tschopp, 2017). School can become a place that feels unsafe, where students feel unsupported and afraid and will significantly struggle throughout their academic life in their overall performance and experience with school.

Bearing in mind the different domains of impairment from complex trauma, consider, for example, a student who, due to complex trauma did not develop a positive and competent self-concept. This student is going to be more likely to view themselves as incapable and powerless. Academic tasks may be seen as simply too difficult and unmanageable. Because this student is more likely to expect rejection and disapproval, he or she may struggle to ask for or accept help from adults or peers. Consider another student who was born into a malevolent and stress-filled home. Based on experiences growing up, it's extremely important for this child to be in a constant state of heightened awareness and suspiciousness that allows him to sense any danger. He needs to be able to quickly enable fight-or-flight response and react aggressively without hesitancy when threatened with danger or loss. Now place this student in a more benign

environment at school. For the student, the real threat of danger at school may be less, but his ability to distinguish between a real and perceived threat, through the use of executive functioning skills, is impaired because his stress response system is frequently activated. These responses don't go away, but they may be labeled as behavior problems.

In 2001, researchers Shonk and Cicchetti studied maltreatment and its impact on children's academic and behavioral adjustment in school. They predicted that maltreatment experienced during infancy, toddlerhood, and preschool would negatively impact academic and behavioral adjustment in school, due to deficits in academic engagement, social competencies, ego resiliency and ego control. Two hundred twenty-nine socially disadvantaged children, ages 5 – 12, participated in this study. The sample included 146 children with histories of maltreatment, as documented by Child Protective Services (CPS); maltreatment status was determined by documentation of abuse and/or neglect. The remaining 83 children were from demographically equivalent, low socio-economic-status backgrounds, with no documented maltreatment; these participating families were all on the county's welfare program. Data collected for this study came from school assessments and records and teachers' comprehensive evaluations, as well as camp counselors ratings from a week-long summer day camp.

Data were collected and evaluated in the areas of academic engagement, social competencies, ego resiliency, ego control, academic maladjustment and behavior maladjustment. Academic engagement was referred to as the "internal motivation to engage, shown by self-initiated, regulated and persistent mastery of skills for competence and self-directed behaviors like paying attention and completing assignments" (Shonk & Cicchetti, 2001, p. 3). This was measured by teacher ratings on various assessments including the Teacher's Rating Scale of Child's Actual Behavior, Teacher's Rating of Perceived Competence, and Teacher's Rating

Scale of Child's Classroom Orientation. Social competencies, or the skills and abilities to form relationships and interact constructively, were measured through the Taxonomy of Problematic Social Situations for Children, Teacher's Checklist of Children's Peer Relationships and Social Skills, and Teacher Rating Scale of Child's Actual Behavior. The Five-Flab at Risk Classification Index was used to measure academic maladjustment. This assessment measures the following high-risk conditions in school: being retained for one or more grades, yearly school attendance below 80% in one or more school years, referral for remedial or special education services, loss of two or more days due to suspension, and scores on standardized achievement tests that fall below the national standards ($37^{th}$ percentile for reading, $38^{th}$ percentile for math). To measure behavioral maladjustment, teacher and camp counselor reports of behavior problems were assessed through the Child Behavior Checklist, which examined internalizing behaviors (e.g., "too fearful or anxious," "feels worthless or inferior"), and externalizing behaviors (e.g., "gets in fights," "doesn't feel guilty after misbehaving,"). Ego resilience and ego control were considered as general indicators of personality functioning. Ego resilience was referred to as "the flexibility of impulse control that enables one to respond and regulate affect and behavior effectively" (Shonk & Cicchetti, 2001, p. 10 ). An example of high ego resiliency would be resourceful and consistent coping when faced with challenges. Ego control was defined as the ability to monitor impulses, including affect regulation, delaying gratification and anticipating consequences. Examples of low ego control include excessive inhibition of affect and impulses, or low frustration tolerance, non-compliance, and attention seeking behaviors.

The results were assessed through a series of regression analyses; the differences found between maltreated and comparison children were studied to evaluate the outcomes of academic and behavioral maladjustment, along with each of the competency components (academic

engagement, social competencies, ego resiliency and ego control). Overall, results showed that maltreated children showed increased signs of maladjustment in both academics and behavior when compared to demographically similar low SES non-maltreated children. Maltreated children had greater levels of school problems than non-maltreated children; they exhibited more grade retention, attendance of less than 80% in one school year, more referrals for and placement in special education, and at risk-achievement test scores. These same children were also more likely to exhibit higher levels of both externalizing and internalizing behavior problems, as rated by teachers and camp counselors, in both school and camp settings. Differences between maltreated children and comparison peers were found in three of the four competencies: lower academic engagement, lower social competencies, and lower ego-resiliency. Children with lower academic engagement were graded on report cards as "lacking in persistence, avoiding challenging tasks, and being overly reliant on teachers' guidance and feedback to sustain effort in the classroom" (Shonk & Cicchetti, 2001, p. 12). Maltreated children were shown to be considerably less ego resilient and more "ego brittle," meaning they had a hard time adapting to the demands of school and self-regulating after stress. Researchers connected this ego-resiliency finding to an association with the development of secure attachment, which frequently is not developed in children experiencing maltreatment (complex trauma) from parents (Cook et al., 2003; Shonk & Ciccheti 2001).

Researchers identified limitations of this study. Children identified through CPS may be inclined to be more harshly maltreated than the general population of maltreated children; it is also possible that despite efforts to confirm the comparison's group of non-maltreated status, undetected maltreatment may exist in this group which would weaken differences found. Additionally, this study was unable to determine the direction of relatedness without longitudinal

data, leading them to recommend that future research should be aimed at collecting longitudinal data. Overall, these findings indicate that the negative impact of maltreatment on children's competencies is one way that maltreatment manifests into higher levels of academic failure and behavior symptoms, which puts children at an increased risk for school drop-out and long-term social failures and psychopathology, over and above the risk acquired from poverty alone (Shonk & Cicchetti, 2001).

In 2016, Jimenez and colleagues examined associations between ACEs in early childhood and teacher-reported academic and behavioral problems in kindergarten. Data were analyzed from the Fragile Families and Child Wellbeing Study, a national, urban birth cohort. The sample size was 1007 children. Data included interviews with parents postpartum, 1, 3, 5 and 9 years after child's birth, along with in-home child assessments and educator interviews. Information was collected on ACE exposures at five years of age. The original eight ACE categories from the CDC-Kaiser study were used. Data were also gathered from the children's kindergarten teachers at the conclusion of their kindergarten year. These included teacher ratings and reports of academic skills, emergent literacy skills and behavior.

Researchers found that 55% of participants had experienced one ACE, and 12% had an ACE score of three or higher. They discovered that children with increased adverse experiences had greater chances of having below-average academic skills (literacy skills, as well as attention problems, social problems, and aggression). This places these children at an increased risk for overall poor achievement in school. An ACE score of 3 or greater was associated with below-average performance or problems in every single category studied: low language, literacy and math skills, poor emergent literacy skills, attention problems, social problems, and aggression. This study revealed that children with early ACE exposure are at increased risk for poor overall

educational achievement, which impacts multiple aspects of their future life (Jimenez et al., 2016).

McClelland and colleagues (2007) examined the relationship between preschoolers' behavior regulation and emergent literacy, vocabulary and math skills. The behavior regulation of 310 preschoolers was assessed using the Head-to-Toes Task, which taps inhibitory control, attention and working memory. Children were asked to respond to a direction like "touch your head" or "touch your toes," then were told to switch the rules by responding in the opposite way (when told to touch their head, they had to touch their toes). This task required children to integrate three behavior regulation skills: pay attention to directions, use working memory to remember a new rule, and inhibit their natural response to a test command and respond in the correct, less instinctual way. Their emergent literacy, vocabulary, and math skills were assessed on the Woodcock-Johnson Tests of Achievement.

The transition from a preschool classroom to a more structured kindergarten classroom can be difficult for many children who haven't developed basic skills to regulate behavior. In this study, behavior regulation was referred to as paying attention, following instructions and inhibiting inappropriate actions, all skills necessary for transitioning into a structured school environment. Results showed that behavior regulation significantly projected fall and spring emergent literacy, vocabulary and math skills. Even more so, development in behavior regulation predicted growth in these emergent academic skills over the prekindergarten year. These findings indicate that students who struggle with behavioral aspects of self-regulation will also struggle with early academic skills and school success (McClelland et al., 2007).

Using 2011-2012 National Survey of Children's Health (NSCH) data, Bethell and colleagues (2014) assessed the prevalence of adverse childhood experiences (ACEs),

associations between them, and factors affecting a child's development and overall lifelong health. The NSCH surveyed a representative sample of nearly 96,000 children, ages 0 – 17 from each state in the United States. Child-level surveys were conducted with parents or guardians and included nine adverse childhood experiences. Key associations evaluated included: whether a child had special health care needs, experienced specific types of chronic conditions (asthma, ADHD, obesity), demonstrated aspects of resilience, engagement in school, and repeated a grade in school. In this survey – resilience was defined as "staying calm and in control when faced with a challenge," for children ages 6 – 17 (Bethell et al., 2014, p. 2107).

As evaluated through the NSCH survey data, 48% of US children were found to have had at least one of the nine adverse childhood experiences, and 22.6% were found to have two or more. Overall, results of this study showed that children with adverse childhood experiences had lower rates of school engagement and higher rates of chronic disease. A scaled association was found between the number of ACEs experienced and the number of health problems. Children with two or more ACEs were considerably more likely to qualify as children with special health care needs. Children with two or more ACEs were 2.7 times more likely to repeat a grade in school, and 2.6 times less likely to be engaged in school, compared to children with an ACE score of 0. These children were also less likely than those without ACE exposure to demonstrate resilience, live in a protective home environment, and have mothers who were healthy and parents who were not unusually aggravated with them. They were also less likely to live in safe and supportive neighborhoods. Researchers evaluated whether resilience mitigated the impact of ACE exposure on school performance. They found that for children who had special health care needs, who had an ACE score of 2 or higher, those who had learned and demonstrated features

of resilience were 1.55 times more probable to be engaged in school and only half as likely to have repeated a grade in school, compared to those who didn't show resilience.

Given the high prevalence of exposure to adverse experiences among youths and adults in the United States, it is extremely beneficial to develop and discover effective methods for mediating the negative impact of adverse childhood experiences. Results from Bethell and colleagues' study (2014) suggest that building resilience in children can improve the negative impact of adverse childhood experiences. Researchers Bethell and colleagues (2014) advocate for the introduction and application of neurological repair methods, such as mindfulness training, and understanding the impacts that adverse experiences have on the overall health and well-being of children in the present and future. Those working with youth must be cognizant of the role that stress from trauma plays on a child's development and work to create an environment that is trauma-sensitive and aware, which helps these youth feel safe, supported and secure.

# CHAPTER III. Discussion and Conclusion

## Summary of Literature

Adverse childhood experiences have been associated with a number of different negative outcomes such as health risk behaviors, disease, behavior problems, and social, emotional and cognitive impairment (Burke et al., 2011; Cowell et al., 2015; Felitti et al., 1998; Ford et al., 2000; Flaherty et al., 2013). Research on the impact of toxic stress on the early childhood brain reveals that healthy development can be disrupted by intense and extended activation of the body's stress response system, which impacts learning, behavior and overall health (Cook, 2005; National Scientific Council on the Developing Child, 2014; Shonkoff & Garner, 2012; Teicher et al., 2002). The early brain is growing and developing at a rapid rate leaving it in a somewhat vulnerable state. Brain development is shaped not only by genetics but also by a child's environment and experiences; therefore positive, stimulating experiences produce optimal brain architecture, and persistent adversity produces weakened brain architecture (National Scientific Council, 2007; Shonkoff & Garner, 2012; Teicher et al., 2002). Thus, the stress response system that is designed to protect an individual from danger becomes problematic when activated frequently, intensely and for a prolonged period of time during this early developmental period (Shonkoff et al., 2009; Teicher et al., 2002).

Toxic stress changes the physical structure and neural connections in the developing brain and causes it to develop along a stress-responsive pathway. This alternate developmental pathway shapes the brain in a way that enables it to maintain a more heightened state of awareness and suspiciousness in order to sense danger and quickly trigger flight-or-fight response and respond aggressively; it allows the brain to maintain survival mode; based on early experiences, it expects to survive and live in this type of stress-inducing environment (Shonkoff

& Garner, 2012; Teicher et al., 2002). Over long periods of time though, this type of neurodevelopment and stress system activation puts an individual at a larger risk for a number of issues including: disease, social problems, depression, substance abuse, cognitive impairment and disordered self-concept (Cicchetti & Rogosch, 2012; Cook et al., 2003; McEwen, 2002). ACE research confirms these findings; a graded relationship was found between ACE scores and negative outcomes. People with ACE scores of four or higher were more likely to experience health problems, health risk behaviors such as alcoholism, drug abuse, depression, and suicide, and internalizing and externalizing behavior problems (Felitti et al., 1998; Flaherty et al., 2013 Isohookana et al., 2013; Hunt et al., 2017). Additionally, when exposed to one ace category, the likelihood of being exposed to additional categories increases significantly (Cook et al., 2003; Felitti et al., 1998).

Adverse childhood experiences are traumatic events, and they are a specific type of trauma: complex trauma. Research shows that the potential negative impact complex trauma has on an individual is great, due to the chronicity of these events and their occurrence within the close family and caregiving structure (Cook et al., 2003; Pickens & Tschopp, 2017). All 10 ACE categories occur within the family system, which has the potential to damage a child's ability for self-regulation and interpersonal relatedness. Again, considering the plasticity of the early childhood brain, the complex trauma that occurs during childhood and early brain development can potentially have a large impact on overall development through changes in seven domains: biology, attachment, affect regulation, dissociation, behavior regulation, cognition, and self-concept. Overall, children who have experienced complex trauma are more likely to struggle with relationships, self-regulation, executive functioning skills, identity development, internalizing and externalizing behavior problems, and cognitive functioning (Cicchetti &

Rogosch, 2012; Cook et al., 2003; Cowell, et al., 2015; Flynn et al., 2014; Mezzacappa, Kindlon & Earls, 2001).

Considering the impacts of complex trauma and toxic stress on the developing child, it's not surprising that the effects of trauma present themselves in children in the classroom. The range of impact and student response to trauma varies greatly based on individual and environmental factors. However, research reveals patterns in in the impact of trauma on school performance. Whether it is a child experiencing maltreatment, a child with complex trauma or a child with an ACE score, all of these titles and situations imply that the child is facing a complex traumatic event that is causing a physiological stress response, which has the potential to impact their development. For children who have experienced trauma, school can be a very stressful place that presents a lot of reminders of trauma and potential threats, which trigger their survival mode mindset. School can become a place that feels unsafe, where the child feels the need to constantly protect him or herself from being hurt, whether physically, emotionally and/or socially; this state of alertness can make many of the different aspects of school such as attention, relationships, planning, and organizing, very difficult (Pickens & Tschopp, 2017). Research revealed that children with an elevated ACE score presented the following negative outcomes: academic and behavior maladjustment, lower academic engagement, higher grade retention, more referrals for special education, externalizing and internalizing behavior problems and, higher rate of absences, and lower levels of resiliency behaviors (Bethell et al., 2014; Jimenez, 2016; Shonk & Cicchetti, 2001). In certain cases, many of these academic and behavior issues (below average academic skills in literacy, language and math skills; attention problems, social problems, physical aggression) emerged as early as kindergarten (Jimenez, 2016; McClelland et al., 2007).

Keeping these outcomes in mind, along with the prevalence of adverse experiences, situations, and environments present in the lives of youth today, it's imperative that teachers understand trauma and how it impacts children. Teachers need to be able to recognize trauma behaviors and be aware of their influence on the student in the classroom. Then effective methods and tools can be found, developed and implemented to support these students in the classroom.

**Limitations of the Research**

When doing research surrounding sensitive and difficult topics such as abuse, neglect, maltreatment, and trauma, the research is limited in its ability to accurately represent the true occurrence of these particular behaviors and experiences, as underreporting and sampling bias occur. Caregivers may be less likely to honestly report incidences of abuse, neglect or maltreatment due to shame or fear of consequences; self-reports may not be accurate for a variety of reasons. Some of the research drew information from documented cases of maltreatment through CPS or reviews of medical files, however many incidences of maltreatment may occur in vulnerable populations that go unreported and undocumented. Other studies drew data from self-reports and interviews of children, parents, families, and teachers.

Another aspect that limited research was an inconsistent use of terminology and differing categories of "adverse experiences." Studies varied in the number of ACE categories being represented by the data (i.e., some included neglect, divorce, maternal mental health and others did not). Additionally, varying terminology was used to represent these adverse experiences, some studies referred to this as maltreatment, others as abuse or trauma and still others as ACEs.

Since the original ACE study was conducted in 1998, I limited the research to peer-reviewed articles dated 1999 – 2017. I felt it was important to draw from research that was

conducted after the first ACE study. The literature gathered was limited geographically as most of the research was drawn from the United States; however, a few studies from Canada and European countries were used, including Finland.

Because the first ACE study was published only twenty years ago, most of the research surrounding the topic of ACEs is fairly new. Additionally, the first study that was conducted about ACEs and their impact on youths occurred in 2011. This limits the pool of information and doesn't allow for the research to be evaluated and examined further with time. Additionally, many of the studies lacked longitudinal data, meaning that outcomes and symptoms measured in children with adverse experiences were immediate and many of the studies didn't follow them into adulthood. This leaves a large gap in understanding the overall and lifelong impact of these adverse experiences. Additionally, the research was limited in its ability to draw definite conclusions as to causation and the effect of particular behaviors. All statements are made in terms of association, mediation and moderation.

**Implications for Future Research**

Although the field of research surrounding adverse childhood experiences is growing, it's still a relatively new topic and area of research. The effects of trauma are becoming more common and widely discussed in professions surrounding child development. Most of the research I found surrounded the impact of trauma and maltreatment rather than toxic stress. More research could be done on how toxic stress from trauma not only impacts brain development but overall development of the whole child. Further investigation should be conducted on the stress response and brain impact from ACEs; many ACE studies simply examined associations between ACEs and behavioral, social or health outcomes.

In terms of mitigating and mediating the impact of adverse experiences on child development, further investigation should be conducted on the brain and effective interventions that decrease the negative impact of toxic stress and these adverse experiences. Researchers should seek answers to questions like: can the impact of complex trauma be halted if interventions are implemented during maltreatment or immediately following it, and do these interventions influence physical brain structure for the better? Recent research has identified mediating factors, like mindfulness, resiliency, trauma-sensitive classrooms/teachers, caring and supportive relationships, etc. Studies should be conducted regarding the effectiveness of these interventions and programs on their ability to reduce toxic stress, and concurrently impact overall child development, specifically brain structure and development.

With regard to education and adverse childhood experiences, investigations should be conducted on the teacher perspective of working with children who are experiencing or have experienced trauma. Current status of teachers' knowledge about trauma could be examined, along with the benefits of understanding how trauma manifests itself in children. Researchers should also seek to evaluate whether the impacts of trauma are being recognized as that, or misrepresented and viewed by school staff as misbehavior and/or a disability. Research should look at the prevalence of ACEs and trauma in children receiving special education services. A deeper understanding of adverse childhood experiences, trauma and toxic stress and their impact on the developing child, would allow school staff to recognize trauma and further implement strategies and systems that help improve student outcomes.

**Implications for Professional Practice**

As a middle school special education co-teacher, I teach and serve many students who have faced or are currently dealing with adverse experiences in their childhood. In most cases,

these students are not only struggling academically and behaviorally at school but are also dealing with other complex and stressful issues such as mental health issues, lack of support and structure at home, poverty, family conflict, and lots of inconsistency and uncertainty. When they come to school they bring these issues with them; they don't disappear. I must be continually aware of how their trauma may be manifesting itself in their behaviors and do my best to create an environment that is sensitive to this trauma; I must be a trauma-sensitive teacher.

On a school-wide level, I need to be an advocate for children experiencing trauma and talk to colleagues and administration about my research and findings. There are many systems and programs that schools can implement that are designed for all students but specifically will support students with trauma. Some of these include YogaCalm, social-emotional learning curriculums (like Second Step), restorative practices, teaching mindfulness and becoming a trauma-sensitive school. At my school, I am a part of the child study team which meets to discuss interventions and plans for students who are struggling in school academically and/or behaviorally, and potentially refer them to special education if necessary. My research surrounding ACEs, complex trauma and toxic stress allows me to approach these situations with a different lens. Some of these students that are being brought forward to this team might be dealing with trauma, and trauma is not a disability. Knowing how to recognize this trauma and having trauma-sensitive interventions, systems and programs to implement will be imperative for me to advocate for what is best for these students.

In the classroom setting, I must create an environment that is trauma-sensitive with minimal triggers or potentially stressful situations, consistency, safety, focus on positive relationships, opportunities for movement, organization and systems, clear expectations, defined behavioral processes, and support of resilience. I need to teach social and emotional learning,

including things like mindfulness, self-regulation, and calming strategies. It will be important to remember that students with traumatic experiences may exhibit unexpected behavior (aggression, defiance, anxiety, zoning out, regressive behavior, etc.) due to perceived threats from things of which I am unaware or as survival coping strategies. During these times I need to be a stable adult that is caring, supportive and consistent

On a personal level, this research has peaked my interest in the topic of trauma and brain development. Learning that the brain is malleable and shaped by its environment even into adulthood excites me. Stress and trauma impact development and learning, this is clear; it's also clear that learning and environment can impact trauma. Because of my research I better understand this process, now I desire to know and implement effective strategies that work in supporting students with trauma. I would like to seek further training in programs like YogaCalm and research trauma-sensitive schools and trauma-sensitive teaching. I want to know how to support resilience, as research showed this was a mitigating factor on the impact of trauma on children. Personally, I also know that working with people who are dealing with trauma can be very difficult and exhausting; I need to be aware of the impact this has on me and be persistent with practicing self-care. My research makes it clear that adverse experiences during childhood impact development and overall health and well-being. Thus, it is of utmost importance that I am intentional, aware of, and constantly reflecting on my interactions with students and the environment that I create, and ensuring that it is sensitive to their unique needs as a result of the trauma they have experienced.

## Conclusion

Adverse childhood experiences have been found to increase the likelihood of immediate and long-term negative impacts on children. Adverse childhood experiences are complex traumatic events that can elicit an intense stress response in the brain and body, which has the potential to influence development. Children with adverse traumatic experiences are at an increased risk for altered neurodevelopment due to the influence of toxic stress. Research has shown this altered development to be associated with many negative outcomes, including adopting health risk behaviors, disease, behavior problems, and social, emotional and cognitive impairment. These negative outcomes have the potential to impact children and their performance in school. Children with complex traumatic experiences are at greater risk for increased learning and behavior problems, decreased executive functioning skills, lower academic performance and engagement decreased social competencies, and increased academic risk behaviors. Teachers must be aware of the impact adverse childhood experiences have on children and seek to understand how to best support students dealing with trauma.

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