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The Relationship Between Adverse Childhood Experiences And Executive Functions in High School Aged Students

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Philadelphia College of Osteopathic Medicine

Department of Psychology

THE RELATIONSHIP BETWEEN ADVERSE CHILDHOOD EXPERIENCES AND
EXECUTIVE FUNCTIONS IN HIGH SCHOOL AGED STUDENTS

By Julia Barta

Submitted in Partial Fulfillment of the Requirements for the Degree of

Doctor of Psychology

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PHILADELPHIA COLLEGE OF OSTEOPATHIC MEDICINE
DEPARTMENT OF PSYCHOLOGY

Dissertation Approval

This is to certify that the thesis presented to us by Julia Barta on the 9th day of March, 2018, in partial fulfillment of the requirements for the degree of Doctor of Psychology, has been examined and is acceptable in both scholarship and literary quality.

Committee Members' Signatures:

_____, Chairperson

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DEDICATION

For my husband, who has always believed in me. I love you.

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ABSTRACT

Childhood adversity and executive function deficits pose significant concerns for those who experience these issues directly, as well as the educators, parents, medical providers, and communities in which they live. Much research has outlined negative physiological effects on typical brain development and health, as well as negative behavioral, social, and emotional outcomes stemming from early life trauma. Similarly, individuals with executive function deficits are more likely to struggle with behavior, emotions, and cognition. Little is known about the self-reported relationship between early life trauma and executive function. This study was designed to learn more about the relationship between adverse childhood experiences (ACEs), using the Philadelphia ACE Survey, and executive functions, as measured by the Behavior Rating Inventory of Executive Function-2 (BRIEF-2), in adolescents ages 14 through 18. This study showed that adolescents who experienced more adversity during childhood also demonstrated poorer global executive functioning. Adolescents with four or more ACEs struggled with inhibition, self-monitoring, shifting, emotional control, task completion, working memory, and planning/organizing more than those with three or fewer ACEs. Adolescents who did not feel safe in their neighborhood or did not believe neighbors could be trusted (adverse neighborhood experience) demonstrated executive function deficits in the areas of shifting, task completion, working memory, and overall emotional regulation. Adolescents who indicated an ACE for bullying were more likely to struggle with task completion. In sum, this study demonstrated several significant correlations between early life adversity and global cognitive, behavioral, and emotional executive dysfunction on self-reports.

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Chapter 1

INTRODUCTION

Investigating the consequences of trauma has long been an area of interest amongst healthcare professionals and for those in working in social sciences. Trauma, including health complications and accidents as well as man-made (e.g., war, violence) and naturally occurring (e.g., natural disasters) experiences are included as contributing factors to the negative psychological, emotional, behavioral, and financial consequences for those who experience these events (American Psychiatric Association [APA], 2013). The conceptualization of trauma etiology, symptoms, and treatment was fueled further after the recognition of posttraumatic stress disorder (PTSD) in the *Diagnostic and Statistical Manual of Mental Disorders, Third Edition* (DSM-III) in 1980 (APA, 1980). Since that time, understanding the significant breadth of potential causes of trauma and methods in which to prevent and respond to those affected have become important cornerstones of public health.

Felitti et al. (1998) created the term *adverse childhood experiences* (ACEs) to describe different types of abuse, neglect, and adversity endured before age 18 that have great potential for catastrophic outcomes. Narrowing the previously vast conceptualization of trauma, Felitti et al. specified 10 types of abuse, neglect, and adversity, including physical abuse, physical neglect, emotional abuse, emotional neglect, sexual abuse, parental divorce or separation, domestic violence against the mother, and living with someone who has been incarcerated, mentally ill, or addicted to substances including alcohol. Later, the Philadelphia ACE Survey was created to reflect the adversity endured by Philadelphia residents (Philadelphia ACE Study [P.], 2013). Nine of the 10 types of abuse outlined by

Felitti et al. were kept, some modified, for the Philadelphia ACE Survey. Categories of emotional/physical/sexual abuse, emotional/physical neglect, domestic violence, household incarceration, household mental illness, and household substance abuse were retained, whereas parental divorce/separation was removed from the Philadelphia ACE Survey. Five more questions targeting adversity, including witnessing violence, experiencing discrimination, being bullied, placement in foster care, and living in an unsafe neighborhood, were added to reflect the experiences of a more racially and educationally diverse population compared to the research of Felitti et al. There is now resounding agreement across years of research that ACEs are highly correlated with negative physical and mental health problems (Behavioral Risk Factor Surveillance System [BRFSS], 2010; Delaware Public Health Institute, 2016; Felitti et al., 1998), decreased intelligence scores (DeBellis et al. 2009; Kirke-Smith, Henry, & Messer, 2014), and alterations in neurobiology that may impact a variety of functioning domains negatively (e.g., social, emotional, and language function; Perry, 2000b; Perry & Szalavitz, 2006). More than one third of adults (37.3%) will have experienced four or more ACEs before the age of 18 (P., 2013), signaling the need for greater prevention and intervention efforts.

The vastness of adversity is of particular concern when understood within the context of brain development from infancy through adolescence. As important foundational elements of brain functioning develop in younger years, a child's experiences with safety, or lack thereof due to trauma or adversity, can create a brain hardwired to respond to basic survival instincts and needs (Perry, 2000b). As brains develop from the "bottom up" (Perry 2000a ; Perry, Pollard, Blakely, Baker, & Vigilante, 1995), the brains of healthy children mature to execute more and more complicated functions, beginning with physiological

reflexes and regulatory functions (e.g., heart rate, breathing), followed by complex state regulations (e.g., sleep, appetite) and large motor and fine motor movement, mood regulation, attachment, affiliation, and, during pubescent years, socialization, self-image, and abstraction (Perry, 2000a). The brain of a child who has experienced abuse or other adversity may become “stunted,” as these scary experiences do not allow the brain to flourish beyond the needs of survival within that particular environment (Perry, 2001).

The frontal lobes play a significant role in executive functions and are particularly susceptible to the negative effects of stress in rodents (Holmes & Wellman, 2009). Moreover, magnetic resonance imaging (MRI) studies of children illustrate smaller overall brain volume as well as abnormal frontal lobe structure in children diagnosed with PTSD resulting from maltreatment in comparison to non-maltreated peers (DeBellis et al., 1999). Although executive functions are defined in a myriad of ways, general agreement can be found in literature that inhibition of thoughts, feelings, and actions; shifting attention, and working memory are examples of executive functions (McCloskey & Perkins, 2013). In addition, executive functions are associated highly with the ability to organize, control attention, regulate emotions, think flexibly, initiate, plan, and self-monitor (Gioia, Isquith, Guy, & Kenworthy, 2015). Some of the negative cognitive, emotional, behavioral, and social consequences of adverse or traumatic experiences are hypothesized to be due to disruption of executive functions, arguably some of the most critical skillsets that are required of high school aged students.

Purpose

The purpose of this study was to examine the relationship between self-reported Philadelphia ACE Survey responses and executive functioning deficits amongst high school

aged students in a large east coast high school beyond the Philadelphia region. Furthermore, this study aimed to contribute relational findings between the types and quantity of Philadelphia ACE Survey responses and specific executive functions deficits as measured with the BRIEF-2.

Research Questions

The research questions addressed in this study are listed below:

1. To what extent are the number of self-reported ACEs via the Philadelphia ACE Survey and number of self-reported executive function deficits via the BRIEF-2 related in adolescents ages 14-18?
2. Are there types of self-reported executive function deficits more commonly associated with self-reported increased Philadelphia ACE Survey scores in high school aged students?
3. Are there different types of self-reported Philadelphia ACEs associated with specific self-reported executive function deficits in high school aged students?
4. Do males and females differ with regard to executive function deficits when considering trauma exposure?

Chapter 2:

LITERATURE REVIEW

Trauma

Stressful or traumatic life experiences in childhood and adolescence have been described in the literature as toxic stress, early life stress, early life adversity, early life trauma, or adverse childhood experiences (ACEs). A tremendous amount of research has been dedicated to examining the outcomes of exposure to trauma prior to age 18 in an effort to prevent exposure and improve intervention response (Banyard, Hamby, & Grych, 2017). Early life trauma has been linked with various negative outcomes, including but not limited to mental health diagnoses (Danese et al., 2009; Ryttilä-Manninen et al., 2014), alcohol and substance abuse (Anda et al., 2006; Lee & Chen, 2017), suicide completion or attempts (Dube et al., 2001; Sachs-Ericsson, Stanley, Sheffler, Selby, & Joiner, 2017), development of chronic illnesses, early mortality (Felitti et al., 1998), impaired social functioning, and poor academic achievement (Daignault & Hebert, 2009).

For the purposes of this dissertation, the term *trauma* will capture the broad range of stress events that present extraordinary challenges to coping and adaptation (Agaibi & Wilson, 2005). Trauma may also include experiences considered to be ACEs. Nearly 20 years of research has helped define ACEs, which traditionally has included exposure to physical abuse and neglect, emotional abuse and neglect, sexual abuse, parental divorce or separation, living with someone who had substance use problems, living with someone who went to prison, living with someone who had mental illness or attempted suicide, and violence toward one's mother or stepmother prior to age 18 (Felitti et al., 1998).

Although trauma is subjective to a person's perspective of experiences or situations and is difficult to define comprehensively, there are also common experiences of trauma, including natural disasters, significant medical illness/injury, war, accidents, death, and forced displacement are associated frequently with causing trauma that may override a person's ability to cope. Although some individuals are able to cope and demonstrate resiliency after experiencing trauma, others are often burdened with aggressive behaviors, occasional distancing from life, despair, dangerous tendencies of reenactment, self-destruction, and poor learning and social skills (Terr, 2008). Many survivors of trauma are later diagnosed with one or more trauma- and stressor-related disorders found in the *DSM-5*, including PTSD, acute stress disorder (ASD), adjustment disorder (AD), reactive attachment disorder (RAD), disinhibited social engagement disorder (DSED), and other specified trauma- and stressor-related disorder (APA, 2013). Due to high prevalence rates in comparison to the other trauma- and stressor-related disorders, PTSD, ASD, and AD are described and briefly reviewed below. As dissociative disorders are also correlated with traumatic events, including child abuse and overwhelming experiences (APA, 2013), brief summarization of this categorization of disorders is also provided.

Posttraumatic stress disorder. PTSD was introduced to the *DSM-III* in 1980 (APA, 1980) and, years later, a new wave of discussion and controversy has illuminated researchers' understanding of this trauma-based disorder today. Prior to 1980, psychological problems resulting from events such as war, torture, and rape were believed to stem from inherent weakness in the individual (M. J. Friedman, 2016). With the recognition of PTSD as a mental illness in 1980, so came a formal shift in this belief and acknowledgement that the etiology of PTSD was environmental in nature (M. J. Friedman, 2016).

Now, a diagnosis of PTSD in any individual must include exposure to actual or threatened death, serious injury, or sexual violence (APA, 2013). Although a minimum age requirement of one year is stipulated for this diagnosis, all age groups hold a commonality of experiencing intrusive symptoms associated with the traumatic event, persistent avoidance of stimuli associated with the traumatic event, negative alterations in cognitions and mood, and alterations in arousal and reactivity (APA, 2013). The DSM-5 (2013) defines symptom presentation, including intrusive symptoms may include distressing memories of the traumatic event or events, recurrent distressing dreams related to the trauma, dissociative reactions (e.g., flashbacks), “intense or prolonged psychological distress at exposure to internal or external cues that symbolize or resemble an aspect of the traumatic event(s),” (p. 271) and “marked physiological reactions to internal or external cues that symbolize or resemble an aspect of the traumatic event(s)” (p. x). Avoidant symptoms may include avoidance of or efforts to avoid distressing thoughts, memories, or feelings associated with the event as well as avoiding people, places, conversations, activities, objects, or situations that may arouse distressing thoughts, memories, or feelings (p. 271-272). Alterations in cognition and mood may include an “inability to remember an important aspect of the traumatic event(s),” “persistent negative beliefs or expectations about oneself, others or the world,” “distorted cognitions about the cause or consequences of the traumatic event, persistent negative emotional state(s),” “markedly diminished interest or participation in significant activities,” “feelings of detachment or estrangement from others”, and/or “persistent inability to experience positive emotions” (p. 271-272). Furthermore, those diagnosed with PTSD must experience changes with arousal and reactivity related to the traumatic event(s) may include “irritable behavior and angry outbursts”, “reckless or self-

destructive behavior”, “hypervigilance”, “exaggerated startle response”, “problems with concentration”, and/or “sleep disturbance” (pg. 272). Symptomology must not be due to a medical condition, substance use, or a medication. Symptoms must be present for more than 1 month and cause significant distress or impairment in social, occupational, or other important areas of functioning (APA, 2013).

The prevalence of PTSD differs based on gender, with an estimated national rate in the U.S. of 5.36% among females and 7.18% among males (Kilpatrick et al., 2013). Higher prevalence rates of PTSD are indicated within populations of lower socioeconomic status (SES); lower education; those exposed to prior trauma (particularly childhood trauma); childhood adversity such as economic deprivation, family dysfunction, parental separation, or death; cultural characteristics such as fatalistic or self-blaming coping strategies; lower intelligence; minority racial/ethnic status; and family psychiatric history (APA, 2013).

Acute stress disorder. Similar in nature to PTSD, a diagnosis of ASD shares many of the same symptomology. Beginning with exposure to trauma, individuals diagnosed with ASD may also display intrusion symptoms, negative mood, dissociative symptoms, avoidance symptoms, and arousal symptoms; however, distinction between these two disorders includes the time at which symptomology is experienced. Whereas a diagnosis of PTSD can only be provided after a period of 1 month of meeting criteria, ASD is used to diagnose those who have experienced the above listed symptomology for a period of 3 days to 1 month following exposure to one or more traumatic events (APA, 2013). Prevalence rates of ASD vary widely dependent upon the disclosed traumatic experiences in both U.S. and non-U.S. populations (APA, 2013). The highest rates, 20% to 50%, are reported by those who have experienced interpersonal traumatic events including assault, rape, and

witnessing a mass shooting (APA, 2013). This is followed by events that do not involve interpersonal assault, 13% to 21% of motor vehicle accidents, 14% of mild traumatic brain injury, 10% of severe burns, and 6% to 12% of industrial accidents.

Adjustment disorder. Holding great range in prevalence, diagnosis of AD ranges from approximately 5% to 20% within outpatient mental health treatment settings and up to 50% in hospital psychiatric consultation settings (APA, 2013). The DSM-5 (2013) characterizes this disorder as one in which an identifiable stressor or stressors has resulted in the emotional or behavioral distress of an individual within 3 months of the onset of the stressor(s). Symptoms may include “marked distress that is out of proportion to the severity or intensity of the stressor, taking into account the external context and the cultural factors that might influence symptom severity and presentation” and “significant impairment in social, occupational, or other important areas of functioning” (APA, 2013, p. 286). Individuals diagnosed with AD must not meet criteria for another mental health disorder that better explains their symptoms, must not be bereaving within normal limits, and symptoms must not persist for more than an additional 6 months after the stressor has ceased.

Dissociative disorders. Dissociative disorders including dissociative identify disorder, dissociative amnesia, and depersonalization/derealization disorder typically do not exceed a prevalence rate of 2% (APA, 2013). Dissociative disorders are characterized by “a disruption of and/or discontinuity in the normal integration of consciousness, memory, identity, emotion, perception, body representation, motor control, and behavior” (APA, 2013, p. 291). Some features of dissociation may include detachment from one’s mind, self, or body, or surroundings; inability to recall autobiographical information; and presence of two or more distinct personality traits or an experience of possession (APA, 2013). Some

hypothesize that dissociation serves as an adaptation to buffer the individual from fully experiencing trauma as it occurs, allowing a retreat (dissociation or detachment) to a safer place or blockade of traumatic memories that may cause psychological and/or physiological harm (Perry & Szalavitz, 2006).

Within the diagnosis of PTSD, clinicians may specify whether an individual has PTSD with dissociative features of depersonalization or derealization (APA, 2013). Depersonalization is described as a persistent or recurrent experience of feeling a sense of unreality of self or body, or detached from one's body or mental process, much like that of an outside observer (APA, 2013). More externally oriented, derealization is described as a persistent or recurrent experience of unreality of surroundings, such as the feeling that the world around the individual is unreal, dreamlike, distant, or distorted (APA, 2013).

Adverse Childhood Experiences

CDC-Kaiser ACE study. The landmark 1998 Centers for Disease Control-Kaiser Permanente Adverse Childhood Experiences (CDC-Kaiser ACE) study was a revolutionary method of measuring traumatic experiences and health outcomes in over 17,000 surveyed adults (Felitti et al., 1998). Rather than the wildly varied trauma research conducted in years prior, the CDC-Kaiser ACE study, herein referred to as the CDC-Kaiser ACE, asked about 10 different self-reported remembered traumatic experiences incurred before age 18. ACEs related to emotional, physical, and sexual abuse, domestic violence, household substance abuse, household mental illness, parental separation or divorce, and incarcerated household member were explored in this study (Felitti et al., 1998).

Although the categories of trauma on the CDC-Kaiser ACE may not be considered comprehensive of all traumatic experiences, these 10 trauma categories yielded significant

negative correlations with mental health, behavioral health, and physical health outcomes. Findings of associated negative outcomes included suicide attempts, depression, alcohol and illicit substance abuse, smoking, poor health, sexually transmitted diseases, having greater than or equal to 50 sexual partners, cancer, poor physical activity, obesity, skeletal fractures, early mortality, and heart, lung, and liver diseases (Felitti et al., 1998). Consequent research expanded on the breadth of negative outcomes associated with ACEs to include increased risk of future intimate partner violence (Dube, Anda, Felitti, Edwards, & Williamson, 2002; Whitfield, Anda, Dube, & Felitti, 2003), later sexual violence and victimization (Ports, Ford, & Merrick, 2016), teen pregnancy (Anda et al., 2002; Anda et al., 2001; Hillis et al., 2004; Hillis et al., 2010), autoimmune disease (Dube et al., 2009), frequent headaches (Anda, Tietjen, Schulman, Felitti, & Croft, 2010), autobiographical memory disturbances (Brown et al., 2007; Edwards, Fivush, Anda, Felitti, & Nordenberg, 2001), hallucinations (Whitfield, Dube, Felitti, & Anda, 2005), neurobiological changes (Anda et al., 2006), work absenteeism (Anda et al., 2004), fetal death (Hillis et al., 2004), increased risk for human trafficking (Reid, Baglivio, Piquero, Greenwald, & Epps, 2017), incarceration and recidivism (Wolff, Baglivio, & Piquero, 2015), and impaired cognitive development (Loman, Wiik, Frenn, Pollak, & Gunnar, 2009; Noble, Tottenham, & Casey, 2005).

In multiple studies, the relationship between ACEs and these negative outcomes have been found to have a graded dose-response impact, meaning that as the dose of the stressor increased, so did the intensity of the negative outcome (Felitti et al., 1998; P., 2013;). Therefore, it is common within literature to include a range of ACEs (e.g., zero, one to three, four or more) as a way to measure the dose. Some types of adversity, including

discrimination and unsafe neighborhood conditions, have been linked to a higher total dose of trauma adversity (PBS, 2016).

Of the respondents on the CDC-Kaiser ACE study, nearly 64% indicated at least one ACE, of which 26% indicated one ACE, 15.9% indicated two ACEs, 9.5% indicated three ACEs, and 12.5% indicated four or more ACEs (Felitti et al., 1998). The most common ACE reported was physical abuse (28.3%), followed by household substance use (26.9%), parental separation or divorce (23.3%), sexual abuse (20.7%), household mental illness (19.4%), emotional neglect (14.8%), mother treated violently (12.7%), emotional abuse (10.6%), physical neglect (14.8%), and incarcerated household member (4.7%). The results of the CDC-Kaiser ACE study were quickly replicated and expanded upon with an outpour of subsequent research. Most subsequent studies included slight variability from the original definition of ACEs utilized in the CDC-Kaiser ACE study. These are outlined below.

Philadelphia Expanded ACE Survey. In 2012, The Institute for Safe Families formed the Philadelphia ACE Task Force in an effort to learn more about ACE prevalence (Findings from the Philadelphia Urban ACE Survey, 2013) and outcomes in a population differing from the largely White and educated populations researched in other ACE studies (CDC, 2011/2012; Felitti et al., 1998). Partnering with the Public Health Management Corporation (PHMC), the Philadelphia ACE Task Force worked to develop a new ACE survey titled the Philadelphia Expanded ACE Survey (Philadelphia ACE Survey). The results of this study were published in 2013 and included significant variation from the CDC-Kaiser definitions of what constituted an ACE. Although the authors of this survey acknowledged the tremendous value of the CDC-Kaiser ACE study, it was concluded that an important contribution could be made by measuring adversity within the population of

Philadelphia—a population in which there is more social and racial diversity in comparison to the largely White, middleclass, and highly educated population of the other ACE research studies (CDC, 2011/2012; Felitti et al., 1998).

Lee Pachter and Roy Wade, members of the Philadelphia ACE Task Force, conducted qualitative focus groups with urban youth to identify common sources of stressors in their lives (P., 2013). A study of racism and discrimination was also conducted by Pachter and Wade (P., 2013). The Philadelphia ACE Task Force form reviewed the data from the literature, focus groups, and results of the racism and discrimination survey and, ultimately, identified experiencing racism, witnessing violence, and living in unsafe neighborhoods to be primary additions to their ACE definition. Once the ACE Task Force and PHMC developed questions to measure these forms of adversity, additional questions were combined from the California Health Interview Survey Adult Questionnaire, the Adverse Childhood Experiences International Questionnaire, the National Survey on Children’s Exposure to Violence, and the CDC Family Health History and Health Appraisal questionnaire to develop what later became known as the Philadelphia Urban ACE Survey (P., 2013).

On the Philadelphia ACE Survey, parental divorce/separation was removed and all other areas of “traditional” ACEs were measured as follows. To measure emotional abuse, respondents were asked two questions: “While you were growing up, how often did a parent, stepparent, or another adult living in your home swear at you, insult you, or put you down?” and “While you were growing up, how often did a parent, stepparent, or another adult living in your home act in a way that made you afraid that you would be physically hurt?” Physical abuse was also measured with two questions: “While you were growing up, did a parent, stepparent, or another adult living in your home push, grab, shove, or slap you?” and “While

you were growing up, did a parent, stepparent, or another adult living in your home hit you so hard that you had marks or were injured?” Similarly, sexual abuse was measured with two questions: “During the first 18 years of life, did an adult or older relative, family friend, or stranger who was at least 5 years older than yourself ever touch or fondle you in a sexual way or have you touch [his or her] body in a sexual way?” and did such a person “attempt to have or actually have any type of sexual intercourse, oral, anal, or vaginal, with you?”

Emotional neglect was measured with the true/false statement, “There was someone in your life who helped you feel important or special.” Physical neglect was measured with the true/false statement, “Your family sometimes cut the size of meals or skipped meals because there was not enough money in the budget for food.” Two questions were used to assess domestic violence: “How often, if ever, did you see or hear in your home a parent, stepparent, or another adult who was helping to raise you being slapped, kicked, punched, or beaten up?” and “How often, if ever, did you see or hear in your home a parent, stepparent, or another adult who was helping to raise you being hit or cut with an object, such as a stick, cane, bottle, club, knife or gun?” One dual part question, “Did you live with anyone who was a problem drinker or alcoholic? Did you live with anyone who used illegal street drugs or who abused prescription medications?” was used to measure household substance abuse. Household mental illness was measured with the question, “While you were growing up . . . Did you live with anyone who was depressed or mentally ill? Did you live with anyone who was suicidal?” Finally, the question, “Did you live with anyone who served time or was sentenced to serve time in a prison, jail, or other correctional facility?” was used to measure having an incarcerated household member.

In addition to the traditional inquiries of ACEs (e.g., abuse, neglect, household dysfunctions), the Philadelphia ACE expanded beyond these questions to include several new areas, such as bullying (“How often were you bullied by a peer or classmate?”), racial discrimination (“While you were growing up . . . How often did you feel that you were treated badly or unfairly because of your race or ethnicity?”), adverse neighborhood experiences (“Did you feel safe in your neighborhood?” and “Did you feel people in your neighborhood looked out for each other, stood up for each other, and could be trusted?”), witnessing violence (“How often, if ever, did you see or hear someone being beaten up, stabbed, or shot in real life?”), and living in foster care (“Were you ever in foster care?”). These added questions were developed after the PHMC conducted a literature review finding that these concerns are reported commonly by those growing up in urban communities (P., 2013).

A total of 1,784 adults completed the Philadelphia ACE Survey via telephone interview in either English or Spanish. This information was collected as a part of the larger PHMC Southeastern Pennsylvania Household Health Survey (SEPAHHS) administered in the fall of 2012. The sample of participants who completed the Philadelphia ACE Survey was more closely aligned to the overall population of Philadelphia than the CDC-Kaiser study (CDC-Kaiser, 2016), but still indicated some slight under- and overrepresentation of certain demographics in Philadelphia (P., 2013). For example, in regard to educational attainment, there was a difference in the percentage of respondents compared to the general population of Philadelphia who had less than a high school level education (residents: 20.0%; respondents: 10.3%) and a high school education (residents: 35.7%; respondents: 31.4%). Additionally, an increase was noted in the area of completing some college (residents:

21.8%; respondents: 22.7%) and being a college graduate (residents: 22.5%; respondents: 35.7%). Racial differences included an increase in White (residents: 38.8%; respondents: 44.1%), Black (residents: 36.1%; respondents: 42.5%), and Biracial races (residents: 2.1%; respondents: 3.8%) and a decrease in Latino (residents: 11.4%; respondents: 3.5%), Asian (residents: 6.2%; respondents: 3.6%), and Other (residents: 5.3%; respondents: 2.4%) races. An increase in females (residents: 53.7%; respondents: 58.3%) and decrease in males (residents: 46.3%; respondents: 41.7%) were also indicated. Age differences were indicated for each of the three domains (18-34, 35-64, and 65+). An increase in individuals ages 35 to 64 (residents: 46.7%; respondents: 52.2%) and individuals greater or equal to 65 years old (residents: 16.4%; respondents: 18.1%) was indicated, whereas a decrease in individuals 18 to 34 years old (residents: 36.8%; respondents: 29.7%) was indicated.

Representative of the dose-dependent consequences of ACEs, Philadelphia ACE Survey participants who indicated four or more ACEs were much more likely as adults to experience negative consequences. These included an increased risk for multiple sexual partners (14.1%) compared to participants with zero ACEs (0.8%) and one to three ACEs (7.2%); diagnosis of a mental health condition (30.1%) compared to participants with zero ACEs (9.7%) and one to three ACEs (18.1%); history of substance abuse (6.1%) compared to participants with zero ACEs (1.7%) and one to three ACEs (0.9%); higher rates of attempted suicide (17.8%) compared to participants with zero ACEs (0.7%) and one to three ACEs (2.3%); and diagnoses of depressive episodes lasting at least two weeks within the last year (44.3%) compared to participants with zero ACEs (8.3%) and one to three ACEs (23.5%; P., 2013).

Behavioral Risk Factor Surveillance System. Another outcome of the Felitti et al. (1998) research included the incorporation of a revised ACE survey as an optional part of the Behavioral Risk Factor Surveillance System (BRFSS), an annual, state-based, random-digit-dial telephone survey used to gather more information about risk factors and health outcomes of adults living in the U.S. (CDC, 2011/2012). By 2001, all 50 states, the District of Columbia, Puerto Rico, Guam, and the Virgin Islands had opted to use the BRFSS ACE, at least once, to survey non-institutionalized U.S. adults. The largest sample year (2010) included results from nearly 54,000 participants when 10 different states (Hawaii, Maine, Nebraska, Nevada, Ohio, Pennsylvania, Utah, Vermont, Washington, and Wisconsin) and the District of Columbia opted to include these ACE questions as part of their annual BRFSS (CDC, 2011/2012). Although phrasing of some of these self-report questions remained quite similar on this 11-question survey (household depression/mental illness/suicide, parental divorce/separation, emotional abuse, household alcohol abuse), other questions or portions of questions were altered (removal from home or parental abandonment, addition of household prescription medication abuse in household substance abuse question, expansion beyond term “prison” to include jail and correctional facility for the household member incarcerated question), or omitted (physical neglect, emotional neglect; CDC, 2011/2012). Finally, sexual abuse on the BRFSS ACE Survey (CDC, 2011/2012) was measured with three separate questions rather than one divided question as in the CDC-Kaiser ACE Survey (Felitti et al., 1998). Rather than asking whether an adult 5 years older than the victim ever touched or fondled his or her body in a sexual way or attempted or had oral, anal, or vaginal intercourse (Felitti et al., 1998), the three questions of the BRFSS ACE Survey (CDC, 2011/2012) were rephrased as whether someone 5 years or older ever touched the victim sexually, tried to

make the victim touch him or her sexually, or forced the victim to engage in sexual intercourse.

Comparison of CDC-Kaiser ACE, Philly ACE, and BRFSS.

Measurement. All questions on the CDC-Kaiser ACE were yes/no questions, only four of which indicated frequency of adversity (emotional abuse/neglect and physical abuse/neglect) by including “did you often” or “often or very often” within the context of the question. Both the BRFSS (CDC, 2011/2012) and the Philadelphia ACE (P., 2013) included a combination of Likert scale questions in addition to yes/no questions to measure variation in reported adversity exposure. The BRFSS and Philadelphia ACE (P., 2013) used yes/no responses for questions related to household mental illness, household substance use, and household member incarceration. The BRFSS used a yes/no response option for the parental divorce/separation question. The Philadelphia ACE used a yes/no response option for questions related to sexual abuse and foster care.

All other questions of the BRFSS (CDC, 2011/2012) utilized a 3-point Likert scale: 1 (*never*), 2 (*once*), 3 (*more than once*). The Philadelphia ACE Survey (P., 2013) differed from this by utilizing a 5-point Likert scale for emotional neglect, physical neglect, and discrimination. This scale ranged from 1 (*very often true*) to 5 (*never true*). A 4-point Likert scale ranging from 1 (*all of the time*) to 4 (*none of the time*) was used for questions related to adverse neighborhood experiences and being bullied. A 4-point Likert scale ranging from 1 (*many times*) to 4 (*never*) was used for questions related to witnessing violence and domestic violence. Physical and emotional abuse were measured with a 3-point Likert scale: 1 (*more than once*), 2 (*once*), 3 (*never*).

Both the Philadelphia ACE (P., 2013) and the BRFSS (CDC, 2011/2012) included a response for “refused” and either “don’t know/not sure” (BRFSS) or “don’t know” (Philadelphia ACE) that were not read to participants. These responses were only utilized if the participant was unable or unwilling to respond with the other provided response options.

Demographics. Whereas roughly 75% of both the CDC-Kaiser (74.8%) and the BRFSS (75%) ACE respondents were White, 44.4 % of the Philadelphia ACE study respondents were White (CDC, 2011/2012; CDC-Kaiser, 2016; P., 2013). Over half (58.4%) of the respondents for the Philadelphia ACE completed some college or graduated from college (P., 2013). This is comparable to the education level of the BRFSS ACE (62%), but much lower than the CDC-Kaiser ACE (75.2%) who had obtained more than a high school level education (CDC, 2011/2012; CDC-Kaiser, 2016).

Prevalence. The numbers of ACEs reported on the BRFSS were comparable to the CDC-Kaiser ACE (2016). On the CDC-Kaiser, 36.1% of participants reported zero ACEs, 26.0% reported one ACE, 15.9% reported two ACEs, 9.5% reported three ACEs, and 12.5% reported four or more ACEs, compared to the BRFSS ACE (2011/2012) with 40.7% reporting zero ACEs, 23.6% reporting one ACE, 13.3% reporting two ACEs, 8.1% reporting three ACEs, and 14.3% reporting four or more ACEs. Differences were found within the different categories of the BRFSS ACE (2011/2012) compared to the CDC-Kaiser ACE. On the BRFSS ACE (2011/2012), the prevalence of emotional abuse (35%) was greater than emotional abuse (11%) on the CDC-Kaiser ACE. Lower prevalence was indicated on the BRFSS ACE (2011/2012) for both physical (15.9%) and sexual abuse (10.9%) compared to the CDC-Kaiser ACE categories for physical (27%) and sexual (21%) abuse. The CDC-Kaiser ACE results included a rate of 14.8% for emotional neglect and 9.9% physical

neglect. All questions within the household challenges domain of the BRFSS ACE (CDC, 2011/2012) were comparable to the rates of household challenges collected by the CDC-Kaiser ACE. This included a rate of 14.9% for intimate partner violence (BRFSS, 2011/2012) and 12.7% for having a mother treated violently (CDC-Kaiser, 2016); 25.1% (BRFSS, 2011/2012) and 26.9% (CDC-Kaiser, 2016) for household substance abuse; 16.3% (BRFSS, 2011/2012) and 19.4% (CDC-Kaiser, 2016) for household mental illness; 22.8% (BRFSS, 2011/2012) and 23.3% (CDC-Kaiser, 2016) for parental separation or divorce; and 5.7% (BRFSS, 2011/2012) and 4.7% (CDC-Kaiser, 2016) for having an incarcerated household member.

Overall, the Philadelphia ACE indicated a higher prevalence of ACEs than either the CDC-Kaiser or BRFSS ACE studies. Whereas 14.3% of BRFSS (2010) and 12.5% of CDC-Kaiser (2016) participants indicated 4 or more ACEs, 37.3% of Philadelphia ACE (2013) participants indicated the same. A mere 16.8% of Philadelphia ACE participants indicated zero ACEs, in contrast with 36.1% of CDC-Kaiser participants and 40.7% of BRFSS participants. Rates were more comparable at the one through three ACEs range, with rates of 45.9% for Philadelphia ACE participants, 45% for BRFSS participants, and 51.4% for CDC-Kaiser participants.

Increased rates were also indicated for the Philadelphia ACE (2013) when compared to the CDC-Kaiser ACE (2016) alone. These areas included for emotional abuse (33.2% Philadelphia ACE; 10.6% CDC-Kaiser ACE), physical neglect (19.1% Philadelphia ACE, 14.8% CDC-Kaiser ACE), and witnessed domestic violence (17.9% Philadelphia ACE, 12.7% CDC-Kaiser ACE). As previously mentioned, new questions were introduced to the Philadelphia ACE that had not been included previously in the CDC-Kaiser ACE research.

As such, the Philadelphia ACE indicated that 40.5% participants witnessed violence, 34.5% felt discrimination, 27.3% had adverse neighborhood experience, 7.9% were bullied, and 2.5% lived in foster care.

Results from the CDC-Kaiser ACE (2016) and Philadelphia ACE (2013) studies concur that Black adults, males, and those living 150% below the federal poverty level (FPL) are significantly more likely to have an ACE score of 4 or more (Felitti et al., 1998). When looking at demographic characteristics of participants who indicated four or more ACEs on the Philadelphia ACE, males were more likely (41.8%) than females (34.1%) to have four or more ACEs, Black adults were more likely to have four or more ACEs (48.6%) than White adults (34%), and adults living 150% below the FPL were more likely to have four or more ACEs (50%) than those participants living at or above 150% of the FPL (31.8%).

National Survey of Children's Health. In 2011/2012, the National Survey of Children's Health (NSCH) ACE was used to collect adverse experiences history data from the reporting of parents or guardians who had children under 18, known as the Child and Adolescent Health Measurement Initiative (CAH; Institute for Safe Families and Public Health Management Corporation [ISFPHMC], 2013). Whereas previous ACE research had been conducted exclusively with adults' retrospective memories of their own adversity histories, this study offered insight into the adverse experiences of children between birth and 17 years old as reported by parents or guardians. This revised nine question survey expanded beyond the traditional ACEs by asking questions related to being a victim of neighborhood violence or witnessing neighborhood violence, perceptions of discrimination based on race/ethnicity, death of a parent/guardian, and socioeconomic hardship. Questions related to parental divorce/separation, parental/adult domestic violence, parental/guardian time in

jail/prison, household alcohol/drug problems, and household mental illness/suicide/severe depression for more than two weeks were included on this ACE survey as well. All questions related to emotional abuse and neglect, physical abuse and neglect, and sexual abuse were omitted.

Over 95,000 surveys were administered by the National Center for Health Statistics at the CDC in the 2011/2012 NSCH ACE Survey (ISFPHMC, 2013). Results indicated that 52.1% of children had zero ACEs, 25.3% had one ACE, and 22.6% had two or more ACEs (ISFPHMC, 2013). This is significantly different from the rates reported on the CDC-Kaiser (2016) and BRFSS ACE (2011/2012) surveys and may aid in the understanding of when children are exposed to ACEs. The intention of all ACEs studies is to measure adverse experiences incurred across life up to 18; therefore, there is greater likelihood for older children to have higher ACE scores. The results were reflective of this, and respondents indicated that within the 0- to 5-year-old population, 24.1% experienced one ACE and 12.5% experienced two or more ACEs, within the 6- to 11-year-old population, 25.8% experienced one ACE and 24.4% experienced two or more ACEs, and within the 12- to 17-year-old population, 26% experienced one ACE and 30.5% experienced two or more ACEs (ISFPHMC, 2013). The most frequently experienced ACE was economic hardship, with 25.7% of participants indicating that it was either very often or somewhat often difficult to get by on the family's income (ISFPHMC, 2013). This was followed by 20.1% of children who lived with divorced or separated parents, and 10.7% who lived with someone with an alcohol or drug problem (ISFPHMC, 2013). Parents indicated a rate of 8.6% children who were either a victim of or had witnessed neighborhood violence and 8.6% who had lived with someone who was mentally ill or suicidal (ISFPHMC, 2013). There were 7.3% who

indicated the child had witnessed domestic violence, 6.9% lived with a parent who served time in jail or prison, 4.1% were treated or judged unfairly because of race or ethnicity, and 3.1% experienced the death of a parent or guardian (ISFPHMC, 2013).

Delaware Household Survey. The state results for the NSCH ACE within the Delaware Household Survey (DeHHS) data collected in 2016 will be reviewed. The DeHHS included a combination of the traditional CDC-Kaiser ACE Survey questions and the Philadelphia ACEs questions to measure ACEs across Delaware from over 2,500 non-institutionalized adults (Delaware Public Health Institute, 2016). All of the participants answered 12 ACE questions, and two methods of measurement were used to find frequency rates. The first method included only the 10 original questions from the CDC-Kaiser ACE (Felitti et al., 1998), the second method included those 10 questions plus two more questions that were selected from the Philadelphia ACE Survey (“How often were you bullied by a peer or classmate?” and “While you were growing up . . . how often did you feel that you were treated badly or unfairly because of your race or ethnicity?”). The results for the number of ACEs experienced by Delawareans differed by method measured, with 41% reporting zero ACEs, 24% reporting one ACE, 20% reporting two or three ACEs, and 16% reporting four or more ACEs when asked the 12 ACEs question method, compared to 13% reporting zero ACEs, 23% reporting one ACE, 19% reporting two or three ACEs, and 13% reporting four or more ACEs with the 10-question method (Delaware Public Health Institute, 2016).

Many results varied from the CDC-Kaiser ACE findings (Felitti et al., 1998), with a rate of 15% emotional abuse (CDC-Kaiser: 10.6%), 15.3% physical abuse (CDC-Kaiser: 28.3%), 9.3% sexual abuse (CDC-Kaiser: 20.7%), 8.7% mother treated violently (CDC-

Kaiser- 12.7%), 21.1% substance abuse in household (CDC-Kaiser: 26.9%), 12.1% household mental illness (CDC-Kaiser: 19.4%), 32.6% parental separation or divorce (CDC-Kaiser: 23.3%), 7.9% incarcerated household member (CDC-Kaiser: 4.7%), 14.6% emotional neglect (CDC-Kaiser: 14.8%), and 4.9% physical neglect (CDC-Kaiser: 9.9%) on the traditional 10-question survey (Delaware Public Health Institute, 2016).

School performance and adversity. Academic achievement has long been an area of focus for parents, educators, and policy makers. The No Child Left Behind Act (NCLB Act, 2002) and Every Student Succeeds Act of 2015 (Impulse, 2017) exemplify a nationwide emphasis on improving student academic achievement. As research and policies regarding academic achievement continue to develop, so does an understanding that emotions and behaviors can significantly impact a child's ability to perform well academically.

School districts and classrooms that have become more invested in the whole-child approach understand the importance of not only developing the academic achievement of a child, but also the child's social, emotional, and behavioral needs. In part, the investment in the whole-child approach can be attributed to researchers who have linked adversity to a host of negative educational outcomes. Poorer performance on standardized achievement tests (Eckenrode, Laird, & Doris, 1993), poorer grades (Kendall-Tackett & Eckenrode, 1996), increased need for academic support (Crozier & Barth, 2005; Leiter & Johnsen, 1997), higher rates of absenteeism (Leiter & Johnsen, 1997), increased likelihood of repeating a grade (Kendall-Tackett & Eckenrode, 1996; Scarborough & McCrae, 2010), and increased likelihood of dropping out of school (Buzi, Smith, & Weinman, 1998; Ensminger, Lamkin, & Jacobson, 1996) are all evidenced in children who have experienced adversity when compared to non-maltreated peers. In a study conducted by Burke, Hellman, Scott, Weems,

and Carrion (2011), learning and behavioral problems were much higher (51.2%) in medical patients with four or more ACEs than those with zero ACEs (3%).

Other research has indicated that some children with dissociative symptoms after maltreatment are more likely to lack a sense of school membership, leading to a potential domino effect with poorer grades and less praise from teachers and peers, therein decreasing perceived academic competence and, ultimately, further contributing to a poor sense of school membership (Perzow et al., 2013). Additionally, Perzow et al. (2013) pointed out that many maltreated children with dissociative features may have more difficulty focusing and, thus, perform more poorly on academic measures.

Brain Development

Typical brain development. The human brain is a remarkably complex organ that is dedicated to the survival of its host: the human body. The brain's managerial position within the body executes commands related to physiological functions (e.g., heartbeat, breathing), physical action (e.g., running, hiding, freezing), and psychological response (e.g., thinking, feeling, perceiving) in response to internal and external stimuli (Perry, 1998). The brain has evolved over thousands of years in a hierarchical fashion, beginning with simpler functions of the lower regions of the brain to the more complex, higher-level functions toward the front of the brain (Perry & Szalavitz, 2006). There are four functional divisions that aid in understanding brain development sequence and functioning: brainstem, diencephalon, limbic system, and neocortex (Perry, 2000a).

Brainstem. Simple brain functions develop first and include those that are the bare necessities of living, including physiological reflexes, respiration, heart rate, and blood pressure (Perry, 2000a). The brainstem manages these functions in the lower regions of the

brain, and the maturity of these functions occurs largely during the third trimester of pregnancy and first six months of life. Specific brain regions associated with these types of functions include the medulla oblongata, pons, cerebellum, and the midbrain's superior colliculus and inferior colliculus.

Diencephalon. The diencephalon is next to mature in the brain, with functional maturity occurring during infancy. With the thalamus and hypothalamus, the brain is able to aid in the control of hunger, sleep, temperature, and other complex state regulations.

Limbic system. Growing in complexity, the limbic system is composed of the cingulate cortex, amygdala, hippocampus, and septum. The amygdala, hippocampus, and basal ganglia (including the caudate nucleus, putamen, globus pallidus, and substantia nigra) play important roles in fine and gross motor function as well as mood regulation. Functional maturity is reached in early childhood, and continues to allow for the development of higher brain regions and functions when maturity has largely been achieved.

Neocortex. Finally, functional maturity for the neocortex will be reached largely in childhood and during puberty in adolescence (Perry, 2000a), and will continue developing well into early adulthood (McCloskey, 2017; Perry, 2000a). With the use of the cerebral cortex, frontal lobes, temporal lobes, parietal lobes, occipital lobes, and corpus callosum, children are able to engage in attachment, affiliation, socialization, self-image, and abstraction functions. These higher level cortical structures are also dedicated to complex functions such as language and abstract thinking (Perry, 2000a) and, as mentioned previously, are often associated with executive functioning such as organization, planning, attention, and working memory (McCloskey & Perkins, 2013). These regions are considered higher level cortical structures, the most recently formed areas evolutionarily, and are at

greater risk of impairment following early life stress (De Bellis et al., 1999; Holmes & Wellman, 2009). Higher-order cortices such as the neocortex will develop only after lower-order cortices have become fully established in structure and function (Gogtay et al., 2004; Gogtay & Thompson, 2010; Shaw et al., 2008). This is of great importance when considering the disruptions caused in brain development by lack of healthy, supportive, nurturing relationships, exemplified by children who experience adversity early in life (Perry, 2000a).

Plasticity. Though predisposed to develop in the aforementioned hierarchical fashion, the brain also displays incredible plasticity, or flexibility in its ability to change in either adaptive or maladaptive ways dependent on use (Perry, 2000c), otherwise known as the “use it or lose it” principle (Greenough, Black, & Wallace, 1987). All sensory information (e.g., sight, sound, taste, touch, smell) is included as input for the brain to “learn” from (Perry, 2006). Once the input is received, an outpouring of cellular and molecular processes begin altering neuronal neurochemistry and cytoarchitecture of the brain, ultimately changing brain structure and function (Perry, 2006). These changes are dependent on the pattern, intensity, and frequency of occurrence and create a blueprint to which the individual can refer quickly, with or without awareness, in order to navigate the challenges and demands of the environment around him or her (Greenough et al., 1987; Perry 2000c). The more frequently a pattern is experienced, the more ingrained that blueprint becomes, and the more it becomes a default reference (Perry 2000b). This concept is sometimes referred to as “states become traits” and plays an important role within understanding the developing brain and adversity exposure (Perry, 2000b; Perry, 2009; Perry et al., 1995).

Learning and memory. A newborn's brain contains 100 billion neurons, otherwise known as the raw material of the brain (Graham & Forstadt, 2001). The blueprints, or pathways, created in a newborn's brain are created quickly, as the approximate 100 billion neurons can easily create connections when provided stimulation (Perry, 1998; Perry, 2001). These undifferentiated neural systems are entirely dependent upon the environment and microenvironments (e.g., neurotransmitters, cellular adhesion molecules, neurohormones, amino acids, ions) to create and appropriately organize neural pathways (Perry, 2000b). As the brain works furiously to take in sensory information, including social experiences and language, it will have reached 90% of its completed adult size by age 3 (Perry, 2000c). This volume is composed of gray matter (i.e., cell bodies, dendrites, axon terminals, synapses) and white matter (i.e., myelinated axon bundles), all of which will orchestrate together to achieve internal and external goal-oriented tasks (Purves et al., 2008).

Most of the neurons in a newborn's brain are "pruned," or removed, by early adolescence as the brain learns the most efficient way to navigate in that individual's world (Santos, & Noggle, 2011). Old and unused neurons become clutter and a hindrance to the brain as it matures and the individual requires more blueprints, rather than first time experiences, to navigate the world. It is also largely during this growth period, between ages 2 and 3, that neurological growth will be approximately 85% complete (Perry, 1998). By this time, the foundation with which that child will understand and navigate the world has largely been achieved. This process of creating, strengthening, and discarding synapses is generally understood as the process of learning and memory (Shonkoff & Phillips, 2000) and holds significant implications for children who experience adversity.

Brain development and adversity. Over one quarter (27%) of child abuse victims are younger than 3 years, with 24.2% of 1,000 children under the age of 1 (Children's Bureau of the U.S. Department of Health and Human Services, 2017). With the majority of brain development completed by age 3 (Perry, 1997), the potential is great that these children have created foundations in their brains that are responsive to trauma, unpredictability, insecurity, or chaos (Perry, 1997). For any child exposed to something scary, not even just in traumatized children, the brain's stress response system is activated, creating a cascade of cortisol and norepinephrine in an attempt to increase chances of survival (Bucci, Marques, Oh, & Harris, 2016; Pechtel & Pizzagalli, 2011). Rather than a typically developing brain, children who have experienced abuse or adversity are more likely to have overdeveloped stress response systems, leading to impaired brain system functions and faulty organization of the brain (Perry, 1997). Because brain development and neurological changes are greatly dependent on experiences prior to age 18, particularly during the first 3 years (Perry, 1997), it is reasonable to surmise that many children who have experienced trauma may have a multitude of difficulties across academic, behavioral, social, and emotional domains. Chronic or severe adversity and maltreatment creates biological changes in children's brains, to their unique blueprints, for how to best survive in the world (Perry, 1998). Despite the brain's best attempts to protect, the cascade of changes created from experiences such as the Philadelphia ACEs can undermine frontal brain development and, therefore, long-term functioning in preference for immediate safety and biological security (Perry, 2006).

Sensitization. One brain process, known as sensitization, occurs when neural networks become sensitized after repetitive activation or experience. Once these systems

have become sensitized, the pattern and quantity of neurotransmitters released alter sensation, perception, and processing of that specific experience (Perry, 2009). Some experiences, such as adversity and trauma, may result in sensitization. This response is one in which sensitized neural responses are developed by experience and exemplified by changing the quantity and pattern of neurotransmitter release. Impacting sensation, perception, and processing of that specific experience, this system then requires very little to become activated; it has become sensitized. This is commonly seen in children who exhibit full-blown stress responses, such as hyperarousal or dissociation, by seemingly minor stressors.

Specific brain alterations. Both primates and humans exposed to early life stressors have been linked with a reduction in volume of the corpus callosum, a band of nerve fibers that allow the right and left hemispheres of the brain to communicate (Navalta, Polcari, Webster, Boghossian, & Teicher, 2006; Sanchez, Hearn, Do, Rilling, & Herndon, 1998; Schiffer, Teicher, & Papanicolaou, 1995). The corpus callosum appears to be most sensitive to the effects of stress between the ages of 9 and 10 (Andersen & Teicher, 2008). The reduction in volume of the corpus callosum is problematic, as it indicates a lack of development in myelination and synapses that allow the left and right hemispheres to communicate. Leussis and colleagues (2008) also indicated a decrease in synaptic density within the prefrontal cortex in animal studies after exposure to stressors during adolescence. Literature reviewing brain changes in maltreated children consistently indicate alterations in the hypothalamic-pituitary-adrenal (HPA) axis, amygdala, hippocampus, medial prefrontal cortex, all of which play a role in executive function processes (Davis, Moss, Nogin, Webb, 2015; Hayes et al., 2011; Tarullo & Gunnar, 2006). The HPA axis, in particular, is

associated with the stress response hormone, cortisol, as well as the phenomenon known as social buffering (Hostinar, Sullivan, & Gunnar, 2014). Social buffering describes the ability to reduce physiological responses associated with stress, and was found to be lacking in a population of adopted children who did not endorse normative early attachment relationships and/or emotional intimacy (Hostinar et al., 2014).

A study by Wismer, Fries, Shirtcliff, and Pollack (2005) demonstrated cortisol differences in children who had been raised in orphanages and adopted 3 years prior. In this study, the adopted children and the control group of non-adopted children were presented with a stressful situation, followed by their caregiver. Unlike the control group, the adopted children did not show lowered cortisol levels when their parents arrived. Rather, the orphanage reared children's cortisol levels remained elevated to a similar degree as if a stranger had been introduced for comfort. Moreover, a study conducted by Teicher and colleagues (2004) illustrated the importance of sensitive periods within brain development. For example, females between the ages of 3 and 5 who experienced sexual abuse demonstrated smaller hippocampal volume, whereas 9- to 14-year-old females demonstrated corpus callosum and prefrontal cortex dysfunctions (Andersen & Teicher, 2008). The age at which the adversity is incurred can have varying outcomes on development and functioning.

A study conducted by De Bellis and colleagues (2009) found that neglected children with and without PTSD were linked consistently with lower intelligence. Specific deficits in language, memory and learning, attention, and executive functioning were identified, even when controlling for differences in IQ. Similarly, various other studies have linked children who spent the early years of their lives in orphanages or other institutions with language impairments, poorer intellectual performance, psychomotor problems, and dulled cognitive

abilities in comparison to non-institutionalized peer groups (Cohen, Lojkasek, Zadeh, Pugliese, & Kiefer, 2008; Loman et al. 2009; Rutter & O’Conner, 2004; van den Dries, Juffer, van Ijzendoorn, & Bakermans-Kranenburg, 2010). Kirke-Smith, Henry, and Messer (2014) found that 11- to 18-year-olds of both genders displayed a significant difference in cognitive scores (non-maltreated mean = 100.97; maltreated mean = 87.37). A 17% decrease in average corpus callosum size was indicated in neglected children in a study conducted by Teicher et al. (2004). Other studies found similar dose-dependent responses, as the amount of time spent in an institution was correlated to the severity of the cognitive deficits found in these populations of children (Loman et al., 2009; Noble et al., 2005).

Positive, Tolerable, and Toxic Stress

Although ACE research has outlined many negative effects of stress, it is important to understand the differences between types of stress that may be experienced in a lifetime. Much of the stress experienced by individuals is healthy and results in brief increases in heart rate with mild elevations of stress hormone levels (Bucci et al., 2016; National Scientific Council, 2005). For adolescents, common forms of positive stress may include the first day of school, taking a test, or driving a car for the first time.

Tolerable stress classifies a stronger alert response activated by the brain when a more severe stressor occurs (Bucci et al., 2016). For adolescents, examples may include car accidents, death of a loved one, or natural disasters, all of which hold potential to trigger a stronger stress response that may, without adult relationships, result in more damaging effects to the brain and functioning (Bucci et al., 2016). If a child has at least one healthy adult relationship—an adult who is stable, responsive, and caring—and the stressor is time-

limited, his or her brain is afforded the opportunity to recover from the initial wave of stress response (PBS, 2016).

Prolonged, strong, and/or frequent stressors, such as those measured in ACE studies, are forms of stress that can become significantly more challenging for brains to adapt to without consequence. This is especially the case when a child does not have adequate support from an adult to adapt to the occurring stressor (Bucci et al., 2016). This collection of circumstances is known as toxic stress, and greatly increases individuals' likelihood of experiencing the negative manifestations of adversity previously reviewed (Bucci et al., 2016).

Intervention

Just as brains can be affected negatively by trauma and adversity, early intervention at the first sign of abuse can change brains and promote resiliency. Although early detection is ideal, in order to have the most time and ability to change that child's developing brain, there is still hope for those whose abuse is not detected early. Exercise and healthy diet (Emmons, Barbeau, Gutheil, Stryker, & Stoddard, 2007), sleep (Sadeh, 1996), mindfulness (Keng, Smoski, & Robins, 2011), mental health intervention (Perry, 2006; Stein et al., 2003), practicing forgiveness (Wade, Hoyt, Kidwell, & Worthington, 2014), and positive relationships can begin to undo the harmful and damaging effects of trauma (Perry, 2006; Perry & Szalavitz, 2006; PBS, 2016). Human brains have developed over thousands of years to rely on interpersonal connectedness to achieve many goals, including, historically, working together to find safety, food, and shelter (Perry & Szalavitz, 2006). In modern times, engaging in helpful relationships with others, ones in which individuals feel safe, nurtured, accepted, and listened to, provides the same reduction in stress hormones (Ludy-

Dobson & Perry, 2010). Research suggests that if a child has a healthy attachment to at least one person, a buffer is created to protect that child from the full dose of adversity (Perry, 2006; PBS, 2016). Parenting styles also appear to mediate the development of executive functions. Fay-Stammach, Hawes, and Meredith (2017) found a mitigating effect against maltreatment victimization and poor executive functions when parents provided expressive encouragement and emotion-focused responses to their young children. It can be hypothesized that caregivers comforting children during emotional arousal and verbally mediating their emotions promote a reduction in cortisol and norepinephrine. Thus, the child's brain is able to return more quickly to a calm state and allow for fewer disturbances in typical development.

Adversity and Memory

In their lifetime, most individuals will process millions of bits of sensory information to store and manipulate, helping them to learn and remember how to navigate the world efficiently (Greenough et al., 1987). Along with this process come the many complexities of memory. How can it be that individuals remember some events so vividly, and others seem impossible to retrieve?

There are several conclusions regarding memory outlined by McNally (2005) that aid in understanding the complexity of memories. The first of these is that memory is not as accurate as we often believe it to be regardless of memory origin. Furthermore, memory recollection often includes the reconstruction of the events that truly occurred (McNally, 2005). It has been well researched that implicit memories, those that are subconscious, are subject to change over time (Lustig & Hasher, 2001), as are other types of memory (e.g., explicit or conscious; McNally, 2005). Although memory is subject to change over time

(Southwick, Morgan, Nicolaou, & Charney, 1997), research has also indicated that the deluge of neurotransmitters released, as well as stress hormones, when experiencing trauma or adversity strengthen memory for the traumatizing experience (McGaugh, 2003).

Reflecting on the process of learning previously discussed, repetition of events, adverse or not, is also likely to contribute to recollection of events (McNally, 2005; Perry, 2006).

Nevertheless, McNally clarified that although an individual may be able to recall that her or she was traumatized, the details of the event or events are likely to be blurred with other events. Some research, including that of Weems et al. (2014), has suggested that memories of childhood trauma fade after experiencing similar, less stressful events. As ACE research has been completed with adult raters' recollection of past events, the complexities of memory are imperative to consider. With over 94% and 86% of responders age 30 or older on the CDC-Kaiser Ace (2016) and BRFSS ACE (2010), respectively, it can be hypothesized that any of the 12-year-old (minimum) memories of trauma or adversity recalled by these participants have been altered or even forgotten. Measuring the experiences of adolescents may hold insight into trauma or adversity as it is remembered in individuals' more recent life histories.

Executive Functions

Perhaps one of the most hotly debated areas within cognition includes that of executive functions. Dozens of years of curiosity and investigation have not yet resulted in agreement of an operational definition for this term, nor the methods in which it can be measured. This multifaceted debate will be summarized and concluded with an operational definition of executive functions and selection of a measurement tool that will appease the purposes of this study.

Executive functions are broadly understood to be a wide-range of higher order skills necessary for performing cognitive, emotional, and behavioral tasks. Gioia and colleagues (2000) described these processes as a collection of interrelated functions that are responsible for purposeful, goal-directed, problem-solving behavior. Royall et al. (2002) characterized the term executive functions as “a set of cognitive skills that are responsible for the planning, initiation, sequencing, and monitoring of complex goal-directed behavior” (p. 2). Many have described executive functions as a set of skills particularly utilized during problem solving to achieve an outcome (Barkley, 2011; Best, Miller, & Jones, 2009; Delis, 2012; Gioia & Isquith, 2004).

Executive functions are also associated strongly with the ability to organize, focus attention, regulate emotions, think flexibly, initiate, plan, and self-monitor (Gioia et al., 2015). Some researchers believe that executive functions stretch beyond these commonly agreed upon skillsets to include areas such as engagement, optimization, efficiency, inquiry, solution, self-realization, and self-determination (McCloskey, 2017). Despite disagreement on this term, there has been consistent recognition in inhibition of thoughts, feelings, and actions; shifting attention; and working memory as critical features of executive functions (McCloskey & Perkins, 2013). Furthermore, there appears to be several assumptions that can be made about the concept of executive functions, including that executive functions are not a unitary trait; rather, they are responsible for cueing, directing, and coordinating aspects of perception, cognition, emotion, and action (McCloskey & Perkins, 2013). Additionally, executive function use varies in different arenas of involvement, symbol system, interpersonal, intrapersonal, and environmental contexts (McCloskey & Perkins, 2013). Although most significant development occurs before age 30, executive functions are

believed to continue to develop over an individual's lifespan (Diamond & Lee 2011, Klingberg 2010). Finally, executive function use is reflected in the activation of areas of the frontal lobes (Best et al., 2009; Luria, 1966; McCloskey & Perkins, 2013). Thus, they are the first functions to suffer in moments of exhaustion (Barnes, 2012), stress (Arnsten, 1998; Liston, McEwen, & Casey, 2009; Oaten & Cheng, 2005), sadness (Hirt, Devers, & McCrea, 2008), or being physically unfit (Chaddock, Pontifex, Hillman, & Kramer, 2011).

Although executive functions have long been associated with intelligence, accumulating evidence suggests that this multifaceted construct often does not correlate to intelligence. For example, one study indicated shifting and inhibition were not related to intelligence in young adults, whereas working memory was (N. P. Friedman et al., 2006). Likewise, other researchers have noted similar findings that executive function deficits do not correlate directly with intelligence deficits (Duncan, Burgess, & Emslie, 1995; Duncan, Emslie, Williams, Johnson, & Freer, 1996).

Assessment of executive function. Much of executive function research has been dedicated to the assessment of these functions. Several assessments used commonly within the clinical, medical, and school fields include the Stroop Task, the Brief Test of Attention (BTA; Schretlen, Bobholz, & Brandt, 1996), the A Developmental Neuropsychological Assessment (NEPSY; Korkman, Kirk, & Kemp, 1998), the Delis-Kaplan Executive Function System (D-KEFS; Delis, Kaplan, & Kramer, 2001), the Wisconsin Card Sorting Test (WCST; Heaton, Chelune, Talley, Kay, & Curtiss, 1993), Gordon Diagnostic System (GDS; Gordon & Barkley, 1998), and the Behavior Rating Inventory of Executive Function (BRIEF-2/BRIEF-SR; Gioia, Isquith, Guy, & Kenworthy, 2000). Each of these assessments vary slightly with what they are purported to measure, as well as the methods used. The

Stroop Task, BTA, NEPSY, D-KEFS, and WCST all rely on an interactive session with the participant, who must complete tasks believed to be associated with specific executive function skillsets. Subtests on assessments such as the NEPSY and D-KEFS, as well as the Wechsler Preschool and Primary Scale of Intelligence (WPPSI-IV), Wechsler Intelligence Scale for Children (WISC-V, 2003), and Kaufman Adolescent & Adult Intelligence Test (KAIT) also rely on this process to isolate particular executive functions in order to estimate ability within that domain (McCloskey & Perkins, 2013). Another method of executive function assessment, used in measures such as the GDS and BRIEF-2, relies on self- or adult-reported (e.g., teacher, parent) observations about an individual's ability to perform a variety of tasks. Scales such as these often reveal that children with executive function deficits face several academic challenges, including but not limited to reading comprehension problems, math achievement deficits, grade retention, poorer overall achievement, and diagnosis of a learning disability (Biederman et al., 2004; Bull, Espy, & Wiebe, 2008; Locascio, Mahone, Eason, & Curring, 2010; Rose, Feldman, & Jankowski, 2011).

Executive functions and adversity. There is a small but growing body of research examining the relationship between executive functions and trauma. Smaller yet is the research on this relationship within the child and adolescent population. A contribution by Spann and colleagues (2012) indicated that children who endorsed higher scores on the Childhood Trauma Questionnaire displayed higher rates of perseverative errors on the WCST. This team also learned that children who had experienced physical abuse and physical neglect specifically were more likely to make perseverative errors. This may be important in understanding the problem solving difficulties of children who have experienced

abuse, particularly those whose experiences are physically based rather than sexual, neglectful, or emotional.

Using the WISC-IV, GDS, BTA, and Stroop Task, DePrince, Weinzierl, and Combs (2008) found parent-reported familial trauma was associated with poorer working memory, inhibition, auditory attention, and processing speed. Variable controls were included for anxiety symptoms, SES, and potential traumatic brain injury. Within this study, familial trauma included sexual abuse, physical abuse, and witnessing domestic violence reported by parents or guardians using the UCLA PTSD Index (Pynoos, Rodriguez, Steinberg, Stuber, & Frederick, 1998).

Beers and De Bellis (2002) found that children diagnosed with maltreatment-related PTSD performed worse than non-maltreated children on freedom from distractibility using the Stroop Color or Word Test, made significantly more omission errors on a sustained visual attention task called Digit Vigilance Test, and completed fewer WCST tasks utilizing abstract reasoning and executive functioning. These children also performed more poorly on the California Verbal Learning Test long delay free recall, an assessment of learning and memory. Visuospatial functions also appeared to be impaired in this population, as deficits were indicated on the Rey-Osterrieth Complex Figure and Judgment of Line Orientation.

Kirke-Smith, Henry, and Messer (2014) found that adolescents who witnessed domestic violence or had been exposed to physical, sexual, or emotional maltreatment or neglect had significant impairments in executive loaded working memory (ELWM), fluency, and inhibition compared to an age and gender matched group of comparison adolescents, even after controlling for IQ. Within this maltreated group, higher rates of anxiety, depression, and behavioral problems were indicated and hypothesized to play an important

role in some of the results within the ELWM tasks and two of four measures of inhibition. When controlling for these emotional and behavioral difficulties, the differences in ELWM, fluency, and two of four measures of inhibition between the control group and maltreated group remained. This suggests that maltreatment is linked with certain types of executive function deficits, although some executive function deficits (e.g. inhibition) may be linked to current emotional and behavioral symptomatology rather than a true executive function skill deficit (Kirke-Smith et al., 2014).

Similar to other dose-dependent research findings, Hughes, Roman, Hart, and Ensor (2013) found that chronicity of exposure to depressive symptoms displayed by their mothers was correlated with severity of executive function deficits in children under 5 years. Between ages 2 and 6, mothers' average severity and persistence of depressive symptoms, which was measured by the Beck Depression Inventory (BDI; Beck, Ward, Mendelson, Mock, & Erbaugh, 1961) predicted children's executive functions at age 6. When assessing executive functions at age 6, the intercept for mothers' depressive symptoms predicted working memory when using the Stanford-Binet Intelligence Scales Beads task (Thorndike, Hagen, & Sattler, 1986), and the slope predicted inhibitory control using the Day-Night game (Gerstadt, Hong, & Diamond, 1994). The Day-Night game requires the participant to say "day" when shown a picture of a moon and stars, and "night" when shown a picture of a sun and assesses the child's ability to adhere to the rules and inhibit an inappropriate response (Simpson & Riggs, 2005).

There have also been few studies that suggest executive function deficits in children who have experienced types of adversities specific to the Philadelphia ACE Survey (P.,

2013). Links between executive function deficits and foster care placement and bullying/victimization have also been researched and are reviewed below.

Two studies, one with kindergarten and first graders (Pears, Fisher, Bruce, Kim, & Yoerger, 2010) and another with preschoolers (Lewis, Dozier, Ackerman, & Sepulveda-Kozakowski, 2007), indicated poorer inhibitory control in foster care children. Pears, Fisher, Bruce, Kim, and Yoeger (2010) examined inhibitory control in children between the ages of 3 and 6 using the Wechsler Preschool and Primary Scale of Intelligence-Revised (WPPSI-R; Wechsler, 1989) and caregiver reports. In this study, it was discovered that inhibition was associated negatively with a history of maltreatment and foster placement. Lewis, Dozier, Ackerman, and Sepulveda-Kozakowski (2007) measured inhibitory control in 5- and 6-year-old children who had experienced either placement instability, one stable placement, or no placement in foster care. Using the WPPSI-R (Wechsler, 1989) or Peabody Picture Vocabulary Test-Third Edition (PPVT-3; Dunn & Dunn, 1997) and a control task performance, it was concluded that placement instability may adversely affect children's ability to develop adequate inhibitory control, behavioral control, and self-regulation. In another study, preschoolers in foster care with unknown trauma histories, rates of dissociation were correlated with poorer inhibition, but not with planning, strategy, or multiple rule sets (Cromer, Stevens, DePrince, & Pears, 2006). Consistencies with specific executive function deficits, even within this narrowed population (preschoolers though first graders in foster care) illustrate the need to expand research into the relationship between adversity or maltreatment and a wider range of potential executive function deficits.

The Comprehensive Executive Function Inventory (CEFI) was used to measure executive function deficits in students between the sixth and eighth grades that had been, or

continued to be, bullied (Jenkins, Demaray, & Tennant, 2017). On this rating scale, bullying victims were found to have a negative correlation with all indices of the CEFI, including attention, emotional regulation, flexibility, inhibitory control, initiation, organization, planning, self-monitoring, and working memory. This research is significant for examining executive function deficits with the utilization of a rating scale rather than task-oriented assessments (e.g., WISC-IV, NEPSY) in conjunction with experiencing adversity.

This research largely summarizes the extent to which executive function deficits have been measured in child populations who have experienced trauma or adversity. Although there have been some patterns of specific executive function deficits related to ACEs (e.g., inhibition deficits), much of the research has focused on measuring these specific deficits rather than assessing a wider range of executive function difficulties. Therefore, there is ample room to contribute research utilizing self-rating scales for executive function deficits in children who have experienced trauma or adversity, particularly with the use of the CDC-Kaiser ACE or Philadelphia ACE (P., 2013). The administration of expanded conceptualizations of trauma using the Philadelphia ACE as reported by adolescents appears to be nonexistent. This research may offer unique insight and contributions to the literature regarding the self-reported ACEs remembered by adolescents as well as their potential correlations with specific executive function deficits included on the BRIEF-2. By assessing a wide range of adversity included in the Philadelphia ACE Survey and wide range of executive function with the BRIEF-2, there is potential to clarify any relationships between these variables, or to elucidate new relationships between adversity and executive function not yet outlined in existing research.

The research hypotheses addressed in this study included the following:

1. It was hypothesized that there would be a positive correlation between number of self-reported ACEs via the Philadelphia ACEs and the number of self-reported deficits in executive functions via the BRIEF-2 in adolescents ages 14 through 18.
2. It was hypothesized that there would be specific types of self-reported executive function deficits more commonly associated with self-reported increased Philadelphia ACE scores.
3. It was hypothesized that there would be specific types of ACEs via the Philadelphia ACEs correlated positively with specific executive functions deficits.
4. It was hypothesized that males and females would differ with regard to executive function deficits when considering trauma exposure.

Chapter 3

METHOD

Design

In this archival study, data collected in the spring of 2017 were reviewed to better understand the relationship between self-reported Philadelphia ACEs and executive function deficits on the BRIEF-2 in 14- to 18-year-olds attending a large east coast high school. An existing school-based problem solving team was utilized to create, design, implement, and evaluate the data collection methods to better understand some of the challenges experienced by this population. The function of this team throughout the year is to coordinate students who fall within the top 5% of building-wide behavioral referrals for intervention. After years of functioning to serve these high need students, this team noted consistent disclosure of trauma or adversity by the students during the interview process. With an interest in improving prevention and intervention, the problem solving team—consisting of general and special education teachers, a guidance counselor, an administrator, and a school psychologist—worked during the 2016/2017 school year with building administration and the school district to survey a randomized sample of students. All data collection was reviewed and approved by the school district’s research board. The team intended to utilize this data to improve supports and procedures serving the student body at large.

With a population of 8% English Language Learners in this high school, the team deemed it necessary to utilize English and Spanish versions for all materials of this study. Whereas the BRIEF-2 could be ordered in English and Spanish, all other materials (e.g., Philadelphia ACE Survey, demographic questionnaire, exit survey, consent/assent, passive parental consent, resource list, and standardized instructions) were translated by a certified

bilingual staff member and proofread by another certified bilingual staff member within the building. Instructions regarding how to complete the BRIEF-2 and Philadelphia ACE Survey were included in print throughout the protocols in the child's preferred language (i.e., English or Spanish).

Instrumentation

Philadelphia ACE Survey. The first 22 questions of the Philadelphia ACE Survey, which are related to trauma and adversity, were administered to assess ACEs in the current study. The Philadelphia ACE Survey and data were used with permission from the Health Federation of Philadelphia and Philadelphia ACE Research and Data Committee. Funding for the Philadelphia ACE Study was provided by the Robert Wood Johnson Foundation, with additional support from the Thomas Scattergood Behavioral Health Foundation, and the Stoneleigh Foundation. Data were provided by the Public Health Management Corporation's Center for Data Innovation, Southeastern Pennsylvania Household Health Survey, 2012. The Philadelphia ACE Survey was selected to measure trauma due to the expanded concept of ACEs as compared to the CDC-Kaiser ACE study. Self-reported survey items included questions regarding neighborhood safety, peer victimization, emotional abuse and neglect, racial discrimination, household dysfunctions, foster care, physical abuse and neglect, and sexual abuse. Benefits of utilizing this expanded definition include capturing a greater range of challenges experienced by these students that have been found to be correlated with a wide range of negative educational, mental health, behavioral health, and physical health outcomes. A copy of the 22-question version of the Philadelphia ACE Survey used during administration is included in Appendix A.

BRIEF-2. The self-report version of the BRIEF-2 was administered to measure various areas of executive functions. The 55 items comprising the self-report BRIEF-2 include questions related the individual's perception of his or her ability to inhibit, self-monitor, shift, use emotional control, complete tasks, use working memory, and plan/organize (Gioia et al., 2015).

Inhibit Scale. The Inhibit executive function subscale is used to describe inhibitory control and impulsivity on the BRIEF-2. This scale represents an individual's ability to resist impulses, to stop behaviors at the appropriate time, to consider consequences before acting, and to generally be in control of himself or herself.

Self-Monitor Scale. Self-Monitor is a term the BRIEF-2 uses to illustrate the level of awareness individuals have about the impact of their behaviors on other people and outcomes. This subscale can also be used to understand adolescents' perceptions of their own behaviors compared to standards or expectations for behavior.

Shift Scale. The ability to move freely from one situation, activity, or aspect of a problem to another as circumstances demand defines the Shift subscale on the BRIEF-2. There are several important aspects of shifting, including the ability to make transitions, tolerate change, problem solve flexibly, switch or alternate attention between tasks, and change focus from one mindset or topic to another. Executive function deficits in shifting often manifest differently, depending on severity. According to Gioia, Isquith, Guy, and Kenworthy (2015), mild deficits may compromise efficiency of problem solving and often result in a tendency to get stuck or focused on a topic or problem, whereas more severe deficits may manifest as perseverative behaviors and marked resistance to change.

Emotional Control Scale. The Emotional Control subscale is used on the BRIEF-2 to describe an individual's emotional expression and ability to modulate or control emotional responses. Difficulty with emotional control may be exemplified by outbursts, sudden or frequent mood changes, or excessive periods of emotional upset.

Task Completion Scale. The ability to complete tasks appropriately and/or in a timely manner is measured by the Task Completion subscale on the BRIEF-2. Although task completion is not typically considered an independent executive function, this skillset requires many other executive functions, including working memory, planning, organization, and inhibitory control. The conglomeration of these other skills manifest in an individual's ability to produce work efficiently.

Working Memory Scale. The subscale of Working Memory on the BRIEF-2 indicates the degree to which an individual is able to hold information in mind for the purpose of completing a task, encoding information, or generating goals, plans, and sequential steps to achieving goals. Challenges with working memory may include difficulty with carrying out multistep activities, completing mental manipulations such as mental arithmetic, and following complex instructions. Working memory allows an individual to hold an appropriate amount of information in memory for further processing, remain attentive, and focus for appropriate lengths of time.

Plan/Organize Scale. The ability to manage current and future-oriented task demands is measured by the Plan/Organize subscale on the BRIEF-2. The first component, planning, can be best described as the ability to anticipate future events, to set goals, and to develop appropriate sequential steps ahead of time to carry out a task or activity. The second component, organizing, represents the ability to bring order to information and to appreciate

main ideas or key concepts when learning or communicating information. Individuals with plan/organize challenges may struggle to grasp the overall structure or framework of novel information that facilitates learning and later recall.

Indexes and Composite. The responses from the participant on questions related to inhibiting and self-monitoring were used to obtain a Behavior Regulation Index (BRI); shifting and emotional control to obtain an Emotion Regulation Index (ERI); and task completion, working memory, and planning/organizing to obtain a Cognitive Regulation Index (CRI). The BRI is attributed as a foundational asset necessary for healthy cognitive regulation, aiding in an individual's ability to engage in active and systemic problem solving (Gioia et al., 2015). The ERI is attributed to an individual's ability to regulate emotional responses and to shift set or adjust to changes in environment, people, plans, or demands. Appropriate emotion regulation and flexibility are precursors to effective cognitive regulation. The CRI reflects an adolescent's ability to control and manage cognitive processes and to problem solve effectively; it relates directly to the ability to problem solve actively in a variety of contexts and to complete tasks such as schoolwork. Finally, the Global Executive Composite (GEC) serves as an indicator of overall everyday executive functioning. This score takes in to account all of the clinical scales to estimate the degree to which a child may display overall executive functioning challenges.

Scoring. Gender, age, and raw scores are utilized to calculate a standardized *t*-score with a 90% confidence interval for comparison to the normative group. These *t*-scores may be used to interpret the level of executive function or dysfunction in each area of the self-report BRIEF-2. Descriptive categories of the BRIEF-2 include average for *t*-scores falling below 59, mildly elevated for *t*-scores of 60 to 64, potentially clinically elevated for *t*-scores

of 65 to 69, and clinically elevated for t -scores at or above 70. With a mean of 50 and standard deviation of 10, t -scores below 40 can be considered better than average. Validity indexes for inconsistency, negativity, and infrequency are included within the BRIEF-2.

Demographic questionnaire. The demographic questionnaire was designed by the problem solving team to gather additional supplementary information from participants. The questionnaire included age, grade, gender, and race/ethnicity. Multiple choices were provided for grade, including ninth, tenth, eleventh, or twelfth, and repeat ninth, tenth, eleventh, or twelfth. Three options were provided for gender, including male, female, and other. Multiple choices for race/ethnicity included White, African American, Latino/Hispanic, Native American/American Indian, Pacific Islander/Asian, and Other. The demographic questionnaire used in this study is located in Appendix B. Benefits of this data collection include the ability to draw core correlations between ACEs and executive functions deficits as they relate to age, grade, gender, and race/ethnicity.

Exit survey. The exit survey consisted of two questions: (a) Did you feel comfortable answering these questions today? (measured on a 5-point Likert scale ranging from 1 [*extremely uncomfortable*] to 5 [*extremely comfortable*]), and (b) Would you like to talk to someone about anything you shared on these questionnaires today? Circle Response: Yes, No. If the participant responded “yes” to the second question, he or she was asked to provide his or her name for follow-up. The exit survey is included in Appendix C.

Characteristics of the Source Data

As stated, this archival study utilized data collected by the school-based problem solving team in a large east coast high school in the U. S. The participants in this study were current ninth through twelfth grade students attending this high school. Of the 1,053 total

students enrolled at this school, 400 students were selected randomly to participate in this study. There were several students excluded from participating in this study. After selecting the 400 students, students diagnosed with a cognitive disability and students with a learning disability in reading comprehension who had standard scores of 70 or below on their most recent psychological evaluation in the area of reading comprehension were removed. This accounted for the removal of three students from the randomly selected group of participants. Additionally, students who were currently attending alternative placement (e.g., residential treatment facilities, alternative education sites) and students who were incarcerated at the time of administration were not included. This accounted for the removal of four students. All students age 19 years or older were excluded from participation, as the norms within the BRIEF-2 do not extend beyond age 18 years. This excluded seven students from participation. There were another six students excluded from survey administration due to parental request. Students who were absent on the day of administration or decided not to complete the survey accounted for 237 students. Of those who participated, a total of six surveys were not included in the results due to 25% or more missing responses or missing demographic information. Further, one participant who had identified as “other” for gender was not included in the final analysis. This was due to an inability to score the BRIEF-2, which requires male/female gender entry for normative comparisons. Therefore, a total of 149 usable protocols were included for data analysis.

Procedure

In January 2017, district funding was secured for 350 protocols (25 Spanish, 325 English) and approximately 400 students were selected randomly for participation in this study. Fifty more students were selected than there were protocols in the event that some

students would be unable (e.g., absent, opted out) to complete the surveys. The school-based problem solving team initiated data collection from approximately 38% of the school population to learn more about the rates and types of trauma and executive function deficits within this high school in March of 2017. The intent of this data collection was to better inform staff of student needs and to demonstrate the need for preventative and intervention supports within the building. After controlling for reading comprehension disabilities, age, absences, students in alternative placements (e.g., hospitals, alternative education setting, detention centers, jail), parent and/or student denial of participation, incomplete protocols, and nonbinary gender, a total of 149 protocols were collected. Of these 149 participants, 8.1% were 14-year-olds, 24.2% were 15-year-olds, 28.9% were 16-year-olds, 26.2% were 17-year-olds, and 12.8% were 18-year-olds. Fewer males (46.3%) completed the survey than females (53.7%). Of these 149 students, the highest level of respondents fell within the traditional (e.g. non-repeated) high school grade levels, including ninth graders (25.5%), tenth graders (24.2%), eleventh graders (24.2%), and twelfth graders (22.1%). Few students reported repeating a grade, with 1.30% responding as ninth/tenth graders and 2.7% responding as tenth/eleventh graders. There were no repeat eleventh or twelfth graders in this sample. Most respondents were White (46.3%), followed by African American (22.1%), Latino/Hispanic (19.5%), Mixed of two or more races (4.67%), Asian/Pacific Islander (2.7%), Native American or American Indian (2%), and Other (2%). Although nearly all respondents chose to complete English protocols (99.33%), 0.67% of the respondents completed Spanish protocols.

Passive parental consent and a list of school and community mental health resources were mailed home to the parents and guardians of all anticipated participants of the study

(Appendix D and Appendix E). Parents who chose to remove their children from participation were instructed to call or e-mail the school-based problem solving team leader (i.e., the school psychologist) by March 1, 2017. Names of students who opted out of survey completion were managed by the problem solving team leader and kept confidential in a locked cabinet. The consent and resource list were provided in each parent's self-reported language preference of either English or Spanish on his or her child's school registration form. Seventeen letters were sent home to parents who indicated a primary language of Spanish. Resources within the letter included free and cost mental and behavioral health agencies within the school and community, bilingual mental health service providers, and a website (www.psychologytoday.com) to search for additional supports. Parents and students were informed that participation was voluntary, would not result in academic gain or consequence, and that students could 'opt-out' of the survey completion at any point. The same list of resources that was provided to parents was provided to students on the day of the survey administration in the students' preferred languages. Students were also provided a form of assent (when participants were under 18 years old) or consent (when participants were 18 years old) outlining the purpose and potential risks and benefits of participation (Appendix F).

To collect this information, a survey consisting of four parts was administered to students during an extended homeroom period in the school cafeteria. Standardized instructions were read aloud in English (Appendix G) followed by Spanish by a district certified interpreter. All four parts were administered during the beginning of the school day, providing a maximum of 45 minutes to complete the survey. The four parts of this survey

included the BRIEF-2, Philadelphia ACE Survey, demographic questionnaire, and exit survey.

The BRIEF-2 was selected to measure executive functions, as there is a substantial amount of literature utilizing this protocol, in contrast with other measures which have limited research beyond standardization norms. Additionally, the BRIEF-2 contains 55 questions, which is significantly shorter than other commonly used executive functions surveys (e.g., CEFI, MEFS).

The Philadelphia ACE Survey (P., 2013) was selected to measure ACEs due to the expanded nature of the questions as compared to the 10 questions of the traditional ACE survey. The options for “don’t know” and “refused” were removed from the survey. All other response options were maintained in the same format as the original Philadelphia ACE Survey. This included the use of yes/no questions and 3-, 4-, and 5-point Likert responses as previously discussed.

Participants were divided in three groups, with each group assessed on a separate day to ensure there was ample room within the cafeteria. On each day, students selected to complete the survey were prompted to report to the cafeteria by their homeroom teachers. Upon entry to the cafeteria, students were seated in cafeteria booths in a staggered pattern with approximately three feet between each student. A brief introduction was printed in English and Spanish and placed at each table for students to read. Students were then provided an assent or consent form in their preferred languages and were encouraged to begin reading this as other students arrived. Once all students had arrived and were seated, the consent/assent forms were read in English and Spanish by the interpreter. If students did not agree to participation, they were asked to return to homeroom. If they agreed to

participate, the signed consent/assent was collected in exchange for the survey packet. Instructions regarding how to complete the forms were included within the packet.

The exit survey was separated immediately from the other three survey materials once the student turned in the packet, due to identifying information being potentially included. All survey materials were collected by the problem solving team members and returned to the problem solving team leader on each of the three days, after all students had completed the survey packets. The first three parts of the survey (BRIEF-2, Philadelphia ACE, and demographic questionnaire) remained stapled from administration to collection in order to ensure organization of materials. Indication for needed follow-up was determined by those students who listed their names on the exit survey. Names of the students who requested follow-up were kept separately from all other survey results and were shared with the school psychologist. Exit surveys were immediately collected and prioritized in order of students who indicated the most distress (rating of 5) to least distress (rating of 1). Those students who also listed their names were called down to speak with a mental health professional (e.g., school psychologist) by the end of the school day. Confidentiality rights were reviewed with all students prior to any disclosure. This included sharing the child's right to privacy, with the exceptions of self-reported intent to harm self, harm others, or abuse of a child. Contact information of mental health and behavioral health agencies were provided in addition to specialized supports for sexual assault, domestic violence, household dysfunctions, healthy relationships, loss due to homicide, exposure to trauma or violence, bullying, and addiction when appropriate. There was a total of six students who requested follow-up support across the three days of administration. All six students were seen by the problem solving team leader, a school psychologist. There were no incidents disclosed by

these students that required a report to Child Protective Services. Further, there were no contacts to the school from parents or guardians with concerns or questions after survey administration.

All paper materials collected from this administration were stored in a locked filing cabinet in the locked office of the problem solving team leader. The BRIEF-2 assessments were scored online using the online scoring administration PARiConnect, which is password protected. Protocols were identified using matching numbers (numbered 1 through 149) for the demographics questionnaire, BRIEF-2, and Philadelphia ACE Survey.

Chapter 4

RESULTS

In order to examine the relationship between trauma and executive functions, several measures were utilized. The BRIEF-2 includes an overall executive function score, known as the Global Executive Composite (GEC), and three index scores: the Behavioral Regulation Index (BRI), Emotional Regulation Index (ERI), and Cognitive Regulation Index (CRI). Subtests of these indexes include seven specific executive function skills: Inhibition, Self-Monitoring, Shift, Emotional Control, Task Completion, Working Memory, and Plan/Organize. On the Philadelphia ACE Survey, a Total ACE score was calculated for each participant, in addition to ACE scores for 14 different categories of trauma. These 14 categories include emotional abuse, physical abuse, sexual abuse, emotional neglect, physical neglect, domestic violence, household substance abuse, household mental illness, incarcerated family member, witness violence, felt discrimination, adverse neighborhood experience, bullied, and foster care. The goal of this study was to gain a deeper understanding of relationships between trauma and executive functioning as self-reported by youth between ages 14 and 18.

Descriptive Statistics

Descriptive statistical analysis included frequency analyses of types of trauma. These were then compared to Philadelphia ACE study frequencies (P., 2013). As noted above, a total ACE score could range from 0 to 14 ($M = 3.54$, $SD = 2.72$). In this surveyed population, more participants (42.3%) indicated four or more ACEs compared to the original Philadelphia ACE study (37.3%). Those with one to three ACEs accounted for 47% of this study's population, compared to 45.9% of the original Philadelphia ACE study. A difference

was also indicated between the participants with zero reported ACEs in this study (10.7%) compared to the original Philadelphia ACE (16.8%). The 14 types of trauma captured within this surveyed population included several differences from the Philadelphia ACE Study. Some of the largest differences were adverse neighborhood experience (23.7% higher), physical abuse (12% higher), incarcerated family member (8.6% higher), witness violence (5.1% higher), felt discrimination (9.0% lower), domestic violence (7.2% lower), and sexual abuse (6.8% lower). Descriptive statistics are found in Table 1.

Table 1

Philadelphia Urban ACE Comparison in Studied Population Versus Philadelphia ACE Study

Indicator	Frequency in Studied Population (N = 149)	Frequency in Original Philly ACE Study (N = 1,784)
ABUSE		
Emotional Abuse	34.2% (n = 51)	33.4% (n = 591)
Physical Abuse	43.0% (n = 64)	35.0% (n = 624)
Sexual Abuse	9.4% (n = 14)	16.2% (n = 289)
NEGLECT		
Emotional Neglect	8.7% (n = 13)	7.7% (n = 136)
Physical Neglect	18.8% (n = 28)	19.1% (n = 340)
HOUSEHOLD DYSFUNCTION		
Domestic Violence	10.7% (n = 16)	17.9% (n = 319)
Household Substance Abuse	34.2% (n = 51)	34.8% (n = 620)

Household Mental Illness	38.9% (n = 58)	24.1% (n = 429)
Incarcerated Household Member	21.5% (n = 32)	12.9% (n = 229)
URBAN ACE INDICATOR		
Witness Violence	45.6% (n = 68)	40.5% (n = 718)
Felt Discrimination	25.5% (n = 38)	34.5% (n = 613)
Adverse Neighborhood Experience	51.0% (n = 76)	27.3% (n = 487)
Bullied	8.7% (n = 13)	7.9% (n = 140)
Lived in Foster Care	4.0% (n = 6)	2.5% (n = 44)

The GEC *t*-score was calculated from all 55 questions included on the BRIEF-2. Descriptive statistics were run for the three indexes on the BRIEF-2, BRI, ERI, and the CRI that comprise the GEC. From the BRIEF-2, the BRI is calculated from 13 questions related to Inhibit and Self-Monitor, the ERI is calculated from 14 questions related to Shift and Emotional Control, and the CRI is calculated from 25 questions related to Task Completion, Working Memory, and Plan/Organize subtests. Descriptive statistics were also run for the seven subscales of the BRIEF-2, and are shown in Table 2. The descriptive statistics of each trauma group (No, Medium, High) were calculated for all participants for each Index and the Composite of the BRIEF-2 (Table 3).

Table 2

Descriptive Statistics of BRIEF-2 Subscales, Indexes, and Composite

	Variable	Mean	Std. Deviation	N
Subscales	Inhibition	51.64	9.571	149
	Self-Monitoring	51.64	11.701	149
	Shift	53.86	10.118	149
	Emotional Control	51.77	9.908	149
	Task Completion	56.34	10.599	149
	Working Memory	54.60	10.252	149
	Plan/Organize	52.97	10.733	149
Indexes & Composite	Behavioral Regulation Index	51.36	11.351	149
	Emotional Regulation Index	53.17	9.487	149
	Cognitive Regulation Index	54.65	10.916	149
	Global Executive Composite	53.36	11.256	149

Table 3

Descriptive Statistics of Participants' Executive Function Domain by Trauma Group

	ACE Ranges	Gender	Mean	SD	N
Behavioral Regulation Index	No ACEs	Female	46.75	7.363	8
		Male	47.00	4.899	8
		Total	46.88	6.043	16
	Medium ACEs	Female	44.74	13.500	35
		Male	50.80	8.944	35
		Total	47.77	11.770	70
	High ACEs	Female	54.92	9.343	37
		Male	58.73	10.425	26
		Total	56.49	9.904	63

	Total	Female	49.65	12.147	80
		Male	53.35	10.079	69
Emotional Regulation Index	No ACEs	Female	49.63	6.989	8
		Male	48.63	8.895	8
		Total	49.13	7.745	16
	Medium ACEs	Female	49.11	7.467	35
		Male	50.91	8.490	35
		Total	50.01	7.988	70
	High ACEs	Female	57.16	9.444	37
		Male	58.50	10.041	26
		Total	57.71	9.638	63
	Total	Female	52.89	9.215	80
		Male	53.51	9.851	69
Cognitive Regulation Index	No ACEs	Female	46.13	8.149	8
		Male	49.88	7.511	8
		Total	48.00	7.815	16
	Medium ACEs	Female	50.57	11.966	35
		Male	53.94	9.643	35
		Total	52.26	10.921	70
	High ACEs	Female	57.59	9.725	37
		Male	61.00	10.214	26
		Total	59.00	9.992	63
	Total	Female	53.38	11.303	80
		Male	56.13	10.334	69

Global Executive Composite	No ACEs	Female	47.13	7.846	8
		Male	48.88	6.534	8
		Total	48.00	7.033	16
	Medium ACEs	Female	47.11	13.830	35
		Male	52.51	8.873	35
		Total	49.81	11.851	70
	High ACEs	Female	57.43	8.598	37
		Male	60.38	9.839	26
		Total	58.65	9.171	63
Total	Female	51.89	12.176	80	
	Male	55.06	9.901	69	

Hypothesis 1

To test the first hypothesis, that there would be a positive correlation between number of self-reported ACEs via the Philadelphia ACEs and the number of self-reported deficits in executive functions via the BRIEF-2 in adolescents ages 14 through 18, a correlational analysis was conducted. There was a medium positive correlation between Total ACEs and the GEC score on the BRIEF-2 ($r = .445, p < .001$), suggesting that individuals who experience more adversity also experience greater global executive function deficits. Medium positive correlations were found at all three indexes between Total ACEs and BRI ($r = .415, p < .001$), ERI ($r = .449, p < .001$), and CRI ($r = .393, p < .001$). These results suggest that individuals who experience more adversity also experience greater challenges with overall behavior regulation, emotion regulation, and cognitive regulation as outlined in Table 4.

Table 4

Correlations between Total ACE Score and Executive Function

		Behavioral Regulation Index	Emotional Regulation Index	Cognitive Regulation Index	Global Executive Composite
Total ACE Score	Pearson Correlation	.415**	.449**	.393**	.445**
	Sig. (2-tailed)	.000	.000	.000	.000
	N	149	149	149	149

** Correlation is significant at the 0.01 level (2-tailed)

A correlational analysis was also conducted to determine the relationship between Total ACEs and each of the seven subscales of the BRIEF-2. For each of these subscales, a medium positive correlation was indicated and significant at the .001 level. This included Inhibition ($r = .423$), Self-Monitoring ($r = .353$), Shift ($r = .360$), Emotional Control ($r = .409$), Task Completion ($r = .358$), Working Memory ($r = .357$), and Plan/Organize ($r = .378$). These results are illustrated in Table 5.

Table 5

Correlations between Total ACE Scores and Executive Function Subscales

		Inhibitio n	Self- Monitorin g	Shift Control	Emotiona l Control	Task Completio n	Workin g Memor y	Plan/ Organiz e
Total ACE Score	Pearson Correlation	.423**	.353**	.360*	.409**	.358**	.357**	.378**
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.000
	N	149	149	149	149	149	149	149

** Correlation is significant at the 0.01 level (2-tailed)

A total Philadelphia ACE score was calculated using the same criteria of the original Philadelphia ACE study and is further outlined in Appendix H. Emotional abuse was determined to be an ACE if either one of the two questions used to measure it (“While you were growing up, how often did a parent, stepparent, or another adult living in your home swear at you, insult you, or put you down? . . . act in a way that made you afraid that you would be physically hurt?”) was indicated as occurring more than once. Similarly, physical abuse was calculated as an ACE if at least one of the two questions used to measure it (“While you were growing up, did a parent, stepparent, or another adult living in your home push, grab, shove, or slap you? . . . hit you so hard that you had marks or were injured?”) was indicated as being experienced at least once. Sexual abuse was also measured by use of two questions (“During the first 18 years of life, did an adult or older relative, family friend, or stranger who was at least five years older than yourself ever touch or fondle you in a sexual way or have you touch their body in a sexual way? . . . attempt to have or actually have any type of sexual intercourse, oral, anal, or vaginal with you?”), in which the response of ‘yes’ on either question indicated an ACE of sexual abuse. Emotional neglect was measured with one item (“There was someone in your life who helped you feel important or special.”) and was determined to be an ACE if the participant indicated that this item was “rarely true” or “never true.” An ACE for physical neglect was earned for responses including “very often true,” “often true,” and “sometimes true” for the item, “Your family sometimes cut the size of meals or skipped meals because there was not enough money in the budget for food.” Domestic violence was measured using two questions (“How often, if ever, did you see or hear in your home a parent, stepparent, or another adult who was helping to raise you being

slapped, kicked, punched, or beaten up? . . . hit or cut with an object, such as a stick, cane, bottle, club, knife, or gun?”). If a response of “many times” or “a few times” was indicated on either or both questions, this was calculated as one ACE. An ACE for household substance abuse was earned if the participant indicated “yes” to either of the two questions exemplifying this category (“Did you live with anyone who was a problem drinker or alcoholic? . . . used illegal street drugs or who abused prescription medications?”). Similarly, if “yes” was indicated for either of the two questions for household mental illness (“While you were growing up, did you live with anyone who was depressed or mentally ill? . . . anyone who was suicidal?”), another ACE point was earned. A response of “yes” indicated an ACE score for having an incarcerated household member with the question, “Did you live with anyone who served time or was sentenced to serve time in a prison, jail, or other correctional facility?” For having witnessed violence (“How often, if ever, did you see or hear someone being beaten up, stabbed, or shot in real life?”), a response of “many times” or “a few times” indicated an ACE. An ACE point was earned for having felt discrimination if “very often true,” “often true,” or “sometimes true” was indicated for the question, “While you were growing up, how often did you feel that you were treated badly or unfairly because of your race or ethnicity?” Answering “some of the time” or “none of the time” to either of the two adverse neighborhood experience questions (“Did you feel safe in your neighborhood? . . . Did you feel people in your neighborhood looked out for each other, stood up for each other, and could be trusted?”) yielded an ACE point. For having been bullied (“How often were you bullied by a peer or classmate?”), an ACE was earned for the responses “all of the time” or “most of the time.” Finally, having lived in foster care (“Were you ever in foster care?”) counted as one ACE point if “yes” was indicated. For unknown

reasons, the Philadelphia ACE Study omitted question 14 from grouping and analysis. It the group (i.e., witness violence, domestic violence) intended for this question was also unclear. In order to utilize the same measures, this study omitted from grouping and analysis, “How often, if ever, did you see or hear a parent, stepparent, or another adult who was helping to raise you being yelled at, screamed at, sworn at, insulted or humiliated?” Therefore, a total score range of 0 to 14 Philadelphia ACEs (Total ACEs) could be obtained from 21 questions.

Hypothesis 2

Three new categorical variables were created to assist in analyzing the second hypothesis, that there would be specific types of self-reported executive function deficits more commonly associated with self-reported increased Philadelphia ACE scores.

Participants were grouped into a No Trauma group, Medium Trauma group, or High Trauma group utilizing the same criteria as the original Philadelphia ACE Study, though the Philadelphia ACE Study did not use these grouping labels. Grouping criteria included zero total ACEs for the No Trauma group, one to three total ACEs for the Medium Trauma group, and four or greater total ACEs for the High Trauma group.

To begin, a multivariate analysis of variance (MANOVA) was computed to compare the three trauma groups with the three indexes (BRI, ERI, CRI), and composite (GEC) of the BRIEF-2. The MANOVA indicated a statistically significant difference in executive function based on trauma groups, *Wilks' $\lambda = 5.211, F(8,286), p < .001$* . Next, a univariate analysis of variance (ANONVA) was used to determine specific differences within the trauma groups, as shown in Table 6.

Table 6

Executive Function Indexes and Composite in Trauma Groups

Executive Function Category	Trauma Group			<i>F</i> <i>df</i> (2,146)
	No Trauma	Medium Trauma	High Trauma	
Behavioral Regulation Index	46.88 _c (2.59)	47.77 _c (1.24)	56.49 _{ab} (9.9)	12.999**
Cognitive Regulation Index	48.00 _c (2.55)	52.26 _c (1.22)	59.30 _{ab} (1.31)	14.914**
Emotional Regulation Index	49.13 _c (2.19)	50.01 _c (1.05)	57.83 _{ab} (1.12)	10.951**
Global Executive Composite	48.00 _c (2.56)	49.81 _c (1.22)	58.65 _{ab} (1.31)	14.478**

Note: Standard deviations appear in parentheses below means. Means with differing subscripts within rows are significantly different at the $p < .01$ based on Bonferonni's comparison post hoc paired comparisons.

* = $p \leq .01$

** = $p \leq .001$

Compared to the No Trauma group, the High Trauma group demonstrated more statistically significant deficits the GEC ($p < .001$), BRI ($p < .001$), ERI ($p < .001$), and CRI ($p < .001$). Similarly, the High Trauma group demonstrated more deficits in each of these areas, GEC ($p < .001$), BRI ($p < .001$), ERI ($p < .001$), and CRI ($p < .001$) when compared to the Medium Trauma group. This suggests that adolescents with four or more ACEs are significantly more likely than their peers with three or fewer ACEs to demonstrate greater deficits with overall executive functioning, ability to regulate and monitor behavior

effectively, ability to regulate emotional responses and response to changing situations, and ability to control and manage cognitive processes and problem solve effectively.

To determine whether increased Philadelphia ACE scores had an impact on any of the seven subscales of the BRIEF-2, a MANOVA was computed with the same grouping variables (No, Medium, High Trauma) with each of the BRIEF-2 seven subscales. A statistically significant effect was found on executive functioning for the High Trauma group, $Wilks' \lambda = 3.60, F(14,280), p < .001$. A univariate analysis indicated statistical significance found for all seven executive function subtests of the BRIEF-2, as depicted in Table 7.

Table 7

Executive Function Subscales in Trauma Groups

Executive Function Subtest	Trauma Group			<i>F</i> <i>df</i> (2,146)
	No Trauma	Medium Trauma	High Trauma	
Inhibition	48.75 _c (2.21)	48.26 _c (1.05)	56.13 _{ab} (1.11)	14.165**
Self-Monitoring	45.13 _c (2.78)	49.286 _c (1.33)	55.92 _{ab} (1.40)	8.989**
Shift	49.13 _c (2.42)	51.73 _c (1.16)	57.43 _{ab} (1.22)	7.898**
Emotional Control	49.44 _c (2.27)	48.06 _c (1.09)	56.49 _{ab} (1.15)	14.855**
Task Completion	48.38 _c (2.48)	54.51 _c (1.18)	60.40 _{ab} (1.25)	11.631**
Working Memory	50.06 _c (2.46)	52.46 _c (1.18)	58.13 _{ab} (1.24)	7.416**
Plan/Organize	46.56 _c (2.55)	50.91 _c (1.22)	56.89 _{ab} (1.28)	9.265**

Note: Standard deviations appear in parentheses below means. Means with differing subscripts within rows are significantly different at the $p \leq .05$ based on Bonferonni's comparison post hoc paired comparisons.

* $p \leq .01$

** $p \leq .001$

Compared to the No Trauma group, the High Trauma group demonstrated more deficits on the subscales of Inhibition ($p < .01$), Self-Monitoring ($p < .001$), Shift ($p < .01$), Emotional Control ($p < .001$), Task Completion ($p < .001$), Working Memory ($p < .01$), and Plan/Organize ($p < .001$). Again, a similar pattern was indicated with the High Trauma group demonstrating more deficits than the Medium Trauma group in Inhibition ($p < .001$), Self-Monitoring ($p < .001$), Shift ($p < .001$), Emotional Control ($p < .001$), Task Completion ($p < .001$), Working Memory ($p < .001$), and Plan/Organize ($p < .001$). This suggests that adolescents who have four or more ACEs are more likely than their peers with three or fewer ACEs to demonstrate deficits in a number of domains, including the ability to inhibit, resist, or not act on an impulse and stopping a behavior at the appropriate time (Inhibit), awareness of their effectiveness in problem solving and the impact of their behavior on other people and outcomes (Self-Monitor), moving freely from one situation, activity, or aspect of a problem to another as the circumstances demand (Shift), modulating emotional responses (Emotional Control), beginning tasks or activities and independently generating ideas, responses, or problem solving strategies (Initiate), finishing or completing tasks (Task Completion), holding information in mind for the purpose of completing a task (Working Memory), and managing current and future-oriented task demands (Plan/Organize).

Hypothesis 3

To test the third hypothesis, that there would be specific types of ACEs via the Philadelphia ACEs are associated with specific executive functions deficits, a MANOVA was calculated, as shown in Table 8. For this, the 14 types of trauma on the Philadelphia

ACE were compared to the seven subscales of the BRIEF-2. Only two areas of adversity were correlated with specific executive function deficits.

Table 8

Differences in Executive Function by Trauma Subscale

Variable	Value	F	df	p
Emotional Abuse	.962	.445 ^a	11.000	.933
Physical Abuse	.920	.979 ^a	11.000	.469
Sexual Abuse	.951	.581 ^a	11.000	.841
Emotional Neglect	.938	.746 ^a	11.000	.692
Physical Neglect	.895	1.322 ^a	11.000	.220
Domestic Violence	.928	.875 ^a	11.000	.567
Household Mental Illness	.950	.599 ^a	11.000	.827
Household Substance Abuse	.951	.583 ^a	11.000	.840
Incarcerated Household Member	.875	1.608 ^a	11.000	.104
Foster Care	.933	.804 ^a	11.000	.636
Felt Discrimination	.915	1.046 ^a	11.000	.410
Adverse Neighborhood Experience	.838	2.184 ^a	11.000	.019
Bullied	.782	3.146 ^a	11.000	.001
Witnessed Violence	.864	1.774 ^a	11.000	.065

^a exact statistic

Adverse neighborhood experiences. Participants who reported that they did not feel safe in their neighborhoods or believe that people in their neighborhoods looked out for each other, stood up for each other, and could be trusted some or none of the time (adverse neighborhood experiences) yielded a significant differences from those who did not indicate neighborhood safety concerns, *Wilks' λ* = 2.184, *F*(11,124), *p* = .02. Using a univariate analysis, participants who indicated a positive ACE score for an adverse neighborhood experience (ANE) were more likely to demonstrate deficits in the subtests of Shift (*p* < .001), Task Completion (*p* < .01), and Working Memory (*p* < .05). This indicates that students who

had one or more ANE were more likely to struggle with moving freely from one situation, activity, or aspect of a problem to another as the circumstances demand (Shift); were more likely to have difficulties finishing or completing tasks appropriately and/or in a timely manner (Task Completion); and were more likely to have challenges holding information in mind for the purpose of completing a task, encoding information, or generating goals, plans, and sequential steps to achieving goals (Working Memory).

The analysis also indicated a positive correlation between ANE and ERI ($p < .01$). This suggests that these participants struggle more than their peers with regulating emotional responses and shifting set or adjusting to changes in environment, people, plans, or demands.

Being bullied. Participants who reported that they were bullied by a peer most or all of the time (Being Bullied) demonstrated a significant difference in task completion in contrast to those who did not identify having been bullied, $Wilks' \lambda = 3.146, F(11,124), p = .001$. This finding suggests that adolescents who are bullied are more likely to have difficulties finishing or completing tasks appropriately and/or in a timely manner.

Hypothesis 4

To analyze the final hypothesis, that males and females would differ with regard to executive function deficits when considering trauma exposure, a MANOVA was computed to examine gender differences in the No, Medium, and High Trauma groups on any of the three executive function indexes (BRI, ERI, and CRI) or executive function composite (GEC). Table 9 outlines no statistically significant interaction between gender and ACE ranges (No/Medium/High groups), $Wilks' \lambda = .501, F(8,280), p = .855$. Similarly, there was not a statistically significant effect for gender for the BRI, ERI, CRI, or GEC, $Wilks' \lambda =$

1.023, $F(14,140)$, $p = .398$, indicating that gender did not play a significant role in the relationship between trauma and executive function deficits.

Table 9

Gender and ACE Ranges Multivariate Tests^a Using Wilk's Lambda

Effect	Value	<i>F</i>	Hypothesis <i>df</i>	Error <i>df</i>	Sig.
Intercept	.029	1167.532 ^b	4.000	140.000	.000
Ranges	.750	5.408 ^b	8.000	280.000	.000
Gender	.972	1.023 ^b	4.000	140.000	.398
Ranges * Gender	.972	.501 ^b	8.000	280.000	.855

a Design: Intercept + Ranges + Gender + Ranges * Gender

b Exact statistic

Chapter 5

DISCUSSION

Summary of Findings

The purpose of this study was to determine the relationships between adversity and executive functions as self-reported by high school aged students. The frequency of ACEs in individuals younger than 18 have not been reported by adolescents themselves; rather, parent/guardian reporting and reflective reporting was utilized. This study offered unique insight into the adverse experiences of adolescents ages 14 through 18, as well as the significant relationship these experiences have with executive functioning. By assessing self-reported ACEs in an adolescent population, this research has contributed new frequency statistics to consider, as all other self-report ACE research has been conducted with adults. Furthermore, there appears to be no existing research on the self-reported executive function deficits as they relate to trauma. Each research question will be explored in depth below.

To what extent is the number of self-reported ACEs via the Philadelphia ACEs and self-reported executive functions deficits related in adolescents ages 14 through 18?

There was a significant positive, medium correlation found between Total ACEs and the GEC. Although specific research is minimal regarding ACEs and overall executive dysfunction, past research has illustrated the importance of healthy development of lower brain functions—including of the stress centers of the brain—to allow for full and appropriate development of the frontal lobes and neocortex (Gogtay et al., 2004; Gogtay & Thompson, 2010; Perry, 2000a; Shaw et al., 2008). This contribution is important, as these self-reported correlations have not yet been made in existing research. With an understanding that childhood adversity has such a significant relationship with executive

functioning, researchers may choose to use this information for further examination.

Although it may be hypothesized that these adverse experiences caused the executive function deficits, determining causation was beyond the scope of this study. Key players in children's lives, including parents, school staff, and community agencies may also incorporate these findings in understanding the experiences of children and the challenges they endure. In the vulnerable population of traumatized adolescents, understanding the likelihood that having executive function deficits adds to the complexity of their experiences and reliance for adult intervention to support healthy development and remediation of impairment.

Are there types of self-reported executive functions deficits more commonly associated with self-reported increased Philadelphia ACE scores?

Similar to other dose-dependent findings in past research (Felitti et al., 1998; Ford et al., 2014; P., 2013), the High Trauma group (reporting at least four ACEs) was the group with the most deficits in this study. Specifically, the High Trauma group reported several elevated areas of the BRIEF-2 that significantly differed from their No or Medium Trauma group peers. These included elevations on three indexes: BRI, ERI, and CRI. All seven subscales of the BRIEF-2 were elevated within this group. This contribution to the research is unique, as it provides a new range of connecting variables than previous research. Spann and colleagues (2012) also found that increased higher rates of childhood trauma were linked to executive function challenges, specifically perseverative errors; however, this present results suggest that experiencing four or more ACEs has a much stronger negative correlation with executive functioning. This is particularly important for prevention and intervention response, as parents, teachers, providers, and other community supports can glean a clear

need for differentiating support. Adolescents who have four or more ACEs may require either trauma intervention or executive function intervention in order to be successful in school. In addition, with the understanding that the most significant executive function deficits occur in those with multiple forms of adversity, it may be important to focus preventative efforts in those with three or fewer ACEs.

Are there different types of self-reported Philadelphia ACEs associated with specific self-reported executive function deficits?

Two specific types of trauma on the Philadelphia ACE Survey, including endorsing an adverse neighborhood experience (ANE) and having been bullied, were correlated with specific executive function deficits. Adolescents who reported ACEs for ANE were more likely than their peers without ANEs to struggle with the executive function areas of Shift, Task Completion, Working Memory, and Emotional Regulation (ERI). Adolescents who reported ACEs for being bullied were more likely to experience Task Completion deficits compared to their non-bullied peers. This supports previous research suggesting that there are particular types of trauma that are correlated with specific types of executive dysfunction (Beers & De Bellis, 2002; DePrince, Weinzierl, & Combs, 2009; Kirke-Smith et al., 2014). Nevertheless, there were several differences between the findings of this study and Jenkins, Demaray, and Tennant (2017). Although in this study there was just one elevated area (Task Completion) on the BRIEF-2 correlated with being bullied, Jenkins, Demaray, and Tennant found elevated areas in attention, emotional regulation, flexibility, inhibitory control, initiation, organization, planning, self-monitoring, and working memory of the CEFI. Hughes, Roman, Hart, and Ensor (2013) found that chronicity of experiencing household mental illness was significantly linked with poorer executive function in later years for the

child; however, the current study found no such correlation. The specificity of the findings in this study may help inform appropriate intervention for specific populations. Furthermore, future research may use this as comparative information in a variety of research topics including but not limited to trauma and adversity, executive function, and school/community-based intervention.

Do males and females differ with regard to executive function deficits when considering trauma exposure?

In this study, there were no gender differences in executive function deficits when considering trauma exposure. This is important, as previous trauma research has indicated differences in types and rates of trauma exposure between males and females (Felitti et al., 1998; Kilpatrick et al., 2013; P., 2013, Felitti et al., 1998). The BRIEF-2 also utilizes gender norms, as executive functions differ by gender (Gioia et al., 2015). Although these gender differences have been documented in the Philadelphia ACE Survey (P., 2013) and BRIEF-2 (Gioia et al., 2015), this study was unable to identify gender as a mediator between trauma exposure and executive functioning. This may be an important area for further research, as there were several important limiting factors which may have impacted the results.

Limitations

There are significant limitations within this study that are important to consider. The first is that although there are significant correlations between adversity and executive functions, causality cannot be assumed. Brain development, adversity, resiliency, and executive dysfunction continue to be richly complex topics that will likely require many more years of research to truly understand.

Despite significant results within this study, there remains much to learn from a larger sample size and alternative geographical locations. There were several differences in the reported rates of adversity in this studied sample compared to the surveyed Philadelphia sample. Increasing sample size may help to improve analyses, particularly with more the detailed correlational analyses, such as the specific types of adversity associated with the specific types of executive function deficits. As discussed previously, there have been some indications that foster care is correlated with inhibition challenges; however, merely six adolescents reported being in foster care, and these participants did not show any deficits in inhibition or any other specific area of executive functioning. It also remains unclear why there are some areas of adversity that are comparable to the Philadelphia ACE Study rates (e.g., household substance Abuse, emotional abuse), whereas others are much higher (e.g., ANE, household mental illness) or lower (e.g., felt discrimination, sexual abuse). The fourth hypothesis may have also suffered from a small sample size, as the surveyed group was divided by gender and then by trauma type to examine executive function deficits. By the time this was reduced, there were not many participants from which to make a conclusion.

Another challenge of this study was the use of specific operational definitions for both executive functions and trauma. As previously discussed, there is ample disagreement about the constitution of trauma and executive functions. Although the Philadelphia ACE Survey demonstrated an expanded conception of trauma as compared to the CDC-Kaiser study, there are other individual factors that may be considered traumatic that are not included in this tool. Some examples of this may include natural disasters, death of a loved one, accidents, or health problems/conditions. Similarly, various definitions, conceptualizations, and measurements of executive functions are prominent in the literature.

Methods by which executive functions are measured, such as the use of self-report versus task performance, may account for some of the resultant variance from previous studies.

Some researchers argue that abnormalities within the amygdala and dorsal anterior cingulate cortex may contribute to an individual's ability to buffer the negative effects of trauma (Admon, Milad, & Hendler, 2013). The correlational results of this study may not accurately account for predisposed challenges that may be influencing executive dysfunction. Other factors, such as parenting style, were not controlled for and have demonstrated significant positive effects on executive functioning as demonstrated in the research by Stambach, Hawes, and Meredith (2017). Furthermore, mental health diagnoses such as anxiety (Romine et al., 2004; Toren, Bucciarelli, & Tannock, 2008) and depression (Holler, Kavanaugh, & Cook, 2014) have been linked with executive function challenges. This is of particular importance, as anxiety and depressive disorders are common outcomes for those who have experienced trauma. Mental health diagnoses were not controlled for within this study and, therefore, are additional limitations. It is unclear whether self-reported executive function weaknesses for these individuals are pre- or post-trauma, and the degree to which these variables interact is also unclear.

Time of trauma occurrence has been linked consistently with differential outcomes in mental health, behavior, and brain development. Although it is clear that the ACEs occurred before age 18 for these participants, this study neglects to specify at what age each trauma occurred. As reviewed briefly in Chapter 2, the time at which trauma is experienced yields differing executive function outcomes. Moreover, severity of trauma exposure may also be of importance, as indicated by chronicity of maternal depression (Hughes, Roman, Hart, & Ensor, 2013), and was not controlled for in this study.

There were many students who either opted out of participation or who were absent from school on the days of survey. This resulted in a reduced sample size, as well as a potentially skewed group of participants. It is unclear what, if any, differences may exist between the students who volunteered to complete the survey versus those who did not. Further, a small number of students were opted-out by parents/guardians, which also removed a portion of the population who may have had experiences of abuse and/or executive function issues that were unable to be accounted for due to lack of participation. Additionally, students who may also exhibit higher dysfunction, such as truant students or students in outside agencies (e.g., mental health hospital, homebound education, incarceration), were missing from study participation, potentially skewing results.

Although the BRIEF-2 offered three validity indexes (i.e., inconsistency, negativity, infrequency), these scales were not utilized to screen out any protocols that may have had validity issues. Additionally, although precautions were taken to provide a level of privacy while completing the surveys, it is possible that some participants answered untruthfully, as they were seated in a cafeteria with their peers. The validity of self-report and susceptibility to bias has been a longstanding area of criticism within the field of psychological research (Balakrishnan, 1999; Fan et al., 2006). Challenges with self-report are particularly important to consider because the entirety of this study was based on self-report methodology.

Finally, many researchers suggest that there is significant importance in controlling for resiliency or protective factors when considering trauma and executive function deficits (Bethell et al., 2017; Hillis et al., 2004; Poole, Dobson, & Pusch, 2017). ACEs are common, and do not doom the fate of children. Although ACEs may begin to stack odds against children, it is thought that protective factors such as nurturing parenting styles, stable family

relationships, access to healthcare and social services, and caring adults outside of the family unit buffer the negative effects of adversity and trauma (Perry, 2000a; PBS, 2016).

Reflecting on the plasticity of the brain and research regarding resiliency, there is much hope that children can overcome the toxic effects of adversity.

Clinical Implications

This study revealed important insight into the self-reported adverse experiences and executive dysfunction in adolescents between the ages of 14 and 18 years. The results of this study are particularly important for consideration within school and community settings to support children who have experienced trauma. As multi-tiered systems of support (MTSS) continue to refine within the school setting, so does the accessibility and appropriateness of intervention for children. Students with elevated (at least four ACEs) may benefit greatly from group or individualized supports for trauma-focused cognitive behavioral therapy, mindfulness training, executive function skills training, and psychoeducation. All children, and particularly those who have elevated ACE scores, may benefit from having one safe, responsive, and supportive adult in their lives (Bucci et al., 2016; PBS, 2016). Similar to findings from the Philadelphia ACE Study (2013), the results of this study indicated that ACEs are common. It may be helpful for parents, teachers, administrators, and other key adults in a children's lives to understand the link between adversity and executive dysfunction as well as be provided education on ways to help these children and adolescents. The prevailing message from this research echoes that of other trauma research: prevention is key (Fazel, Hoagwood, Stephan, & Ford, 2014; Gonzalez, Monzon, Solis, Jaycox, & Langley, 2016). Schools play a significant role in prevention and intervention, as supporting the well-being of students improves their ability to learn. The term *trauma-informed care*

has gained popularity in recent years across many settings, including schools, medical facilities, and mental health treatment centers (Substance Abuse and Mental Health Services Administration [SAMHSA], 2015). There are multiple pathways in which an agency or facility may become trauma-informed, as this term represents the adoption a systematic approach to the realization of the widespread prevalence and impact of trauma, a recognition of the signs of traumatic exposure, and a response grounded in evidence-based practices that resists re-traumatization of individuals (SAMHSA, 2015). Trauma-informed schools often focus on training teachers, administrators, counselors, and other staff to understand what trauma is, how it manifests in the school setting, how it impacts students, and approaches in which school staff can support these students (Overstreet & Chafouleas, 2016).

With the finding in this study that No Trauma and Medium Trauma groups did not display the significant executive function challenges that the High Trauma group did, screening children for trauma may help schools prioritize the level of need their students may have (Gonzalez et al., 2016). For students with one to three ACEs, schools may consider tier 2 services through MTSS teams or problem solving intervention. With the knowledge that these students may incur more trauma in future years, preventative efforts with small groups may be of benefit. Cognitive Behavioral Intervention in Schools (CBITS) may be used as an intervention modality in either small groups for tier 2 students or individually for students who have four or more ACEs (Ringle, 2016). This evidence-based modality focuses on reducing symptoms of PTSD, depression, and behavioral problems, and to improve functioning, grades and attendance, peer and parent support, and coping skills (Ngo et al., 2008). Although having more structured one-on-one adult relationships may be beneficial for some students (Hostinar et al., 2014; PBS, 2016), it is also important for schools to

consider the feasibility of this demand, particularly when considering the high prevalence of ACEs. Partnering trauma screening with universal interventions such as trauma-informed training and secondary and tertiary interventions such as CBITS may be a comprehensive solution for the full spectrum of prevention and intervention in the school setting.

Although schools are a tremendous resource of safety, stability, and healing, communities may also benefit from understanding the results of this study. One ACE, ANE, was by far one of the most frequently experienced forms of adversity in this population. The improvement of neighborhood safety and trust in neighbors is particularly suited for community intervention. Furthermore, challenges with Shift, Task Completion, Working Memory, and the ERI for adolescents with ANE are likely experienced across settings, as these were significant. Any one or more challenges with these executive function skills may contribute negatively to an individual's ability to become self-sufficient and independent.

Future Directions

Replication of this study could provide valuable information about the adversity experienced by adolescents as well as adversity's relationship to executive functioning. Future research may be conducted with the consideration of limitations reviewed in this study, including an increase in sample size. This may be of particular help for detailed analysis of specific types of trauma as they relate to specific types of executive function deficits. Addition of parent and/or teacher rating scales would also provide insight into potential executive functioning of adolescents who are unaware of their challenges or view their challenges as typical.

Controlling for BRIEF-2 validity issues may be of significant benefit to reduce the likelihood of participants' negativity, inconsistency, or infrequency. Furthermore, it may be

of benefit to extend the validity reports from the BRIEF-2 to the Philadelphia ACE, as the validity issues may be generalized to both protocols. Using this level of precaution holds potential to improve validity of trauma rate results.

Adding more specific timing of adversity exposure may be an informative addition to this research. As sensitive periods in brain development and adversity combine, it may be beneficial to better understand how these interact with executive function. Future research involving the self-reported experiences of teenagers, including trauma and executive functioning, may also benefit from assessing their resiliency and protective factors. This may aid in understanding the extent to which the relationship between adversity and executive function can be mediated or moderated by resiliency.

With these results of this study in mind, the school in which this study was completed is currently developing a strategic plan to become a trauma-informed school. Thus far, this has included the review of potential trauma-informed training programs and opportunities appropriate for the school setting, such as the Compassionate Schools Model (Compassionate Schools, 2018) and the Neurosequential Model in Education (NME, n.d.). In addition to reviewing the results of this study with district administration and the principal of the school building, the school staff was provided a brief presentation on prevalence and a brief synopsis of the negative consequences of executive dysfunction and adversity. Staff were then provided a survey link to elicit preferences for training styles (e.g., who the trainer is, times of training) for becoming a trauma-informed building. Trauma-informed planning, training, and consideration for policy change will likely continue within this building and are hoped to be expanded to a larger audience, such as district or state levels.

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Appendix A

Philadelphia ACE Survey

FOR Questions 1-4: While you were growing up, that is during your first 18 years of life...

1. Did you feel safe in your neighborhood?

- 1 All of the time
- 2 Most of the time
- 3 Some of the time
- 4 None of the time

2. Did you feel people in your neighborhood looked out for each other, stood up for each other, and could be trusted?

- 1 All of the time
- 2 Most of the time
- 3 Some of the time
- 4 None of the time

3. How often were you bullied by a peer or classmate?

- 1 All of the time
- 2 Most of the time
- 3 Some of the time
- 4 None of the time

4. How often, if ever did you see or hear someone being beaten up, stabbed, or shot in real life? Would you say...?

- 1 Many times

2 A few times

3 Once

4 Never

Now please think about your childhood, in general, not just your neighborhood or community.

FOR Questions 5-6: While you were growing up, during your first 18 years of life, how true were each of the following statements?

5. There was someone in your life who helped you feel important or special. Was this...?

1 Very often true

2 Often true

3 Sometimes true

4 Rarely true

5 Never true

6. Your family sometimes cut the size of meals or skipped meals because there was not enough money in the budget for food. Was this...?

1 Very often true

2 Often true

3 Sometimes true

4 Rarely true

5 Never true

Sometimes people are treated badly, not given respect, or are considered inferior because of the color of their skin, because they speak a different language or have an accent, or because they come from a different country or culture.

7. While you were growing up during your first 18 years of life how often did you feel that you were treated badly or unfairly because of your race or ethnicity? Would you say...

- 1 Very often true
- 2 Often true
- 3 Sometimes true
- 4 Rarely true
- 5 Never true

Again, I want to remind you that the next questions refer to the time period while you were growing up in your first 18 years of life. During your first 18 years of life:

8. Did you live with anyone who was depressed or mentally ill?

- 1 Yes
- 2 No

9. Did you live with anyone who was suicidal (IF NECESSARY: during your first 18 years of life)?

- 1 Yes
- 2 No

10. Did you live with anyone who was a problem drinker or alcoholic?

- 1 Yes
- 2 No

Still looking back to your first 18 years of life...

11. Did you live with anyone who used illegal street drugs or who abused prescription medications?

1 Yes

2 No

12. Did you live with anyone who served time or was sentenced to serve time in a prison, jail, or other correctional facility?

1 Yes

2 No

13. Were you ever in foster care?

1 Yes

2 No

Sometimes physical blows occur between parents or other adults in the house. FOR Q14-Q16: While you were growing up, that is during your first 18 years of life...

14. How often, if ever, did you see or hear a parent, step parent or another adult who was helping to raise you being yelled at, screamed at, sworn at, insulted or humiliated? Would you say...

1 Many times

2 A few times

3 Once

4 Never

15. How often, if ever, did you see or hear in your home a parent, step parent or another adult who was helping raise you being slapped, kicked, punched or beaten up?

1 Many times

2 A few times

3 Once

4 Never

16. How often, if ever, did you see or hear a parent, step parent or another adult who was helping to raise you being hit or cut with an object, such as a stick or cane, bottle, club, knife, or gun?

1 Many times

2 A few times

3 Once

4 Never

Sometimes parents or other adults hurt children.

While you were growing up, that is during your first 18 years of life, how often, if ever, did a parent, step-parent, or another adult living in your home...

17. Swear at you, insult you, or put you down?

1 More than once

2 Once

3 Never

How often, if ever, did a parent, step-parent, or another adult living in your home...

18. Push, grab, shove, or slap you?

1 More than once

2 Once

3 Never

19. Hit you so hard that you had marks or were injured?

1 More than once

2 Once

3 Never

20. Act in a way that made you afraid that you would be physically hurt?

1 More than once

2 Once

3 Never

Some people, while growing up in their first 18 years of life, had a sexual experience with an adult or someone at least five years older than themselves. These experiences may have involved a relative, family friend, or stranger.

During the first 18 years of life, did an adult or older relative, family friend or stranger who was at least five years older than yourself ever...?

21. Touch or fondle you in a sexual way or have you touch their body in a sexual way?

1 Yes

2 No

22. Attempt to have or actually have any type of sexual intercourse, oral, anal, or vaginal, with you?

1 Yes

2 No

Appendix B

Demographic Survey

Please circle your response.

Q. Age: What is your age?

- 14
- 15
- 16
- 17
- 18

Q. Gender: What gender do you identify as?

- Male
- Female
- Other

Q. Grade: What grade are you in?

- 9th
- 9th/10th
- 10th
- 10th/11th
- 11th
- 11th/12th
- 12th

Q. Ethnicity origin (or Race): Please specify your ethnicity.

- White
- Hispanic or Latino
- Black or African American
- Native American or American Indian
- Asian / Pacific Islander
- Other

Appendix C

Exit Survey

Exit Survey (optional)

How comfortable were you completing these questionnaires today?

1 2 3 4 5

Extremely Uncomfortable

Extremely Comfortable

Would you like to talk to someone about anything you shared on these questionnaires today?

Circle Response: Yes No

If so, please provide your name:

Name: _____

Appendix D

3/1/2017

Dear Parent(s)/Guardian(s),

This year, XXXXX High School will be asking for your permission for your student to participate in a survey that will be utilized to improve our school-based practices. Specifically, your child may be selected to answer a variety of questions related to executive skills (e.g. organization, planning, sustained attention, time management, working memory) measured by the BRIEF-2 and a selection of sensitive questions related to traumatic experiences they have endured using select questions from the Philadelphia Adverse Childhood Experiences Survey. The purpose of this survey is for our school administrators to better understand some of the adverse experiences our student body have experienced, related mental and physical health outcomes, and what we can do to better meet the needs of these students to help them achieve success.

Your child's participation in this survey is completely voluntary and anonymous and will not result in any academic gain or consequence. Should you wish to review the questions included on the Philadelphia ACE, please go to: <https://tinyurl.com/PhiladelphiaACE> . All surveys will be kept in a locked file cabinet and are completely confidential. Should you not want your child to participate in this survey, you are asked to email or call Julia Barta via the contact information provided below **by March 6th, 2017**. If your child completes this survey, they will be provided with a selection of mental health services that they may choose to accept or deny. This same list of mental health services has been provided to you within this letter should you have any concerns for your child. You are also welcome to contact myself or our guidance/counseling center with concerns. AIHS will use the results of this survey to better inform our practices as educators to support children who have adverse childhood experiences and/or executive function deficits.

If you have any further questions, or would like to opt your child out of participation in this survey, please contact Julia Barta, School Psychologist, at XXXXXXXX or XXX-XXX-XXXX ext. XXX.

Sincerely,

Julia Barta, Ed.S.
Certified School Psychologist
Doctoral Intern of School Psychology
Problem Solving Team Leader
Building Leadership Team Member

Appendix E

Your child has the opportunity to access free mental healthcare services within our building through Christiana Care's Wellness Center. If you would like to receive a copy of the required paperwork to enroll your child at the Wellness Center, please contact Julia Barta, School Psychologist via email (julia.barta@XXXXXXXXX.com) or phone (XXX-XXX-XXXX ext. XXX).

You may also wish to consider the following services, should you desire additional support for your child.

Christiana Care's Adolescent Bridge Program (no-cost, Spanish services sometimes available) Address: 205 W. 14th Street, Wilmington Phone: (302) 320-2100

Catholic Charities (no-cost, Spanish services available) Address: 2601 W 4th St, Wilmington, DE 19805 Phone: (302) 655-9624

St. Paul's Catholic Church (no-cost, Spanish services available) Address: 1010 W 4th St, Wilmington, DE 19805 Phone: (302) 655-6596

Norman Broudy & Associates (Spanish services available) Address: 825 Washington St, Wilmington, DE 19801 Phone: (302) 655-7110

Mid-Atlantic Behavioral Health

Phone: (302) 224-1400

Newark Office: 910 S. Chapel Street, Ste 102 Newark, DE 19713

Wilmington Office: 3521 Silverside Rd, Ste 2F1 Quillen Building Concord Plaza
Wilmington, DE 19810

Springside Office: 300 Biddle Ave, Ste 207 Conner Building Newark, DE 19702

You may also use the website below to customize a search to find the right therapist for your child and/or family. Search features include: area(s) of expertise, accepted insurance and fees, location, gender, and more. <https://therapists.psychologytoday.com/>

Appendix F

You have been randomly selected to participate in a research study.

What is a research study?

A research study is when people like me collect a lot of information about a certain thing to find out more about it. Before you decide if you want to be in this study, it's important for you to understand why we're doing the research and what's involved.

Please read carefully. You can discuss it with your parents or anyone else. If you have questions about this research, just ask me.

Why are we doing this study?

We are doing this study to find out what types of challenges students have in different environments so that we can improve our supports at school. This study is not part of your school work, and you won't get grades on it.

Why are we talking to you about this study?

We're asking about 400 AIHS students if they would like to participate. We're inviting you to take part because you are enrolled in A.I. High School and have been randomly selected to participate in this study to help us improve staff training and practices to better support students. A letter was mailed home informing your parents of the study and they were provided the opportunity to opt you out of participation. You may also choose to opt-out of participating.

What will happen if you are in this study?

If you agree to be in the study, we will ask you to:

- Answer two questionnaires and two brief surveys

You will be asked to complete a questionnaire called the BRIEF-2 about how you think, feel, and act. This part will take about 15 minutes.

You will be asked to complete a questionnaire called the Philadelphia Adverse Childhood Experiences Survey about challenges and potential trauma you may have endured in your life. This part will take about 10 minutes.

You will be asked to complete a Demographic Survey about some basic personal information. This part will take about 2 minutes.

You will be asked to complete an Exit Survey to help us understand how you felt during today's study and if you would like to talk to someone to receive help. This part will take about 2 minutes.

Total time: The instructions, questionnaire and survey will take about 40 minutes of your time.

Study location: Cafeteria

If you don't want to be in the study, what can you do instead?

If you don't want to be in the study, you may choose to return to class any time. You may wish to remain in the cafeteria while students complete the survey or return to class immediately. You will be sent back to a class with a pass so that you are excused. There are no consequences for not participating.

Are there any benefits to being in the study?

There is no benefit to you personally for taking part in this study. But we hope that the results of the research will help us improve our supports for students. We expect share the results with our staff so that they are more aware of challenges experienced by students and to provide staff training for identified areas of need.

Are there any risks or discomforts to being in the study?

- *You may become uncomfortable or upset answering some of the questions asked today. If you don't want to answer a question, you may choose not to answer it. If you would like to stop completing the questionnaires or surveys at any time, just tell us you want to stop.*
- *You might get bored or tired and decide that you don't want to finish the study questionnaires or surveys. If so, just tell us that you want to stop.*
- *Please raise your hand if you have a question, would like to stop, or would like more privacy to complete your questionnaire/survey. Someone will come to help you.*

How will you protect my privacy?

You are asked NOT to write your name on any of the materials provided to you to protect your privacy. At the end of the questionnaires, there is an *optional* Exit Survey for you to write your name on if you wish to talk to someone. You are not required to put your name on this form and it will be kept separately from the questionnaires you complete. If you choose to write your name on the Exit Survey, you will be seen by a guidance counselor or school psychologist by the end of the day. Therefore, you are the only one who will know your questionnaire belongs to you. If you request to see a guidance counselor or school psychologist, you may choose whether or not to share that you participated in the study. To help protect confidentiality, we will give your study data a code number, and keep it in a file with a password that only the researchers know. The file will be on a computer that only the researchers are allowed to use. The paper documents you complete will be kept in a locked filing cabinet that only the researchers will have access to.

We plan to keep this information for 1 year, in case we or other researchers want to use it later for other studies. But, we will not know which questionnaires are yours, as you are not writing your names on these materials.

Do you have to be in the study?

You do not have to participate in the study. Research is something you do only if you want to. No one will get mad at you if you don't want to be in the study. And whether you decide to participate or not, either way will have no effect on your grades at school.

Do you have any questions?

You can contact Ms. XXXX if you have questions about the study. You can talk to me, or your parents, or someone else at any time during the study.

ASSENT/CONSENT OF PARTICIPANT (14-17/18 years old)

If you decide to participate, we'll give you a copy of this form upon request, to keep for future reference.

If you would like to be in this research study, please sign your name on the line below.

Student's Name/Signature (*printed or written by child*)* _____
Date

Signature of Investigator/Person Obtaining Assent _____
Date

Appendix G

“Good morning! You have all been randomly selected to help our school improve our practices. We would like to ask for your help to better understand the experiences of our students. If you are willing, we would like you to stay for up 40 minutes to complete some multiple-choice questionnaires. You will be excused from class for helping us today. Please take a careful look at the form provided and raise your hand if you have a question. If you are willing to participate, please sign the form and return to myself or (Ms. XXX, Mr. XXX) so we can give you a survey to begin. If you would rather not participate, please return your form so that we can give you a pass back to homeroom.”

Appendix H

Philadelphia Urban ACE Comparison in Studied Population Versus Original Philadelphia ACE Study

Indicator	Philadelphia Urban ACE Survey Question	Frequency in Studied Population (N=149)	Frequency in Original Philly ACE Study (N=1,784)
ABUSE			
Emotional Abuse	While you were growing up how often did a parent, step-parent, or another adult living in your home swear at you, insult you, or put you down? More than once, once, never	34.2% (n=51)	33.2% (n=1,190)*
	While you were growing up how often did a parent, step-parent, or another adult living in your home act in a way that made you afraid that you would be physically hurt? More than once, once, never		
Physical Abuse	While you were growing up did a parent, step-parent, or another adult living in your home push, grab, shove, or slap you? More than once, once, never	43.0% (n=64)	35.0% (n=624)
	While you were growing up did a parent, step-parent, or another adult living in your home hit you so hard that you had marks or were injured? More than once, once, never		
Sexual Abuse	During the first 18 years of life, did an adult or older relative, family friend, or stranger who was at least five years older than yourself ever touch or fondle you in a sexual way or have you touch their body in a sexual way? Yes or no	9.4% (n=14)	16.2% (n=289)

	Attempt to have or actually have any type of sexual intercourse, oral, anal, or vaginal with you? Yes or no		
NEGLECT			
Emotional Neglect	There was someone in your life who helped you feel important or special. Very often true, often true, sometimes true, rarely true, never true	8.7% (n=13)	7.7% (n=136)
Physical Neglect	Your family sometimes cut the size of meals or skipped meals because there was not enough money in the budget for food. Very often true, often true, sometimes true, rarely true, never true	18.8% (n=28)	19.1% (n=340)
HOUSEHOLD DYSFUNCTION			
Domestic Violence	How often, if ever, did you see or hear in your home a parent, step-parent, or another adult who was helping to raise you being slapped, kicked, punched, or beaten up? Many times, a few times, once, never	10.7% (n=16)	17.9% (n=319)
Household Substance Abuse	Did you live with anyone who was a problem drinker or alcoholic? Yes or no	34.2% (n=51)	34.8% (n=620)
	Did you live with anyone who used illegal street drugs or who abused prescription medications? Yes or no		
	While you were growing up did you live with anyone who was		

	depressed or mentally ill? Yes or no		
Household Mental Illness		38.9% (n=58)	24.1% (n=429)
	Did you live with anyone who was suicidal? Yes or no		
Incarcerated Household Member	Did you live with anyone who served time or was sentenced to serve time in a prison, jail, or other correctional facility? Yes or no	21.5% (n=32)	12.9% (n=229)
URBAN ACE INDICATOR			
Witness Violence	How often, if ever, did you see or hear someone being beaten up, stabbed, or shot in real life? Many times, a few times, once, never	45.6% (n=68)	40.5% (n=718)
Felt Discrimination	While you were growing up...How often did you feel that you were treated badly or unfairly because of your race or ethnicity? Very often true, often true, sometimes true, rarely true, never true	25.5% (n=38)	34.5% (n=613)
Adverse Neighborhood Experience	Did you feel safe in your neighborhood? All of the time, most of the time, some of the time, none of the time	51.0% (n=76)	27.3% (n=487)
Bullied	Did you feel people in your neighborhood looked out for each other, stood up for each other, and could be trusted? All of the time, most of the time, some of the time, none of the time		
	How often were you bullied by a peer or classmate? All of the time, most of the time, some of the time, none of the time	8.7% (n=13)	7.9% (n=140)
Lived in Foster Care	Were you ever in foster care? Yes or no	4.0% (n=6)	2.5% (n=44)

*Correction in reported Philadelphia ACE Study n (P., 2013)

