2020

The Effects of Adverse Childhood Experiences on Behavioral Outcomes

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Abstract

This study intends to explore the intersection of two vulnerable populations, early childhood development and risks associated with exposure to adverse childhood experiences (ACEs). This study examines how age plays a role in the long-term relationship between ACEs and internal and external behaviors. This study seeks to answer the question of: How does age influence the relationship between number of ACEs and internal and external behaviors? The participants in this study include those aged 0 – 16 from the National Survey of Child and adolescent Well-Being (NSCAW) dataset. The NSCAW study consists of five waves of data where Wave I and V will be used for the analyses. This study used multiply analyses: simple linear regression, ANOVA, and moderation to answer the research question. There are three main variables used: age, ACEs, and internal and external behavior. Results showed that there was a dose-response relationship between ACEs total score and internal and external behaviors total score. Age does influence the relationship. Examination of an interaction plot indicated that the effects of adversities can be more detrimental to those who are younger in age. Targeted preventions and interventions are needed to help reduce exposure to adversities, reduce the long-term negative health impact, and provide mental health services to those who have experienced adversities.

Document Type

Thesis

Degree Name

M.A.

Department

Quantitative Research Methods

First Advisor

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Keywords

Adverse childhood experiences, ANOVA, Internal and external behavior, Linear regression, Moderation

Subject Categories

Child Psychology | Developmental Psychology | Other Statistics and Probability | Psychology | Statistics and Probability

The Effects of Adverse Childhood Experiences on Behavioral Outcomes

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A Thesis

Presented to

the Faculty of the Morgridge College of Education

University of Denver

In Partial Fulfillment

of the Requirements for the Degree

Master of Arts

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by

Jennifer Thomas

August 2020

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Title: The Effects of Adverse Childhood Experiences on Behavioral Outcomes
Advisor: Elizabeth Anderson
Degree Date: August 2020

ABSTRACT

This study intends to explore the intersection of two vulnerable populations, early childhood development and risks associated with exposure to adverse childhood experiences (ACEs). This study examines how age plays a role in the long-term relationship between ACEs and internal and external behaviors. This study seeks to answer the question of: How does age influence the relationship between number of ACEs and internal and external behaviors? The participants in this study include those aged 0 – 16 from the National Survey of Child and adolescent Well-Being (NSCAW) dataset. The NSCAW study consists of five waves of data where Wave I and V will be used for the analyses. This study used multiply analyses: simple linear regression, ANOVA, and moderation to answer the research question. There are three main variables used: age, ACEs, and internal and external behavior. Results showed that there was a dose-response relationship between ACEs total score and internal and external behaviors total score. Age does influence the relationship. Examination of an interaction plot indicated that the effects of adversities can be more detrimental to those who are younger in age. Targeted preventions and interventions are needed to help reduce exposure to adversities, reduce the long-term negative health impact, and provide mental health services to those who have experienced adversities.

TABLE OF CONTENTS

LIST OF TABLES

CHAPTER ONE: INTRODUCTION

In 2017, there were 3,501,000 children who received an investigation or alternate response from child protective services, which is a 10% increase from 2013 (United States Children's Bureau, 2019, p. 18). Of these 3.5 million children, 673,830 were cases of neglect or abuse (p. 20). Adverse experiences are common. However, in the past researchers often focused on a single type of maltreatment rather than the cumulative effect (Dong et al., 2004; Grasso, Dierkhising, Branson, Ford, & Lee, 2016; Liming & Grube, 2019). By focusing on a single maltreatment, researchers are missing the effect that multiple events can have and are often assuming that the presence of one adversity is the same in all cases whether other adversities are present or not. Researchers need to analyze the co-occurring effects of adverse childhood experiences to gain a better understanding of ACE's long-term effects. Much of the research on co-occurring effects has found a strong dose-response relationship between ACEs and negative health and behavioral outcomes. Negative outcomes can be related to social, emotional, and cognitive impairment (Liming & Grube, 2018), adopting health-risk behaviors, disease and disability, and early death (Felitti et al., 1998).

The early years of life are crucial in influencing a range of health and social outcomes. Children need positive connections and stimulation in the early years to experience positive physical, social, and emotional development. Families and communities often provide these relationships and learning experiences (Shonkoff,

2010). Maltreatment often interrupts this development causing delays where maltreated children often have more social skill deficits and; less academic engagement and perform worse in school (Cprek et al., 2019). Interrupting development has implications across the lifespan, so it is important to understand the long-term and short-term effects adverse exposures can have on one's life. Children who are doing well in school and are sociable will have support from teachers whereas individuals who are aggressive and struggling in school will often be rejected which in turn can result in further adversity (Jaffee, Caspi, Moffitt, Polo-Tomas, & Taylor, 2007). This negative chain needs to be broken so there is a better chance of promoting positive adaptions.

While there needs to be continued research exploring the relationship between early childhood development and the cumulative risks associated with exposure to ACEs, it can often be a hard area in which to conduct research as it is a doubly vulnerable population. Researchers often rely on adult retrospective reports, caseworker reports, and/or caregiver reports. It is highly likely that adverse exposures are underreported, especially in younger children as they may be unable to communicate or vocalize the exposures they have indirectly or directly witnessed (Liming & Grube, 2018). It is also important to note when looking at studies involving adversities that we may not be receiving the full truth as individuals may be unwilling or unable to disclose abuse or maltreatment and caregivers may fear getting in trouble if they report any maltreatment. Caseworker reports are a way to enhance the reliability of caregiver reports, but underreporting can still occur if maltreatment is not observed (Clarkson Freeman, 2014; Cprek et al., 2019). Adult retrospective reports are often unreliable and underestimate the

actual occurrence as stressful experiences in childhood can cause memory impairments that result in an inability to fully recall the adversity (Dube et al., 2004). When data collected does not reflect the full truth, it can be hard to create accurate prevention and intervention services that are unique to adverse experiences.

Since child development is such a vulnerable time, there is a need to develop and implement interventions that are unique to each child's situation. Interventions are needed to help decrease exposure to childhood adversity. Intervention in early childhood is important because; "neurobiology tells us that the later we wait to invest in children who are at greatest risk, the more difficult the achievement of optimal outcomes is likely to be, particularly for those who experience the early biological disruptions of toxic stress" (Shonkoff, 2010, p. 365). Future policies need to recognize that ACEs are related to negative health outcomes as well as future risky behavior, and often are repeated across generations (Liming & Grube, 2018). To reduce the long-term negative health impact these interventions may need collaboration with school systems, social workers, pediatricians, public health organizations, and parents (Cprek et al., 2019). Further research is needed to help those in the medical field understand how social, emotional, and medical problems are related throughout the lifespan (Felitti et al., 1998). There is also a need to create a program that helps promote resilience (Hughes et al., 2017). To aid in this development and adaptation of intervention and prevention services tailored to young children with multiple ACE exposures, further research is needed to understand and examine the connection of adversities within child development.

What this study brings to this field is a uniqueness in analyses. Much of the research around adverse childhood experiences is looking at logistic regression to find the odds of developing that certain behavior or health problem. I am using multiple analyses to reach a conclusion. The variables I am using also add a uniqueness. I am examining how age plays a role in the long-term relationship between ACEs and internal and external behaviors. By including age of individual at time of study, it is helping focus the research on when adversities can be the most detrimental. The literature often lacked a solid example or definition of what early years or early childhood meant. Some of the terms used are "early harmed" referring to 5 and under (Keiley, Howe, Dodge, Bates, & Pettit, 2001, p. 896), "young children (aged 18 to 71 months)" (Kerker et al., 2015, p. 513), and "early childhood" which was later referred to as between 0 and 6 (Liming & Grube, 2018, p. 318). This made it hard to select terms for my hypotheses as there was often not clarity. With this lack of clarity, it led me to look at all the ages possible with the data set. By creating age groups, I was able to examine when adversities may be more detrimental.

LITERATURE REVIEW

Many researchers have focused on a single type of maltreatment in past research which may disregard the likelihood that individuals have experienced recurring or several adversities (Clarkson Freeman, 2014; Dong et al., 2004). The co-occurrence of adverse childhood experiences is common (Dong et al., 2004; Felitti et al., 1998; Dube, Williamson, Thompson, Felitti, & Anda, 2004). In the ACE study conducted by Felitti et al. (1998), they found that more than half of the respondents had experienced at least one adverse childhood exposure. They also found that for individuals who reported to have

any one adverse experience there was a 65-93% probability of exposure to any additional experience, and similarly, the probability of 2 or more additional exposures ranged from 40-74%. In the Dong et al. (2004) study, the researchers found that two-thirds of their participants (67.3%) were exposed to one or more subset of adverse childhood experiences. In a meta-analysis conducted by Hughes et al. (2017) they found across all the studies that 144,725 (57%) of 252,467 participants reported experiencing at least one adverse experience, and 13% of the participants reported experiencing four adversities. These studies show that adverse experiences are common, and that there needs to be a greater understanding of how these events can impact life as most of the world will have experienced at least one adversity in their life (Felitti et al., 1998; Dong et al., 2004; Hughes et al., 2017).

Adverse Childhood Experiences

Adverse experiences involve household dysfunction as well as physical, emotional, and sexual abuse and physical and emotional neglect. Household dysfunction can include mental illness, incarcerated relative, mother treated violently, substance abuse, and divorce. While there are many studies that use these childhood events and many others as categories of an adverse experience, the literature lacks clarity as to what constitutes an ACE. Because of this lack of clear meaning Kalmakis & Chandler (2014) developed an operational definition of ACEs "Adverse childhood experiences are childhood events, varying in severity and often chronic, occurring within a child's family or social environment that cause harm or distress, thereby disrupting the child's physical or psychological health and development (p. 1495)." To clarify this meaning, Kalmakis & Chandler (2014) identified five relevant characteristics: harmful, chronic or recurring,

distressing, cumulative, and varying in severity. Table 1 describes how these characteristics relate to adverse childhood experiences. Figure 1 is Kalmakis & Chandler's (2014) model of adverse childhood experiences. Kalmakis & Chandler's model is showing that the environment surrounding the child that is causing harm (i.e., abuse, neglect, and household disfunction) can vary in number, severity, and frequency where the potential increase in harm and distress leads to a negative impact on a child's health (Kalmakis & Chandler, 2014).

Table 1

Characteristics of Adverse Childhood Experiences

Characteristics	What is it?	Effect on life
Harmful	Harm can result from a lack of a positive experience or a negative experience. Negative harm to the child can come in many forms including intentional physical, psychological, and sexual abuse, as well as neglect (Kalmakis & Chandler, 2014).	Adverse childhood experiences can impact multiple domains of development, which can often result in a variety of emotional and behavioral problems including depression, conduct problems (Grasso, Dierkhising, Branson, Ford, & Lee, 2016), drug abuse, and poor overall health (Liming & Grube, 2018).
Recurring or Chronic	Adverse childhood experiences are often recurring events. Exposure to adversity is often a frequent or prolonged, rather than a single occurrence. Adverse childhood experiences can be a single occurrence, but it often defined as "chronic exposure to hardship over time (Kalmakis & Chandler, 2014, p. 1494)"	Children exposed to multiple or recurring adversity often have an increased likelihood of developing negative health outcomes (Kalmakis & Chandler, 2015; Dube et al., 2010; Felitti et al., 1998). Chronic trauma during childhood affects brain development causing the body to go through changes as it is adapting to the stressors (Kalmakis & Chandler, 2015).
Distressing	Adverse experiences often distress children. Stress is a neurobiological response that can	Prolonged stress has been shown to overwhelm a child's developing immune system

Characteristics	What is it?	Effect on life
	result in distress over time. Adverse childhood experiences are often considered uncontrollable events especially for younger children, which can result in greater distress. Prolonged stress can decrease a child's stress threshold which makes them inclined to adverse reactions (Liming & Grube, 2018).	leaving them vulnerable to chronic health conditions Liming & Grube, 2018; Miller, Chen, & Zhou, 2007). The risk of negative psychological and physical health outcomes is often increased when chronic stress becomes distress (Dube et al., 2009).
Cumulative	The cumulative effect or dose response shows that increase in exposure has an additive effect on health (Kalmakis & Chandler, 2014). People are often experiencing more than one category of ACE, and those individuals often had poorer health in adulthood. The overlap of different adversities can make it more difficult to specify and separate the experiences to determine the effect of one single adversity (Maughan & McCarthy, 1997).	Clarkson Freeman (2014) found that internalized and externalized behaviors, as well as total problems generally increased as the number of ACEs increased. Similarly, Kerker et al. (2015) found for each increase in adverse experiences the likelihood of developing chronic health issues increased by 21%. Kerker et al. (2015) also found that for each increase in adverse experiences the likelihood of having a problem score on the Child Behavioral Checklist increased by 32%.
Varying in Severity	Adverse childhood experiences have also been characterized as varying from less to more severe. Physical and sexual abuse are often considered more severe that others, but witnessing violence often has the same effect on children's development (Kalmakis & Chandler, 2014). A child's individual resilience and support often affect a person's response to adverse experiences.	Each child will have their own interpretation of the situation. Not all individuals who have experienced adversity develop health risk behaviors or psychosocial problems, some individuals show to have stability in functioning and are often referred to as resilient (Poole et al., 2017). Often when there is at least one supportive person or stable caregiver present they can act as a protective factor promoting resilience (Afifi & MacMillan, 2011).

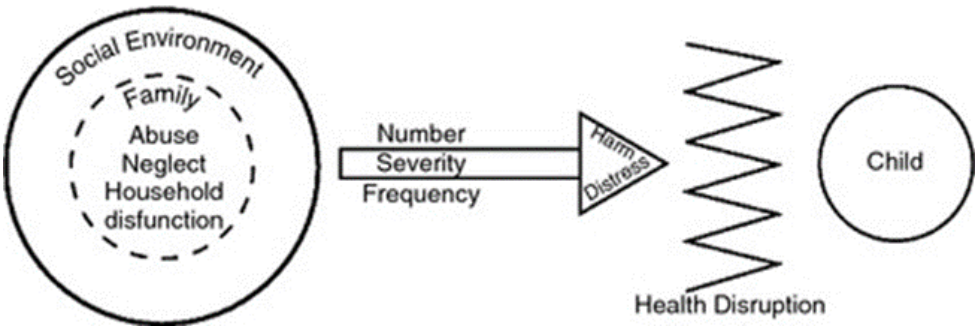

Figure 1. Kalmakis & Chandler (2014) Model of Adverse Childhood Experiences.

The ten adverse exposures mentioned above are the most commonly measured subsets of adverse childhood experiences (Dong et al., 2004; Kerker et al, 2015; Liming & Grube, 2018; Hughes et al., 2017). Some studies often add additional subsets like serious injury/ accident, community/school violence, and traumatic loss (Grasso, Dierkhising, Branson, Ford, & Lee, 2016). Refer to table 2 for the definitions of the ten adversities as well as common questions asked to individuals and some behavioral health outcomes related to each adversity. The behavioral health outcomes mentioned in the table are focused on internal and external behaviors that have been shown to be affected by those characteristics of ACEs. External behaviors are characterized primarily by actions in the external world such as acting out, antisocial behavior, hostility, and aggression. Internalizing behaviors are characterized by processes within the self, including anxiety, somatization, and depression. The definitions of the adversities reflect the work conducted by Felitti et al. (1998), Dong et al. (2004) and Dube, Williamson, Thompson, Felitti, & Anda (2004).

Table 2

Definitions of the Adverse Childhood Experiences

Adverse Experience	Definition	Commonly asked questions	Behavioral Health Outcomes
Physical abuse	If a parent or adult often pushed, grabbed, shoved, slapped, or hit you and left marks.	(Did a parent or other adult in the household…) - Sometimes, often, or very often push grab, slap, or throw something at you? - Ever hit you so hard that you had marks or were injured?	Victims of physical abuse often have more severe behavioral and emotional problems. Some researchers say physically abused youth often experience internalizing problems such as low self-esteem, depression, anxiety, and suicidal ideations. While others will exhibit externalizing behaviors such as conduct disorder, substance abuse, and aggression.
Sexual abuse	If a parent or adult touched or fondled you in a sexual way, had you touch their body in a sexual way, attempted or had sexual intercourse with you.	(Did an adult or person at least 5 years older ever…) - Touch or fondle you in a sexual way? - Attempted oral, anal, or vaginal intercourse with you?	Internalizing behaviors related to sexual abuse are anxiety, depression, and suicidal behaviors, and externalizing behaviors such as greater risk for substance abuse, involvement in the justice system, and future sexual offending.
Emotional abuse	If a parent or adult often swore at, insulted, put you down, or acted in a way that made you afraid you would be physically hurt.	(Did a parent or other adult in the household…) - Often or very often swear at you, insult you, or put you down? - Often or very often act in a way that made you afraid that you might be physically hurt?	Emotional abuse has been shown to have a greater impact on psychological functioning, such as having lower self-esteem. A study found that emotional abuse is predictive of internalizing outcomes.

Adverse Experience	Definition	Commonly asked questions	Behavioral Health Outcomes
Emotional Neglect	If a parent or adult severely and persistently failed to provide a child with support, love, and affection.	Reverse coded questions: - I felt loved. - I knew there was someone there to take care of me and protect me	There is little know about the internalizing and externalizing outcomes of physical and emotional neglect separately. Neglect is related to externalizing outcomes in children such as aggression, violence, school issues, substance abuse, and delinquency.
Physical Neglect	If a parent or adult severely and persistently failed to provide a child with food, hygiene, supervision/care.	I didn't have enough to eat. I had to wear dirty clothes.	Internalizing outcomes related to neglect are low self-esteem, depressive symptoms, and withdrawn and submissive behaviors.
Household mental illness	If a member of the household suffers from a mental illness, depression, or emotional problem and if any household member has attempted suicide.	Was a household member depressed or mentally ill? Did a household member attempt suicide?	Often associated with both internalizing and externalizing outcomes such as anxiety, depression, social withdrawal, aggression, conduct problems, and delinquency.
Household substance abuse	If a member of the household uses and abuses drugs and alcohol.	Live with anyone who was a problem drinker or alcoholic? Live with anyone who used street drugs?	Those who witness substance abuse are often more likely to show externalizing behaviors such as using drugs, displaying problematic behaviors, and aggression. Some internalizing problems can include anxiety and depression.
Mother treated violently	If your mother was pushed, grabbed, slapped, kicked,	(Was your mother or stepmother) - Sometimes often, or very	Exposure to domestic violence can lead to both internal and external outcomes such as low self-

Adverse Experience	Definition	Commonly asked questions	Behavioral Health Outcomes
	hit, or threatened.	often pushed, grabbed, slapped, or had something thrown at her? - Ever threatened with or hurt by a knife or gun?	esteem, depression, anxiety, aggression, and school failure. Exposure to household violence usually co-occurs with other types of abuse, where the chance of experiencing psychosocial problems increases.
Parental separation or divorce	If your parents are separated or divorced.	Were your parents ever separated or divorced?	
Incarcerated household member	If a member of the household has ever gone to prison or jail.	Did a household member go to prison?	Internalized behaviors related to parental incarceration include withdrawal, depression, anxiety, and antisocial behavior. Externalized behaviors can include greater risk of incarceration for the children with incarcerated parents, exhibit academic problems, and behavioral problems such as aggression.

History of ACEs Research

The original Adverse Childhood Experience (ACE) Study conducted by Felitti et al. (1998) paved the way for the field. They undertook the study to assess the long-term impact of adversities on health outcomes in adults. This study consisted of two survey waves among 26,824 adult members of the Kaiser Health Plan, where Wave I had a response rate of 71% (n = 9,508) and Wave II had a response rate of 65% (n = 8,667). They defined adverse childhood experiences to include seven adversities: psychological abuse, physical abuse, sexual abuse, exposure to substance abuse in the household,

mental illness in the household, violent treatment of mother or stepmother in the household, and criminal behavior in the household. The risk factors they used include smoking, drug abuse, alcoholism, severe obesity, physical inactivity, depression, suicide, and risky sexual behaviors. They found that as the number of childhood adversity exposures increased the risk for these factors also increased (Felitti et al., 1998). They also assessed several disease conditions including heart disease, cancer, stroke, COPD, and diabetes. The found that heart disease, cancer, COPD, and poor overall health also had a dose-response effect (Felitti et al., 1998).

Dube, Williamson, Thompson, Felitti, & Anda (2004), used the data from 658 participants in the ACE Study who partook in Wave I and II in order to assess the test-retest reliability. In their study, they added an additional household dysfunction variable of parental separation or divorce for a total of eight adversities. Dube, Williamson, Thompson, Felitti, & Anda (2004) used kappa coefficients, where they found that the test-retest reliability for each question and adversity as well as the overall ACE score showed to be good according to Fleiss (1981) and moderate to substantial according to Landis & Koch (1977).

Dong et al. (2004), used the data from 8,629 participants who partook in Wave II of the ACE Study to analyze the interrelationships among the adversities. They used wave II because it includes additional items on emotional and physical neglect. With these two additions we are now at 10 adversities, which are the most commonly measured adversities and are defined above in Table 2. They found that 86.5% of these participants had experienced at least one adversity in childhood, and 38.5% had

experienced four or more. They found that all 10 of the adversities where significantly associated with each other. They also found that if someone has experienced one adversity, they are 2 to 18 times more likely to experience another. With the cumulative effect, and the commonality and likeliness of the co-occurrence of ACEs it is important to understand the long-term health implications of these events.

Health and Behavioral Problems

The ACE Study demonstrated that adults who experienced adversity as a child were more likely to rate their health as poor and to have health problems as an adult. These health problems can include premature mortality, alcoholism, drug abuse, depression, suicide, heart disease, obesity, cancer, and COPD (Clarkson Freeman, 2014). Adverse experiences often work in a gradient manner in that individuals who experience more adversity will likely have more health and behavioral outcomes. Adverse experiences have also been shown to increase the risk of conduct and behavioral problems as well as mental health problems (Muniz et al., 2019). These can include risky sexual behavior, poor educational outcomes, depression, anxiety, PTSD, lower perceived quality of life, conduct disorder, insomnia, psychological distress, substance abuse, and eating disorders (Muniz et al., 2019; Chapman et al., 2004). Delinquency is one of the negative outcomes that result from adverse experiences. Long-term trauma in childhood can often increase the risk of conduct and behavioral problems (Muniz et al., 2019).

Harmful behaviors like smoking, drinking, and drug abuse are often used as a coping mechanism to alleviate stress and childhood adversity increases the risk of developing dependence on these substances (Merrick et al., 2017). Merrick et al (2017) analyzed the relationship between ACEs and four mental health outcomes: drug use,

alcohol use, depressed affect, and attempted suicide where they found a dose-response relationship between the ACEs and the mental health outcomes. Thornberry, Ireland, & Smith (2001) mentioned that maltreated children can suffer from a variety of developmental discrepancies including externalizing behaviors, disrupted behavior, behavioral and academic problems at school, and depressive symptoms.

Chronic Stress. Experiencing multiple or chronic traumatic events during childhood affects brain development when the autonomic nervous system is overstimulated and the hypothalamic-pituitary-adrenal axis is dysregulated (Kalmakis & Chandler, 2014). Short-term dysregulation of these systems results in behavioral and physical changes, and prolonged dysregulation of these systems can result in stress systems disorders, including allostatic load which is thought to be related to physical and mental diseases throughout an individual's life (Kalmakis & Chandler, 2014). Chronic stress can lead to changes in the development of the endocrine, nervous, and immune systems, which can cause impairment in cognitive, social, emotional functioning (Hughes et al., 2017). Individuals facing chronic stress are occasionally three to four times more likely to develop depression, respiratory infections, and accelerated progression of chronic diseases.

Internal and External Behaviors. The co-occurrence of maltreatment and household dysfunction has been associated with both internal and external problems that can extend into adulthood (Clarkson Freeman, 2014). Externalizing behaviors are problematic outcomes that are manifested in a child's outward behaviors through acting out in the external environment, and internalizing behaviors are those that affect a child's

internal environment and are often psychological (Muniz et al., 2019). Listed above in table 2 are behavioral health outcomes related to each adverse experience taken from Muniz et al. (2019). Clarkson Freeman (2014) found that externalizing behaviors were related to all types of child abuse, domestic violence, and criminality, and that internalizing behaviors were related to neglect and psychological abuse. Chapman et al (2004) found that emotional abuse exhibited the strongest relationship to depression which further supports previous studies showing that emotional abuse can have harmful consequences.

Research shows that some children who are abused are more likely to show internalizing behaviors such as anxiety and depression, while others are more likely to show externalizing behaviors such as violence and aggression (Muniz et al., 2019). Muniz et al (2019) mentioned that it can be unclear why certain abused children externalize their trauma when others internalize. Muniz et al (2019) found that sexual abuse and household mental illness increased the risk of internalizing behaviors and that emotional abuse, physical abuse, household violence, household substance abuse, and household member incarceration increased the odds of externalizing behaviors. This diversity in outcomes can be referred to as multi-finality. Children often have different outcomes depending on their development and their interaction with the event (Thornberry, Ireland, & Smith, 2001).

Child Development

Children face several issues after experiencing abuse. One is having difficulty trusting the abusive adult, or other adults because children often are abused by adults. An important developmental task would be to overcome these trust issues in order to be able

to develop positive relationships with others. If a child is abused by an adult that they live with, they can often live in fear that the event could happen again. Also, those who have witnessed and are treated aggressively may have difficulty adjusting and living a life non-aggressively. Lansford, Malone, Stevens, Dodge, Bates, & Pettit (2006) mentioned physically abused children are often biased when processing social information, where these biases mediate the association between behaving aggressively and being physically abused. A developmental task would be to learn how be less biased when interpreting others' behaviors and learn how to be less aggressive.

Resiliency. Protective and vulnerability factors help promote resiliency and can often help in the accomplishment of these developmental issues. Resilient children, adolescents, and adults were found to have a lower risk of developing mental health problems, have better functioning, and better life outcomes (Meng, Fleury, Xiang, Li, & D'Arcy, 2018). Resiliency is not set in stone; people can be resilient in one area of functioning but not another. Resiliency can vary over time and across developmental phases, resiliency status can change from resilient to non-resilient or vice versa (Afifi & MacMillan, 2011). Since resiliency can fluctuate, it may be an explanation as to why individuals have different responses to adversity.

Age of Exposure. Many studies suggest that the age of exposure is important, where traumatic experiences earlier in childhood have a more significant health impact. Individuals face challenges in affective, biological, and cognitive development stages where successful completing one stage results in moving to the next stage (Jaffe & Maikovich-Fong, 2011). In families with maltreatment there is often a lack of warm

relationships, which can impair a child's ability to develop feelings of self-worth and trust in others, which are essential for successful social and emotional adjustment throughout development (Keiley, Howe, Dodge, Bates, & Pettit, 2001). Insecure and disorganized attachments during early development periods can have more of a detrimental effect than in later development when attachments have already been formed. Younger children can also be at a greater risk for negative outcomes because they do not have the ability to escape the situation or the cognitive, emotional, and physical resources to cope as older individuals do (Liming & Grube, 2018). Keiley, Howe, Dodge, Bates, & Pettit (2001) mention that during the first eight years, a child's social information processing patterns are being formed. Interrupting this development can lead to social problem-solving deficits and hostile attribution biases which are related to aggressive behavior later. Later in age these processes have already developed to where maltreatment may be less detrimental.

While much research points towards worse effects for younger victims, Keiley, Howe, Dodge, Bates, & Pettit (2001) mention a study (Conte & Schuerman, 1987) that suggests physical harm later in life may have more adverse consequences. In this mentioned study by Conte & Schuerman (1987) it is said that abuse of longer duration and that which takes place more frequently is related to more negative effects. This can be because older children have a greater cognitive awareness and self-reflection where they will have the capability to reflect consciously on the meaning of maltreatment. This reflection can lead to internal and external outcomes such as self-blame and anger (Keiley, Howe, Dodge, Bates, & Pettit, 2001). Although there is some evidence that

abuse later in life can be detrimental, more evidence points towards younger children who are still developing. Older children have more control over their environment, have more mature information processing, better senses of self, stable attachment, and have acquired social and cognitive skills necessary to cope with maltreatment better (Keiley, Howe, Dodge, Bates, & Pettit, 2001).

The first five years of life are critical to child development, affecting cognitive, emotional, and social competencies (Cprek, Williamson, McDaniel, Brase, & Williams, 2019; Liming & Grube, 2018). Cprek, Williamson, McDaniel, Brase, & Williams (2019) mention that about 40% of children under the age of five are at risk for some developmental delay. Relationships between childhood adversity and development, social, and behavioral delay have been found and are often related to more social skill deficits, less academic engagement, and poor academic performance (Liming & Grube, 2018; Cprek, Williamson, McDaniel, Brase, & Williams, 2019). Jaffe & Maikovich-Fong (2011) mention that maltreatment originating in infancy and continuing through other developmental periods would be the most detrimental because it interrupts the mastery of developmental tasks leading individuals to be stuck at that stage of development.

Synopsis of Literature Review

Clearly adverse childhood experiences are a vast area that can often be hard to narrow down to a single outcome; therefore, there is a need for continued research to understand why certain individuals experience certain outcomes while others do not. A reason for these differences can come from the five characteristics of ACEs. These characteristics include being harmful, chronic or recurring, distressing, cumulative, and varying in severity. These events often lack a positive experience where there is harm

being caused to the child and can be recurring events that are distressing. Often there is a cumulative effect of adverse experiences where there is an increased likelihood of experiencing more adversities if one has already occurred. This cumulative effect can cause a dose-response relationship where the development of negative behavioral and health outcomes is increased as the number of adversities increases. These negative outcomes include internalized and externalized behaviors as well as health problems.

Timing of exposure has also shown to be important where many researchers have found that there are more detrimental effects on those who are exposed at an earlier age where they may not be able to process information as well, they may not have social or cognitive skills needed to help cope, they're still forming attachments, and cannot escape the situations. While these points are often the consensus in ACE research, events can vary in severity to the individual causing differing outcomes. This variation can come from the interpretation of the event, whether there is at least one stable and supportive individual in their life, and resiliency which can cause individuals to have different outcomes and outlooks. After reviewing this research, I have come to a single research question.

RESEARCH QUESTION & HYPOTHESES

How does age influence the relationship between number of ACEs and internal and external behaviors? With this question I have developed four hypotheses:

1) With an increase in ACEs there will also be an increase in internal and external behaviors.
2) Those who are younger in age at sampling will show to have more internal and external behaviors.

3) Those who are younger in age at sampling will experience more ACEs.
4) Age will influence the relationship between number of ACEs and internal and external behaviors.

CHAPTER TWO: METHODS

Participants

Data used in these analyses comes from the National Survey of Child and Adolescent Well-Being (NSCAW). The NSCAW sample consists of two populations of children: children who are subjects in investigations or assessments by CPS and children who have been in out-of-home care for a year following an investigation. The target population is modified to include "all children in the U.S. who are subjects of child abuse or neglect investigations (or assessments) conducted by CPS and who live in states not requiring agency first contact" (Dowd et al., 2002, p 17). It is not stated whether the investigation was founded or substantiated. The sample was selected using a two-stage stratified sample design. In the first stage the US was divided into nine sampling strata, then within each strata, primary sampling units were formed through random selection. Eight of the strata represent eight states with the largest child welfare caseloads, and the ninth strata represents 38 states and the District of Columbia. The NSCAW sampling process was conducted over 15 months to include all children investigated between October 1999 and December 2000. The sample was drawn from 92 participating county child welfare agencies throughout the United States. The sample includes children aged 1-14 at the time of sampling, and who were receiving CPS services, were in out-of-home care, and were investigated for allegations of sexual abuse and other abuse or neglect.

The Department of Health and Human Services was authorized to conduct a longitudinal study that intended to answer a range of questions about the outcomes and involvement on the child welfare system for abused and neglected children by the Personal Responsibility and Work Opportunity Reconciliation Act of 1996 (Dowd et al., 2002). The NSCAW was conducted under a contract funded and administered by the Administration on Children, Youth, and Families and the U.S. Department of Health and Human Services. The study was conducted through collaboration between staff at the Research Triangle Institute, the University of North Carolina at Chapel Hill, Caliber Associates, and the University of California at Berkeley. There was also a Technical Work Group that included several experts in fields of research related to the NSCAW where they provided helpful information on the design and implementation of the study (Dowd et al., 2002).

The NSCAW study consists of five waves of data where Wave I is baseline and is 2-6 months after the close of the investigation, Wave II is 12 months after the close of the investigation, Wave III is 18 months after close of the investigation, Wave IV is 36 months after the close of the investigation, and Wave V is 59-97 months after the close of the investigation (Dowd et al., 2008). The data was collected through face-to-face interviews or assessments with children, their parents or other permanent caregivers, nonparent adult caregivers if applicable, teachers, and child welfare workers (Dowd et al., 2002). Data collection started in 1999 and was completed in 2007 (Dowd et al., 2008). For this study I will use Wave I and Wave V as this will show how characteristics at baseline relate to the final status. The total sample size of this study in Wave I is n =

5501, consisting of 2732 males and 2769 females. The age range is 0-16 with a mean of 5.7 (*SD* = 4.81). The children's race in Wave I of the study consist of black (1767), white (2362), Hispanic (956). and other (399). The total sample size of this study in Wave V is *n* = 4278 with 1223 missing cases, consisting of 2105 males and 2229 females. The age range is 4-21 with a mean of 8.16 (*SD* = 8.0). This data will be split into four age groups: 0 – 2, 3 – 5, 6 – 10, and 11+. The data is split into four age groups to make comparisons across all analyses. Table 3 below shows the sample size for each group across the Waves. This data is coming from NSCAW I, general release data set.

Table 3

Age Groups and Their Sample Size

Groups	Wave I	Wave V
Age 0 - 2	*n* = 1996	*n* = 0
Age 3 - 5	*n* = 833	*n* = 715
Age 6 - 10	*n* = 1492	*n* = 1183
Age 11+	*n* = 1179	*n* = 2380

Variables and Their Measurement

Demographic variables. Demographic information used will be age, sex, race, and caregiver marital status. This information will be taken from Wave I. Age is referring to the individual's age in years calculated from his/her date of birth and in this study an individual's age will remain the age they were at sampling (Wave I age). The sex is the gender of the person. Race is determined by how they or others define their race to be as either white, black, Hispanic or other. The caregiver marital status asked if current caregivers were married, never married, or formerly married.

Indicators of ACEs. The 10 categories of ACEs will be used (physical abuse, sexual abuse, emotional abuse, emotional neglect, physical neglect, household mental

illness, household substance abuse, mother treated violently, parental separation or divorce, incarcerated household member). There are five categories of child abuse and neglect, and five categories of household dysfunction. The five categories of child abuse will use the Parent-Child Conflicts Tactics Scales (CTS-PC) to measure whether these adversities were present. The CTS-PC is a 35-item questionnaire that measures discipline with 6 subscales: nonviolent discipline, physical assault, supplemental questions on discipline, neglect, and sexual abuse. The definitions reflect the work conducted by Felitti et al. (1998), Dong et al. (2004) and Dube, Williamson, Thompson, Felitti, & Anda (2004). The ACEs will be taken from Wave I of the dataset to see how the score at the start of the investigation related to the individual's behavioral outcomes in the long-term. A cumulative score will be used by adding up the number of adversities an individual had experienced. This will be done by adding together each adversity one has experienced and creating a new variable with the cumulative score, so if an individual has experienced physical abuse and household substance abuse their cumulative score will be 2. Table 4 below shows the ACEs definition and how they were measured. The measurement descriptions and psychometrics were taken from Dowd et al. (2002). Since neglect is combined as one in the NSCAW data, they will be combined for the purposes of this study and there will now be 9 categories of adversities.

Table 4

Adverse Childhood Experiences and Their Measure

ACE	Definition	Measure	Description	Psychometrics
Physical abuse	If a parent or adult often pushed, grabbed, shoved, slapped, or hit you and left marks.	Parent-Child Conflicts Tactics Scales (CTS-PC; Straus, Hamby, Finkelhor, Moore, & Runyour, 1998)	Physical abuse will be measured by the CTS-PC subscale of physical assault.	The subscale of physical assault has an alpha reliability of r=.55.
Sexual abuse	If a parent or adult touched or fondled you in a sexual way, had you touch their body in a sexual way, attempted or had sexual intercourse with you.	CTS-PC	CTS-PC subscale of sexual abuse	
Emotional abuse	If a parent or adult often swore at, insulted, put you down, or acted in a way that made you afraid you would be physically hurt.	CTS-PC	CTS-PC subscale of psychological aggression.	The subscale of psychological aggression has an alpha reliability of r=.60
Emotional neglect	If a parent or adult severely and persistently failed to provide a child with support, love, and affection.	CTS-PC	CTS-PC subscale of neglect	The subscale of neglect has an alpha reliability of r=.22
Physical neglect	If a parent or adult severely and persistently failed to provide	CTS-PC	CTS-PC subscale of neglect	The subscale of neglect has an alpha

ACE	Definition	Measure	Description	Psychometrics
	a child with food, hygiene, supervision/care.			reliability of r=.22
Household mental illness	If a member of the household suffers from a mental illness, depression, or emotional problem and if any household member has attempted suicide.	Composite International Diagnostic Interview Short-Form (CIDI-SF)	CIDI-SF module for depression.	
Household substance abuse	If a member of the household uses and abuses drugs and alcohol.	CIDI-SF	CIDI-SF module for alcohol dependence and the module for drug dependence.	
Mother treated violently	If your mother was pushed, grabbed, slapped, kicked, hit, or threatened.	Conflict Tactics Scale (CTS1; Straus, 1990)	CTS1 is measuring the type and frequency of violence occurring in the home and directed toward a female caregiver.	The CTS1 has an internal consistency reliability of .79 to .95.
Parental separation or divorce	If your parents are separated or divorced.	Demographic question in Wave I	It is asking where caregivers were married, never married, or formerly married.	
Incarcerated household member	If a member of the household has ever gone to prison or jail.	Project developed questions.	This is under the section of caregiver involvement with the law.	

Behavioral outcomes. Internalized and externalized behaviors will be measured by the Child Behavioral Checklist (CBCL; Achenbach, 1992), The scores will be taken from Wave V and are measured by a caregiver's overall assessment of the child's

behavior. A total score may also be used, as well as the internalizing and externalizing scores to measure the relationship between ACEs and behavior. The measure yields raw and standardized scores for each problem scale and total score. The total standardized score will be used for analyses. Internal consistency is found to be very high for internalizing, externalizing, and total scores (Dowd et al., 2002).

Internalizing outcomes. Internalizing behaviors are those that affect a child's internal environment and are often psychological. Internalizing behaviors can include anxiety, withdrawal, antisocial behavior, low self-esteem and depression.

Externalizing outcomes. Externalizing behaviors are problematic outcomes that are manifested in a child's outward behaviors through acting out in the external environment. Externalizing behaviors can include violence, conduct disorder, substance abuse, and aggression

Data Preparation

Obtaining data. The data comes from the National Data Archive on Child Abuse and Neglect (NDACAN) at Cornell University. To gain access to the data the researcher needs to join the NDACAN online mailing list, complete the Terms of Use Agreement, and IRB approval of the proposed research. Once approval was gained, I sent the Terms of Use Agreement in email to NDACAN at Cornell. Once the email was sent, it took one day for delivery. The dataset was delivered on Box.com and needed to be downloaded within 10 days of delivery. The data files were delivered in SPSS and SAS compatible formats. Once the data was received and downloaded, data clean-up was started.

Data Patterns and Missingness. To start, the values of the data were examined to ensure that they're "within the limits of reasonable expectation" (Meyers, Gamst, &

Guarino, 2017, p. 32). This is checking to see if ages are correct (all values under 14) and to see if there are any values that are outside the range of response for that scale. If we determine the values are incorrect, we may leave it alone or consider that the data point may be an outlier and may need to be deleted. If we see that the value may not be representative of the target population, we will treat it as a missing value and specify a code in the data related to missing values. This target population is rather large, in the introduction it is mentioned there were 3,501,000 children who received an investigation or alternate response from child protective services in one year. While this may be one part of missing values, we may see more missing data as we are scanning. This can be because of several reasons including a refusal to answer personal questions, lack of motivation, data entry errors, or unavailability of information (Meyers, Gamst, & Guarino, 2017). When researching maltreatment, we may often see refusal to answer a question as individuals may fear for what could happen if others found out the truth and often many individuals may not want to even talk or think about a situation, so they don't report it. It needs to be decided whether theses missing values are a function of systematic or random processes.

When determining the pattern, we can see where the missing data fits into one of the three mechanisms of missingness: missing completely at random, missing at random, or not missing at random (Meyers, Gamst, & Guarino, 2017). Missing completely at random suggest that the values are missing accidentally or randomly. Missing at random suggests that cases with missing values on a particular variable are systematically or conditionally related to one or more variables. Not missing at random suggests that cases

with a missing value on a certain variable are a function of that variable and are often deemed as unobservable data. If data is determined to be missing completely at random or missing at random, they are often ignorable. If the data is deemed to be not random, they are nonignorable and the missing values will need to be "modeled to develop reliable missing value parameter estimates" (Meyers, Gamst, & Guarino, 2017, p. 37). It is expected that there will be a high number of random missingness in the data as much of it is involving a vulnerable area where individuals may not want to report the truth or anything at all. Much of the data cleaning will have been done by the organizations that completed the study.

Data Analyses

To measure what the research question intends, we first need to break the question down into the four hypotheses. Table 5 below shows a breakdown of what analysis is used for what hypothesis.

Hypotheses.

1) With an increase in ACEs there will be an increase in internal and external behaviors.
2) Those who are younger in age at sampling will show to have more internal and external behaviors.
3) Those who are younger in age at sampling will show to have more ACEs.
4) Age will influence the relationship between number of ACEs and internal and external behaviors.

Hypothesis 1. We first need to determine if there is a relationship between the number of ACEs and internal and external behaviors (hypothesis 1). To establish if there

is a relationship, a simple linear regression will be run with ACEs as the independent variable (IV) and internal and external behaviors total score at the dependent variable (DV) If ACEs are shown to be non-continuous, a logistic regression will be run instead. The goal of running a simple regression is to find the best fitting line or the least squares regression line. The equation for this line is $\hat{Y} = b_0 + b_1 X$ where b_0 represents the y-intercept and b_1 represents the slope of the line. This line can be used to describe a linear relationship in the data, predict values of Y with given values on X, and test underlying models about the relationship between variables (Bobko, 2001). What makes a line best fit is when it yields the minimum squared errors. When looking at variance explained in regression it is the variance of a DV that is explained by an IV using R^2. When looking at correlations, a high correlation indicates that the line fits the data well. The significance of the model and R^2 is tested using a F-test and the significance of the individual predictors is tested using a t-test.

When running a regression there are four assumptions to consider: linearity, normality, homoscedasticity, and independence (Bobko, 2001). With linearity we are assuming that the relationship between our outcome and predictor can be described as linear. If the true relationship is non-linear it can increase the chance of committing a Type II error, which is accepting a false null hypothesis. With normality we are assuming that the residuals are normally distributed. With homoscedasticity we are assuming that the regression line fits the data consistently across the predictor values, having equal error variances. With independence we are assuming that residuals are not correlated and are

independent of each other. If assumptions are violated steps will be taken to mediate them.

Hypotheses 2 & 3. When looking at hypotheses 2 and 3, they are both looking at age group comparisons. Hypothesis 2 is looking to see if there are more internal and external behaviors in those who are younger at sampling and hypothesis 3 is looking to see if those who are younger at sampling experienced more ACEs. To look at these age group comparisons some ANOVA tests will be used. Analysis of variance (ANOVA) is used to evaluate group mean differences for three or more groups (Gamst, Meyers, & Guarino, 2008). For both hypotheses, the four age groups will be the independent variables (IVs). The dependent variable (DV) for hypothesis 2 is internal and external behaviors total score, and hypothesis 3 is the total number of ACEs experiences. These ANOVA's will be a between-subjects design as there are different participants at each level of the IV. The sum of squares are developed from the variation around the grand mean and are separated into the between and within groups. The between group sum of squares is focused on group means and variance represents the independent variables effect. The within group sum of squares is focused on the variation within the groups. The sum of squares are divided by the degrees of freedom to get the mean square. The mean squares of between and within are then divided to get the F ratio which is a ratio of two variance estimates. ANOVA is testing the null hypothesis which is stating that the group means are equal. If group means are equal, then the groups are not statistically, significantly different.

When running an ANOVA there are three primary assumptions to consider: independence, normality, and homogeneity of variance (Gamst, Meyers, & Guarino, 2008). Independence is assuming that the errors are random and independent across the individual observations. Violations of independence can result in inflated p-values. Normality is assuming that the residual errors are normally distributed. The violations can be robust if there is a sufficient sample. Effects are often small with an equal sample and get smaller as the sample size increases. Homogeneity of variance is assuming that the distribution of errors across groups has equal variances. The violation can be robust if samples are equal. Effects are often small with an equal sample and get smaller as the sample size increases. Violation of homogeneity can have serious consequences and the severity can be measured with F_{MAX} where if it is greater than 9 there is a problem. It can be measured with Levene, Brown-Forsythe, or Welch's.

Hypothesis 4. A moderation analysis will be used to see the moderation effect age will have on the relationship between number of ACEs and internal and external behaviors (hypothesis 4). Regression analyses start as a linear relationship between Y and X_1 and introducing the interaction term adds a possibility that the relation changes as a function of X_2 (Bobko, 2001). X_2 is often referred to as a moderator of the relationship between Y and X_1. An interaction effect occurs when the nature of the relationship between one of our predictor variables and our outcome depends on the level of another predictor variable. The cross-product term of X_1X_2 often means that some pattern of scores on X_1 and X_2 are associated with the highest scores of Y. Adding product terms to regression analyses produces examples that increase the flexibility of social science

models. In this analysis Y or DV will be the internal and external behaviors total score, X_1 or IV will be the total ACE score, and X_2 (the moderator) will be age shown in figure 2. This interaction term must show significance over and above the main effects (Bobko, 2001).

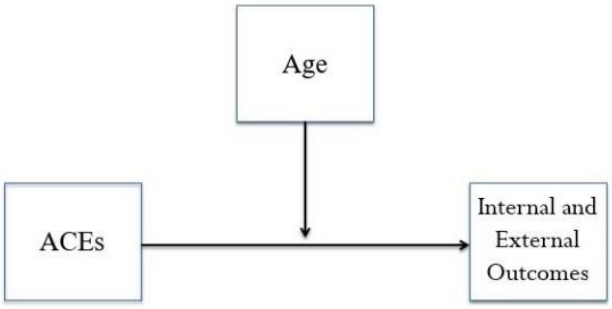

Figure 2. Moderation Model

To test this interaction a hierarchical regression will be used. The most common hierarchical approach for testing interaction effects follows these two steps: step one is looking at the two main effects and the covariates and step two is looking at the two main effects, interaction effects, and covariates. Variables must be centered before creating and testing for the interaction effects if you have continuous predictor and/ or moderator variables. Centering data reduces collinearity/multicollinearity between predictors, moderators, and interaction terms and often makes data more interpretable. Centering involves subtracting the mean value from each score in the distribution. When looking at the differences between centered and uncentered output we see that the collinearity statistics, slope coefficients and associated standard errors, t-values, and p-values for your main effects in block 2 of the model often have different values. There is some information that stays the same in both centered and uncentered and that is the model

summary information, all the information in block 1 of the model, and the interaction effect in block 2 of the model.

Step 1. Step 1 is looking at the two main effects and the covariates. The interpretation of main effects is often only done in step 1 of the hierarchical approach when the interaction term is not in the model and centering often makes the main effect more interpretable.

Step 2. Step 2 is looking at the two main effects, interaction effects, and covariates. When interpreting the significance of the interaction effect you must include the individual predictors as you want to know whether the interaction term explains a significant amount of the variance over and above the individual predictors. This is often done by looking at the change in R-square to see how much additional variance in explained by adding the interaction to the model and the F-change statistic and p-value to determine if the added variance is significant.

Table 5

Data Analyses

Hypothesis	Analysis Used	Variables
1: With an increase in ACEs exposure will also be an increase in internal and external behaviors.	Simple Linear Regression	DV: internal and external behaviors total score IV: total ACE score
2: Those who are younger in age at sampling will show to have more internal and external behaviors.	ANOVA	DV: internal and external behaviors total score IV: four age groups
3: Those who are younger in age at sampling will experience more ACEs.	ANOVA	DV: total number of ACEs IV: four age groups
4: Age will influence the relationship between number of ACEs and internal and external behaviors.	Moderation	Moderator (X_2): age IV: total ACE score DV: internal and external behaviors total score

CHAPTER THREE: RESULTS

The data analyses revolve around three main variables: age groups, ACEs total score, and internal and external behaviors total score. There will be four age groups used for these analyses: 0 – 2, 3 – 5, 6 – 10, and 11+. Table 3 below and above in the methods section shows the age groups that will be used and the sample size for each group. The ACEs were combined to create

Table 3

Age Groups and Their Sample Size

Groups	Wave I	Wave V
Age 0 - 2	$n = 1996$	$n = 0$
Age 3 - 5	$n = 833$	$n = 715$
Age 6 - 10	$n = 1492$	$n = 1183$
Age 11+	$n = 1179$	$n = 2380$

a total score with a range of 0 – 9. The frequency for each number is shown below in table 6. The mean for ACEs total score is 2.42 (SD = 2.07). The ACEs were taken from Wave I to show the long-term effects adversities can have.

Table 6

Frequencies of ACEs Total Score

Number of ACEs	Frequency	Percent
0	1494	27.2
1	739	13.4
2	683	12.4
3	785	14.3
4	804	14.6
5	556	10.1
6	289	5.3
7	114	2.1
8	33	.6
9	4	.1

Note: Information taken from Wave I

The internal and external behaviors total score used was a standardized score with a mean of 54.92 (SD = 12.07). The range for the scores was 23 – 91. There were 3376 valid cases and 2125 missing cases for the behaviors total score.

Linear Regression (Hypothesis 1)

A linear regression was run to see the linear relationship between ACEs Total Score and internal and external behaviors total score. To assess linearity a scatterplot of ACEs Total Score and internal and external behaviors total score was plotted. This plot is shown below in Figure 3. There was homoscedasticity and normality of the residuals. Total number of ACEs statistically significantly predicted the behaviors total score, $F(1, 3374) = 25.18$, $p < .001$, accounting for 0.7% of the variation in the behaviors total score. These numbers are shown below in table 7. This significant relationship means that these two variables, ACEs total score and internal and external behaviors total score influence each other. From the prediction equation and scatter plot it shows that this is a positive relationship where if there is an increase in one, there will be an increase in the other. The

ACEs total score accounting for 0.7% of the variation in the behaviors total score is telling us the how close the data are fitted to the regression line. This percentage may be low because of the ACEs variable having 9 different groups so data points will fall on the exact number of ACEs an individual had experienced leaving gaps in the plot.

Table 7

ANOVA for Linear Regression

Source	Sum of Squares	df	Mean Square	F	Sig.
Regression	3639.45	1	3639.45	25.18	<.001
Residual	487749.911	3374	144.56		
Total	4931389.36	3375			

Note: Information taken from Wave I and V

The prediction equation is: Internal and External Behaviors Total Score = 53.72 + .52(ACEs). The information from the prediction equation is shown below in table 8. This equation is showing that for every unit increase in ACEs, the behaviors total score will go up by .52. When an individual has experiences zero ACEs, the behaviors total score will be 53.72. This equation is showing the relationship in a mathematical way, the behaviors total score will go up based on how many ACEs an individual has experienced.

Table 8

Coefficients for Equation (Linear Regression)

	B	Std. Error	t	Sig.
(Constant)	53.73	.32	170.28	<.001
ACE Total Score	.52	.1	5.02	<.001

Note: Information taken from Wave I and V

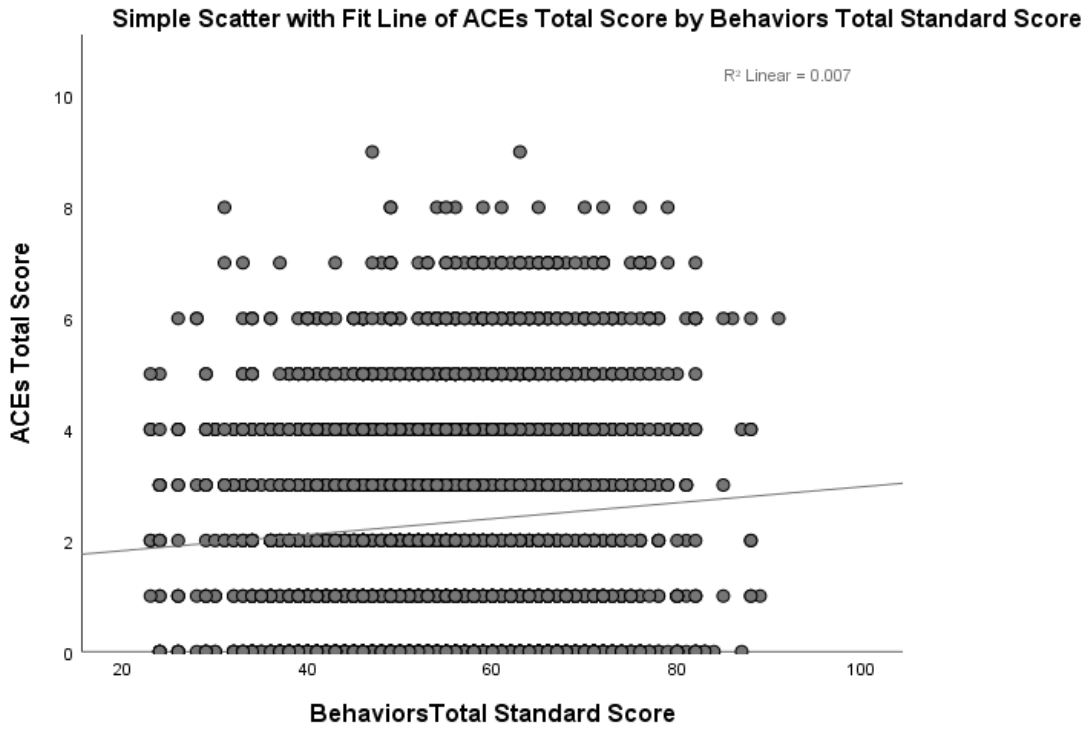

Figure 3. Scatter Plot of ACEs by Total Standard Score with Fit Line

ANOVA (Hypothesis 2)

This ANOVA was conducted to determine if internal and external behavior total score was different for groups with a different age. The four age groups are: 0 – 2, 3 – 5, 6 – 10, and 11+. The data was normally distributed and there was homogeneity of variance as assessed by Levene's test of homogeneity of variances (p = .001). Data is presented as mean ± standard deviation. Total score increased from (0-2) with 53.69 ± 11.49, (11+) with 54.77 ± 10.18, (6-10) with 56.02 ± 12.46, and (3-5) with 56.19 ± 12.64. These means and standard deviations are also shown below in table 9. Age group 3 – 5 had the highest mean (56.19) and 0 – 2 had the lowest mean (53.69). These means are showing the average behaviors total score for that age group. The difference between

these four age groups was statistically significant, $F(3, 3372) = 10.97$, $p < .001$. Table 10 below show the results of the between-subjects ANOVA.

Table 9

ANOVA Means and Standard Deviations for the Behaviors Total Score

Age Groups	Mean	Std. Deviation	N
0 – 2	53.69	11.49	1611
3 – 5	56.19	12.64	624
6 – 10	56.02	12.46	1093
11+	54.77	10.18	48
Total	54.92	12.07	3376

Note: Information taken from Wave I and V

Table 10

Test of Between Subjects Effects for Behaviors Total Score

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Age Groups	4750.55	3	1583.52	10.97	<.001
Error	486638.8	3372	144.32		
Total	491389.35	3375			

Note: Information taken from Wave I and V

ANOVA (Hypothesis 3)

This ANOVA was conducted to determine if ACEs total score was different for groups with a different age. The four age groups are: 0 – 2, 3 – 5, 6 – 10, and 11+. The data was normally distributed and there was homogeneity of variance as assessed by Levene's test of homogeneity of variances ($p < .001$). Data is presented as mean ± standard deviation. Total score increased from (0-2) with 1.58 ± 1.69, (11+) with 2.8 ± 2.26, (6-10) with 2.91 ± 2.09, and (3-5) with 3.01 ± 1.98. These means and standard deviations are also show in table 11 below. Age group 3 – 5 had the highest mean (3.01) and 0 – 2 had the lowest mean (1.58). The means are showing the average number of

ACEs that age group has experienced. The difference between these four age groups was statistically significant, $F(4, 5496) = 143.92$, $p < .001$, Table 12 below shows the results of the between-subjects ANOVA.

Table 11

ANOVA Means and Standard Deviations for the ACEs Total Score

Age Groups	Mean	Std. Deviation	N
0 – 2	1.58	1.68	1996
3 – 5	3.01	1.97	833
6 – 10	2.91	2.09	1492
11+	2.8	2.26	1179
Total	2.42	2.07	5501

Note: Information taken from Wave I

Table 12

Test of Between Subject Effects for ACEs Total Score

Source	Type III Sum of Squares	df	Means Square	F	Sig.
Age Groups	2240.31	4	560.08	143.92	<.001
Error	21387.72	5496	3.89		
Total	23628.03	5500			

Note: Information taken from Wave I

Moderation (Hypothesis 4)

This moderation was done by taking what was done in the linear regression and splitting it by age to see if the slope of the line changes by age. A hierarchical multiple regression analysis was conducted to determine if age moderates the relationship between ACEs total score and internal and external behaviors total score. In the first step, two predictors were included: age and ACEs total score. The variables accounted for a significant amount of variance in the internal and external behaviors total score, $R^2 = .011$, $F(2, 3373) = 19.05$, $p < .001$. The variables were centered and an interaction term

between age and ACEs total score was created. In step 2, the interaction term was added to the regression model, which accounted for a significant proportion of the variance in internal and external behaviors total score, $\Delta R^2 = .013$, $\Delta F(3, 3372) = 14.37$, $p < .001$. The results for both steps are shown in table 13 and 14 below. The significance with the interaction term indicates that there was moderation. There was a 0.2% increase in the variance explained by adding the interaction term. The linear regression established that there was a relationship and the moderation revealed that age changes this relationship.

Table 13

ANOVA for Moderation

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	5489.66	2	2744.83	19.05	<.001
	Residual	485899.69	3373	144.06		
	Total	491389.35	3375			
2	Regression	6202.55	3	2067.52	14.37	<.001
	Residual	485186.81	3372	143.89		
	Total	491389.36	3375			

Note: Information taken from Wave I and V

Table 14

Coefficients for Equations (Moderation)

Model		B	Std. Error	t	Sig.
1	(Constant)	55.35	.23	238.27	<.001
	Age Groups	.99	.29	3.58	<.001
	ACEs Total Score	.82	.22	3.69	<.001
2	(Constant)	55.48	.24	231.43	<.001
	Age Groups	.95	.28	3.42	.001
	ACEs Total Score	.65	.24	2.78	.006
	Interaction	-.64	.29	-2.23	.026

Note: Information taken from Wave I and V

Examination of the interaction plot showed an enhancing effect that as individuals got older and ACEs increased, internal and external behaviors total score increased. Individuals with a high ACE total score and who were older in age had the highest internal and external behaviors total score. This plot is shown in figure 4 below. The age variable -1.14 relates to the younger individuals or the 16th percentile, the -.29 age relates to the middle ages or the 50th percentile, and .56 relates to the older individuals or the 84th percentile. The CBCL standardizes scores based on age and gender, so that the average score for each age or age group is 50. The older individuals start at a higher behaviors total score and doesn't change much after experiencing multiple ACEs. The younger individual's behavior total score changes more after experiencing ACEs. Examining these lines shows that the younger you are the more likely that an increase in ACEs will cause an increase in internal and external behaviors. As you get older your behavior seems to be developed and doesn't change much based on the adversities experienced.

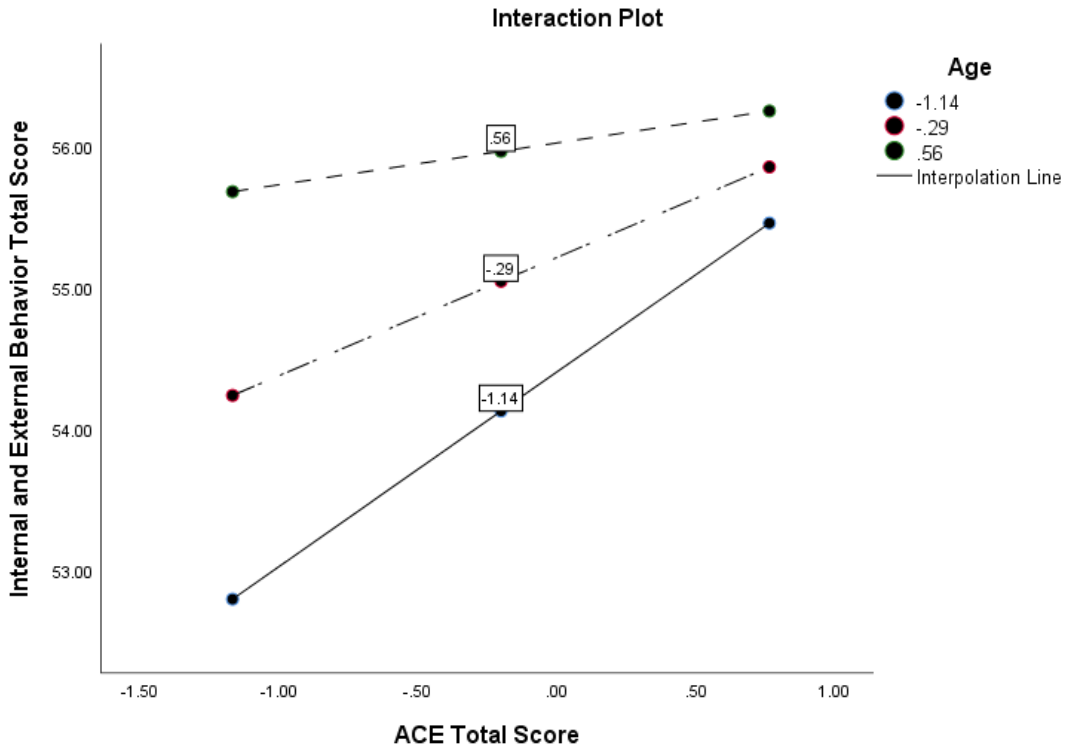

Figure 4. Interaction Plot

CHAPTER FOUR: DISCUSSION

This study used the data from NSCAW I, which is the first longitudinal study of children in the welfare system. The sample included those who were subjects of a child abuse or neglect investigation. Given the nature of the sample, the risk for exposure to ACEs may be more pronounced within this environment, however, it does not mention whether the investigations were founded or substantiated. This shows in this study as 27.2% of children in this sample have experienced no ACEs. This 27% allows for this study to include individuals who have not experienced adversity and gives to some extent a comparison group to those who have experienced ACEs. 72.8% of children in this sample have experienced at least 1 ACE with 4 ACEs being the most frequent among those who have experienced ACEs at 14.6%.

The results of this study support the hypotheses to varying degrees. When looking at hypothesis 1, it is shown that the more ACEs children had, the more internal and external behaviors they had which supports the hypothesis. This was not surprising as it was shown in multiple studies (Felitti et al., 1998; Kerker et al., 2015; Clarkson Freeman, 2014; Kalmakis & Chandler, 2014) that there is a cumulative effect or dose-response relationship between ACEs and health or behavior problems. In this dose- response relationship when there is an increase in one (ACEs) there is also an increase in the other (internal and external behaviors).

Hypotheses 2 and 3 were not fully supported. In both analyses, the youngest group (0 -2) had the lowest behaviors total score or lowest ACEs total score. However, the other three groups showed a decrease in behaviors total scores or ACEs total score as age increased. With hypothesis 2, where I suggest the younger age group will have the most internal and external behaviors is found to not be fully supported. The youngest group (0 – 2) showed to have the lowest internalizing and externalizing behaviors total score. Age group 3 – 5 had the highest behaviors total score with 56.19 ± 12.64 (mean ± standard deviation). Then age group 6 – 10 with a behaviors total score of 56.02 ± 12.46. Then age group 11+ with a behaviors total score of 54.77 ± 10.18. The age group 0 – 2 had the lowest behaviors total score of 53.69 ± 11.49. With hypothesis 3, where I suggest the younger age group will have the most ACEs experienced is found to not be fully supported. The youngest group (0 – 2) showed to have the lowest ACEs total score. Age group 3 – 5 had the highest ACEs total score with 3.01 ± 1.97 (mean ± standard deviation). Then age group 6 – 10 with an ACEs total score of 2.91 ± 2.09. Then age group 11+ with an ACEs total score of 2.8 ± 2.26. The age group 0 – 2 had the lowest ACEs total score of 1.58 ± 1.68.

Much of the research states that exposure to traumatic experiences earlier in childhood have a more significant impact (Cprek et al., 2019; Liming & Grube, 2018; Jaffee & Maikovich-Fong, 2011; Keiley, Howe, Dodge, Bates, & Pettit, 2001). These studies often mentioned under 5 or 6, the beginning years, or younger children. It wasn't always specific as to what age younger was meaning. The individuals in age group 0 – 2 may be too young to remember the maltreatment, were removed from the situation early

enough, and/ or are exhibiting resiliency. The age group 3 – 5 shows the highest behaviors total score and the highest number of ACEs, which follows along with research where the studies mention exposure to those under 5 is more detrimental. With both ANOVA analyses giving similar results it makes for easy comparison. The age group 3 – 5 had the highest ACEs total score as well as the highest internal and external behaviors total score and age group 0 – 2 had the lowest ACEs total score as well as the lowest internal and external behaviors total score. These results can be related back to hypothesis 1 results where an increase in ACEs will lead to an increase in internalizing and externalizing behaviors total score.

Hypothesis 4 was supported; age did influence or mediate the relationship between ACEs total score and internal and external behaviors total score. This moderation took place in two steps. Step 1 found significant effects without the interaction; thus, we were able to proceed and examine step 2. In step 2, the interaction term was found to be significant as well as the model. Adding the interaction increased the variation accounted for in the behaviors total score. The interaction plot created enhances the relationship between ACEs and behaviors total score by showing the lines for three different age levels

The interaction plot is following these results to an extent. The results of the ANOVA may be impacting the results and the interpretation of the results. The age variable -1.14 is relating to the youngest group where they had the lowest ACEs total score and lowest behaviors total score as shown in analyses for hypotheses 2 and 3. The age variable -.29 is relating the ages in group 2 (3 – 5). This group had the highest ACEs

total score and highest behaviors total score in the analyses for hypotheses 2 & 3, but in the interaction plot for hypothesis 4 the age group is showing to have scores more towards the middle of the groups. The age variable .56 is relating to the older ages in age group 6 – 10 and the younger ages in age group 11+. These groups had the middle score on the analyses in hypotheses 2 and 3 but show to have the highest dose-response relationship between ACEs total score and behaviors total score. When looking at the lines we see that the older individuals got, the more the lines evened out. Each age group starts at a different score because of the standardization based on age. Since the score is standardized by age, the plot shows that the older individuals start at a higher behavior score. This can impact the hypotheses by showing that the older an individual got, the higher their behavior total score was before any adversity was experienced which goes against my hypotheses that the younger individuals will have the higher scores.

Looking at the slopes of the lines we can see a different interpretation. The youngest group had the steepest line. For the youngest individuals the steep line indicates that ACEs experienced at this age will cause internal and external behaviors to rise more so or faster than in any other age group. As individuals got older their behavior may be more developed and outside factors like adversity won't cause a large fluctuation in behavior like it does for those who are younger. This can be related back to the literature and why I worded my hypotheses the way I did, effects of adversities can be and are more detrimental for those who are younger in age. The younger in age for the plot is referring to ages 0 – 2. This plot follows the research stating that an increase in ACEs leads to an increase in health or behavior problems (dose-response relationship).

Overall, the hypotheses were adequately supported. There was a dose-response relationship between ACEs total score and internal and external behaviors total score. The age groups partially followed the prediction that the younger groups will have the highest internal and external behaviors total score as well as the highest ACEs total score. Age did show to influence the relationship between ACEs total score and internal and external behaviors total score. In the analyses the variation in the behavior score based on age and ACEs was low which can suggest that other factors may be the cause of the change including protective factors like the support from family and friends, an individual differences, and care received. The plot indicated that effects of adversities can be more detrimental in those who are younger, in this case the 0 – 2 range. The overall age range that can have the most detrimental effects from adversities are the ages 0 – 5 based on the ANOVAs and the moderation. The results of this study provide information on gaps with how age is related and affected by adversity.

Limitations

A limitation of this study is that the ACE total score was taken only from Wave I. This could be ignoring that fact that individuals may have experienced additional ACEs in the months between waves. Another limitation is how the data was collected. While NSCAW obtained data from multiple sources: caregivers, teachers, caseworkers, and children, much of this study utilized data collected from the caregivers. Caregiver reports may often not be the full truth and symptoms can often be understated or exaggerated. With the longitudinal nature of the study comes another limitation, missing data. While NSCAW used weighting for non-response and other site issues (Dowd et al., 2008) it can still be a limitation as there were 1223 missing cases for Wave V data.

Implications

This examination of a nationally representative sample of children highlights the challenges individuals can face when exposed to adversity. The findings indicate that exposure to ACEs when younger in age may lead to an increase in health and behavioral problems. It also indicates that an increase in ACEs can lead to an increase in health and behavioral problems. This suggests that it may make sense for preventions to target children who have experienced more adversities especially those who are under the age of 5. However, further research needs to be done to prove that this is that case, that effects are more detrimental for those who are younger. There is a need for additional research to determine when the development and wellbeing implications begin. Much of the literature does not have a clear meaning or set age for what early harm or those who are younger actually means, so further research is needed to develop a consistent definition in order to clarify the relationship between timing and long-term outcomes.

There is a need for intervention and prevention services to help reduce exposure to adversities, reduce the long-term negative health impact, and provide mental health services to those who have experienced adversities. Interventions will need the collaboration of social workers, school systems, health organizations and parents/guardian in order to have a cohesive plan aimed at reducing the long-term negative health impact. It can be hard to create accurate prevention and intervention services that are unique to adverse experiences, especially since data collected may not reflect the full truth. Therefore, it is important to collect data from multiple parties including children, caregivers, teachers, close family members, and the caseworkers to help enhance the reliability.

In the future it may be important to conduct longitudinal data analyses. An additional analysis need is the comparison between a group with no ACEs to a group with ACEs to see if there's a difference in outcomes. In longitudinal studies it would be important to see if more ACEs were acquired over time and what impact it has, if any, rather than just taking from baseline as this study did. Some other factors that may be important to look at are gender, race, removal from home, duration in foster care, baseline behavioral health, and if they are receiving behavioral health care. Removal from home or placement in foster care can and may be considered a traumatic experience and in future research it may be necessary to consider adding removal from home/ foster care to the adversities measured. It is important to look at other factors to determine how behavior is affected by them as ACEs and age showed to cause little variation in this study.

REFERENCES

Afifi, T. O., & Macmillan, H. L. (2011). Resilience following child maltreatment: A review of protective factors. *The Canadian Journal of Psychiatry, 56*(5), 266–272. https://doi.org/10.1177/070674371105600505

Bobko, P. (2001). *Correlation and regression: Applications for industrial organizational psychology and management* (2nd ed.). Thousand Oaks, CA: Sage.

Chapman, D. P., Whitfield, C. L., Felitti, V. J., Dube, S. R., Edwards, V. J., & Anda, R. F. (2004). Adverse childhood experiences and the risk of depressive disorders in adulthood. *Journal of Affective Disorders, 82*(2), 217–225. https://doi.org/10.1016/j.jad.2003.12.013

Clarkson Freeman, P. A. (2014). Prevalence and relationship between adverse childhood experiences and child behavior among young children: Adverse childhood experiences and young children in child welfare. *Infant Mental Health Journal, 35*(6), 544–554. https://doi.org/10.1002/imhj.21460

Conte, J., & Schuerman, J. (1987). Factors associated with an increased impact of child sexual abuse. *Child Abuse & Neglect, 11*(2), 201-211.

Cprek, S. E., Williamson, L. H., McDaniel, H., Brase, R., & Williams, C. M. (2019). Adverse childhood experiences (ACEs) and risk of childhood delays in children ages 1–5. *Child and Adolescent Social Work Journal*. https://doi.org/10.1007/s10560-019-00622-x

Dowd, K., Kinsey, S., Wheeless, S., Thissen, R., Richardson, J., Mierzwa, F., & Biemer, P. (2002). National survey of child and adolescent well-being (NSCAW):

Introduction to the Wave 1 General and Restricted Use Releases. Ithaca, NY: Cornell University.

Dowd, K., Kinsey, S., Wheeless, S., Thissen, R., Richardson, J., Suresh, R. et al. (2008). National survey of child and adolescent well-being (NSCAW), combined waves 1–5, Data file user's manual, Restricted Release Version. Ithaca, NY: Cornell University.

Dube, S. R., Cook, M. L., & Edwards, V. J. (2010). Health-related outcomes of adverse childhood experiences in Texas, 2002. *Preventing Chronic Disease*, *7*(3). https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2879984/

Dube, S. R., Fairweather, D., Pearson, W. S., Felitti, V. J., Anda, R. F., & Croft, J. B. (2009). Cumulative childhood stress and autoimmune diseases in adults. *Psychosomatic Medicine*, *71*(2), 243–250. https://doi.org/10.1097/PSY.0b013e3181907888

Dube, S. R., Williamson, D. F., Thompson, T., Felitti, V. J., & Anda, R. F. (2004). Assessing the reliability of retrospective reports of adverse childhood experiences among adult HMO members attending a primary care clinic. *Child Abuse & Neglect*, *28*(7), 729–737. https://doi.org/10.1016/j.chiabu.2003.08.009

Felitti, V. J., Anda, R. F., Nordenberg, D., Williamson, D. F., Spitz, A. M., Edwards, V., Koss, M. P., & Marks, J. S. (1998). Relationship of childhood abuse and household dysfunction to many of the leading causes of death in adults. *Am J Prev Med*, 14(4), 245-258.

Gamst, G., Meyers, S., & Guarino, A.J. (2008). *Analysis of variance designs.* NY: Cambridge University Press.

Grasso, D. J., Dierkhising, C. B., Branson, C. E., Ford, J. D., & Lee, R. (2016). Developmental patterns of adverse childhood experiences and current symptoms and impairment in youth referred for trauma-specific services. *Journal of Abnormal Child Psychology*, *44*(5), 871–886. http://dx.doi.org.du.idm.oclc.org/10.1007/s10802-015-0086-8

Hughes, K., Bellis, M. A., Hardcastle, K. A., Sethi, D., Butchart, A., Mikton, C., Jones, L., & Dunne, M. P. (2017). The effect of multiple adverse childhood experiences on health: A systematic review and meta-analysis. *The Lancet Public Health*, *2*(8), e356–e366. https://doi.org/10.1016/S2468-2667(17)30118-4

Jaffee, S. R., Caspi, A., Moffitt, T. E., Polo-Tomás, M., & Taylor, A. (2007). Individual, family, and neighborhood factors distinguish resilient from non-resilient maltreated children: A cumulative stressors model. *Child Abuse & Neglect*, *31*(3), 231–253. https://doi.org/10.1016/j.chiabu.2006.03.011

Jaffee, S. R., & Maikovich-Fong, A. K. (2011). Effects of chronic maltreatment and maltreatment timing on children's behavior and cognitive abilities. *Journal of Child Psychology and Psychiatry*, *52*(2), 184–194. https://doi.org/10.1111/j.1469-7610.2010.02304.x

Kalmakis, K. A., & Chandler, G. E. (2014). Adverse childhood experiences: Towards a clear conceptual meaning. *Journal of Advanced Nursing*, *70*(7), 1489–1501. https://doi.org/10.1111/jan.12329

Kalmakis, K. A., & Chandler, G. E. (2015). Health consequences of adverse childhood experiences: A systematic review. *Journal of the American Association of Nurse Practitioners*, *27*(8), 457–465. https://doi.org/10.1002/2327-6924.12215

Keiley, M. K., Howe, T. R., Dodge, K. A., Bates, J. E., & Pettit, G. S. (2001). The timing of child physical maltreatment: A cross-domain growth analysis of impact on adolescent externalizing and internalizing problems. *Development and Psychopathology*, *13*(4), 891–912. https://doi.org/10.1017/S0954579401004084

Kerker, B. D., Zhang, J., Nadeem, E., Stein, R. E. K., Hurlburt, M. S., Heneghan, A., Landsverk, J., & McCue Horwitz, S. (2015). Adverse childhood experiences and mental health, chronic medical conditions, and development in young children. *Academic Pediatrics*, *15*(5), 510–517. https://doi.org/10.1016/j.acap.2015.05.005

Lansford, J. E., Malone, P. S., Stevens, K. I., Dodge, K. A., Bates, J. E., & Pettit, G. S. (2006). Developmental trajectories of externalizing and internalizing behaviors: Factors underlying resilience in physically abused children. *Development and Psychopathology*, *18*(1), 35–55. https://doi.org/10.1017/S0954579406060032

Liming, K. W., & Grube, W. A. (2018). Wellbeing outcomes for children exposed to multiple adverse experiences in early childhood: A systematic review. *Child and Adolescent Social Work Journal*, *35*(4), 317–335. https://doi.org/10.1007/s10560-018-0532-x

Maughan, B., & McCarthy, G. (1997). Childhood adversities and psychosocial disorders. *British Medical Bulletin*, *53*(1), 156–169. https://doi.org/10.1093/oxfordjournals.bmb.a011597

Meng, X., Fleury, M.-J., Xiang, Y.-T., Li, M., & D'Arcy, C. (2018). Resilience and protective factors among people with a history of child maltreatment: A systematic review. *Social Psychiatry and Psychiatric Epidemiology*, *53*(5), 453–475. https://doi.org/10.1007/s00127-018-1485-2

Merrick, M. T., Ports, K. A., Ford, D. C., Afifi, T. O., Gershoff, E. T., & Grogan-Kaylor, A. (2017). Unpacking the impact of adverse childhood experiences on adult mental health. *Child Abuse & Neglect*, *69*, 10–19. https://doi.org/10.1016/j.chiabu.2017.03.016

Meyers, L. S., Gamst, G., & Guarino, A. J. (2017). *Applied multivariate research: Design and interpretation* (3rd ed.). Thousand Oaks: Sage Publications, Inc.

Miller, G. E., Chen, E., & Zhou, E. S. (2007). If it goes up, must it come down? Chronic stress and the hypothalamic-pituitary-adrenocortical axis in humans. *Psychological Bulletin*, *133*(1), 25–45. https://doi.org/10.1037/0033-2909.133.1.25

Muniz, C. N., Fox, B., Miley, L. N., Delisi, M., Cigarran, G. P., & Birnbaum, A. (2019). The effects of adverse childhood experiences on internalizing versus externalizing outcomes. *Criminal Justice and Behavior*, *46*(4), 568–589. https://doi.org/10.1177/0093854819826213

Poole, J. C., Dobson, K. S., & Pusch, D. (2017). Childhood adversity and adult depression: The protective role of psychological resilience. *Child Abuse & Neglect*, *64*, 89–100. https://doi.org/10.1016/j.chiabu.2016.12.012

Shonkoff, J. P. (2010). Building a New Biodevelopmental framework to guide the future of early childhood policy. *Child Development, 81*(1), 357–367. JSTOR.

Thornberry, T. P., Ireland, T. O., & Smith, C. A. (2001). The importance of timing: The varying impact of childhood and adolescent maltreatment on multiple problem outcomes. *Development and Psychopathology*, *13*(4), 957–979. https://doi.org/10.1017/S0954579401004114

U.S. Department of Health & Human Services, Administration for Children and Families, Administration on Children, Youth and Families, Children's Bureau. (2019). Child maltreatment 2017. Retrieved from https://www.acf.hhs.gov/cb/research-data-technology/ statistics-research/child-maltreatment.