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Moderators To The Effects Of Childhood Traumatic Stress On Childhood Physical Health

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MODERATORS TO THE EFFECTS OF CHILDHOOD TRAUMATIC STRESS ON

CHILDHOOD PHYSICAL HEALTH

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Abstract

According to the United States National Statistics on Child Abuse, in 2017 Child Protective Service agencies in the United States received an estimated 4.1 million referrals involving approximately 7.5 million children. A substantial body of research has revealed that adverse childhood experiences (ACEs) have detrimental long-term effects on physical health and a large number of health conditions. However, little research exists regarding the effects of childhood maltreatment on childhood physical health. Identifying protective factors such as self-esteem can moderate the effects of ACEs, help children thrive, and potentially lower the risk of a variety of conditions like cardiovascular disease, cancer, and diabetes in adulthood. The study's findings can help change the trajectory of health risk markers in childhood prior to the progression to full-blown disease by positively impacting future health outcomes and decreasing the economic burden on society of adult illness. To fill in the gap in current literature, the following study examined the relationship between adverse childhood experiences and childhood physical health in a high risk, understudied pediatric population. The following research questions were presented: (1) What is the impact of adverse childhood experiences on childhood physical health? (2) Does self-esteem moderate the relationship between ACEs and physical health in welfare-involved children? (3) Do age and gender moderate the relationship between ACEs and physical health in welfare-involved children? In total, this research expands literature on adverse childhood experiences and explores the effects of resiliency on the impact of adverse childhood experiences and childhood physical health.

Keywords: adverse childhood experiences, trauma, children, mind-body connection, resilience

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CHAPTER I: INTRODUCTION

Child abuse and neglect are serious public health issues with far-reaching consequences for the youngest and most vulnerable members of society. Child maltreatment refers to the abuse and neglect experienced by children under 18 years of age. Child abuse and neglect result from the interaction of a number of individual, family, societal, and environmental factors. Children who have experienced abuse or neglect can suffer from immediate physical injuries such as cuts, bruises, or broken bones, as well as emotional and psychological problems such as impaired socioemotional skills or anxiety (Cahill et al., 1991; Centers for Disease Control and Prevention [CDC], 2019; Finkelhor, & Browne, 1985; Fortson, 2016; Shaw et al., 1994). Additionally, child abuse can have other negative impacts on children such as behavioral, cognitive, emotional, and developmental difficulties in childhood (Herrenkohl, & Jung, 2016; James, 2018; Prock, 2015; Scannapieco, & Connell-Carrick, 2005; Sousa et al., 2018; Starr, & Wolfe, 1991). These difficulties have also been found to extend past childhood into adulthood. The long-term effects of childhood abuse on adult mental health have been a focal point of research (Chartier et al., 2001; Chartier et al., 2010; Fergusson et al., 1996; McGuinness, 2010).

Adverse childhood experiences (ACEs) are negative early life experiences including all forms of child abuse and neglect as well as parental mental illness, substance use, divorce, incarceration, and domestic violence. Early life experiences have become increasingly recognized as important factors in health outcomes later in life. The rising connection between ACEs and poor health outcomes was established in the 1990s when researchers at Kaiser Permanente and Centers for the Disease Control and Prevention (CDC) developed the ACE scale to measure negative early life experiences (Felitti et al., 1998). The Adverse Childhood Experiences Study (Felitti et al., 1998) was the first study to establish that traumatic events

during childhood (ACEs) can have long-term detrimental effects on health risk behaviors and disease in adulthood.

In addition to the original ACEs Study, ACEs have been studied extensively. Research has found that a higher burden of ACEs was associated with a higher risk of many adverse health, behavioral, psychological, and social outcomes, including smoking, heavy alcohol consumption, substance use, and high-risk sexual behavior (Felitti et al., 1998). Adverse childhood experiences have also been linked to chronic diseases including ischemic heart disease (Dong et al., 2004), cancer (Fuller-Thomson, & Brennenstuhl, 2009), lung disease (Cunnigham et al., 2014), diabetes (Huang et al., 2015; Rich-Edwards et al., 2010), chronic headaches (Felitti et al., 1998), liver disease (Anda et al., 2010), and autoimmune disease (Dube et al., 2009). Researchers also find that adverse childhood experiences are associated with self-reported poor health (Thompson et al., 2015) and increased utilization of health services (Chartier et al., 2010). Child abuse and neglect and other adverse childhood experiences (ACEs) can have a tremendous impact on broader lifelong health and well-being outcomes (CDC, 2016; Fortson, 2016). For instance, exposure to violence during childhood increases the risks of injury, future violence victimization and perpetration, sexually transmitted infections, delayed brain development, reproductive health problems, involvement in sex trafficking, noncommunicable diseases, lower educational attainment, and limited employment opportunities (CDC, 2016; Fortson, 2016).

Two explanatory models have been proposed to further the understanding of the relationship between exposure to childhood adversity and physical health outcomes. Adverse childhood experiences have been shown to cause stress. In the past 2 decades, a greater examination of the effects of stress on the human brain has improved the understanding of the dynamics of childhood exposure to traumatic stress. Biological theory asserts that early adversity

and trauma cause systemic dysregulation; for example, impacting the hypothalamic-pituitary-adrenal (HPA) axis, which causes over- and underproduction of neuroendocrines such as cortisol (Bremmer, 2003; Danese et al., 2011; Heim et al., 2002; Middlebrooks & Audage, 2008; Taylor et al., 2011). These disruptions in HPA signaling cause sustained inflammatory processes, which may have a role in developing cancers, heart disease, and immune disorders (Brown et al., 2010; Teicher et al., 2003). Additionally, research has shown that ACEs are linked to neurobiological changes, as well as functional and structural changes to the brain (Heim & Nemeroff, 2001; Kaufman et al., 2000). Cumulative risk theory states that the greater the accumulation of risk factors, the worse the outcome, regardless of the presence or absence of particular risk factors (Rutter, 1979; Sameroff, 2000). Studies have found a cumulative effect with early adversity (Chartier et al., 2010; Dube et al., 2009; Quach et al., 2017). Research has also demonstrated that greater numbers of ACEs are associated with greater incidence of health risk and disease (Anda et al., 2008; Brown et al., 2013; Chartier et al., 201; Dong et al., 2004; Felitti et al., 1998; Felitti, & Anda, 2010; Jakubowski et al., 2018), suggesting that cumulative stress can have long-term effects on health (McEwen & Seeman, 1999).

This chapter presents the statement of the problem, definition of ACEs, and the specific aims of the study, including the research questions and hypotheses. The second chapter reviews the research and theory relevant to the problem as well as the rates of adverse childhood experiences in adult samples and pediatric samples. Physical health outcomes in adult and pediatric samples are also discussed. The third chapter describes the methods that are used to explore ACEs in childhood and presents the analysis of the data. The fourth chapter provides the results of the current research study. The fifth chapter discusses these results as well as implications for practice and policy.

Statement of the Problem

According to the United States National Statistics on Child Abuse, in 2017 Child Protective Service agencies received a national estimate of 4.1 million referrals involving approximately 7.5 million children. (U.S. Department of Health & Human Services (HHS), Administration for Children, Administration on Children, Youth and Families (ACYF), Children's Bureau (CB), 2017). An estimated 674,000 children were identified as victims of abuse and neglect, with the greatest percentages of children suffering from neglect (74.9%) and physical abuse (18.3%; HHS, ACYF, CB U.S. Department of Health & Human Services, Administration for Children, Administration on Children, Youth and Families, Children's Bureau, 2017). According to the Centers for Disease Control and Prevention (CDC) (2019), at least one in seven children has experienced child abuse and/or neglect in the past year. Children could suffer a single type of maltreatment or a combination of two or more maltreatment types. Furthermore, the presence of one type of maltreatment significantly increases the risk of having another one (Dong et al., 2004). Finkelhor and colleagues (2007) found that 64% of children who had experienced any type of victimization (physical assault, peer/sibling victimization, property victimization, witnessed victimization, sexual victimization, maltreatment) also experienced another type of victimization in the same year. Additionally, rates of child abuse and neglect are 5 times higher for children in families with low socioeconomic status compared to children in families with higher socioeconomic status (CDC, 2019). These statistics highlight the prevalence of child abuse and how vulnerable children are. As a result of this prevalence, there has been an extensive amount of research exploring the long-term impact of child abuse.

Research conducted on adults has established that there is a relationship between childhood maltreatment and poor health outcomes as adults. Additional studies have shown that

ACEs substantially increase risk for mental illness, substance use, and chronic health problems as well as the leading causes of death in the United States, including ischemic heart disease, any cancer, stroke, chronic obstructive pulmonary disease, diabetes, and suicide (Bryan, 2019; Chang et al., 2019; Petruccelli et al., 2019). Furthermore, the accumulating evidence for the negative impact of ACEs on health outcomes now recognizes ACEs as a public health concern (CDC, 2017). As a result of these poor outcomes, in the United States the total lifetime economic burden associated with child abuse and neglect was approximately $124 billion in 2008 (CDC, 2017). According to the CDC (2017) this economic burden rivals the cost of other public health problems such as stroke and type 2 diabetes. Peterson et al. (2018) conducted a follow-up study using updated methods and found the estimated nonfatal child maltreatment per-victim lifetime cost increased from $210,012 (2010 USD) to $830,928 (2015 USD); the fatal per-victim cost increased from $1.3 to $16.6 million. The estimated U.S. population economic burden of child maltreatment based on 2015 substantiated incident cases (482,000 nonfatal and 1670 fatal victims) was $428 billion, representing lifetime costs incurred annually (Peterson et al., 2018). Using estimated incidence of investigated annual incident cases (2,368,000 nonfatal and 1670 fatal victims), the estimated economic burden was $2 trillion (Peterson et al., 2018). These compelling statistics highlight the gravity of adverse childhood experiences.

Despite extensive data gathered from adults who experienced ACEs, fewer studies have addressed the immediate physical health effects of adverse childhood experiences during childhood. There are currently gaps in the literature in terms of examining ACE categories in pediatric samples. Furthermore, among high-risk samples such as welfare-involved children, exposure to multiple adversities is common (although the literature is scarce on the impact of ACEs in this population). There is a growing recognition that children in the welfare system are

a unique population with unique needs. By definition, children in the child welfare system have suffered at least one ACE. Recent studies have shown that in comparison to the general population, these children are far more likely to have experienced at least four ACEs (42% versus 12.5%; Centers for Disease Control and Prevention [CDC], 2016). Their risks for poor health outcomes are greatly increased based upon their higher ACE prevalence. Furthermore, the studies that have researched welfare-involved children investigated early adversity in young children specifically, those ages 1–6 years. As such, there is limited information on the impact of ACEs on physical health for older children and adolescents involved in the welfare system.

Purpose of the Study

The purpose of this study was to examine the relationship between adverse childhood experiences and childhood physical health in a high-risk, understudied pediatric population. There has been extensive research on adverse childhood experiences and adult physical health. A preponderance of these studies highlights the negative sequelae; however, fewer studies focus on how individuals exposed to adverse experiences were able to overcome them. Although ACEs are prevalent, there are individuals who have been exposed to adversity yet still develop into well-functioning adults (Jones et al., 2014; Prince, 2008; Subramaniam et al., 2017). Resilience has been studied for decades and has been found to have positive effects on psychological functioning (Bonnano, 2004; Singh et al., 2013; Subramaniam et al., 2017). Specifically, of the studies conducted, self-esteem has been shown to be a positive determinant of healthy development in adolescence (Emler, 2001; Gao et al., 2019; Garcia-Reid et al., 2013; Jonzon & Lindblad, 2006; Yun et al., 2019). A high level of self-esteem has been shown to improve psychological adjustment and health-related behavior (Yun et al., 2019). Several studies have reported a close relationship between self-esteem and adjustment, with this relationship found to have a lifelong impact (Yun et al., 2019). However, it is not known whether this protective effect

will also extend to physical health. Thus, this study also explored whether self-esteem could moderate the effects of ACEs on childhood physical health.

<center>**Definition of Terms**</center>

This section identifies and explains for the reader key terminology that defines the scope of the study. To provide clarity and effectively frame the discourse of this study, the following terms are defined in the context of this research.

Adverse childhood experiences (ACEs). The term *ACE* is used to describe types of abuse, neglect, and other traumatic experiences that occur to individuals under the age of 18 (CDC, 2016). ACEs focus on traumatic experiences that occur in childhood, and the term is used in research to create an index of adverse events to include maltreatment such as abuse and neglect as well as dysfunctional household circumstances such as parental conflict, incarceration of a household member, and domestic violence (Felitti et al., 1998; SAMHSA, 2014). Studies have consistently focused on 8–10 variables for ACEs that parallel those originally identified by Felitti et al. (1998). In the present study, the 10 categories of adverse experiences include the following: (1) physical abuse, (2) emotional abuse, (3) sexual abuse, (4) physical neglect, (5) emotional neglect, (6) mother or female caregiver treated violently, (7) household substance abuse, (8) mental illness in household, (9) parental separation or divorce, and (10) criminal behavior in the household/incarceration of a household member. These categories are described below.

CHEC program. The Comprehensive Health Evaluations for Children (CHEC) program identifies the physical, developmental, and mental health treatment needs for children entering out-of-home placements. CHEC is a partnership between the Division of Child Protection and Permanency (DCP&P) and Medicaid. Through this program, clinicians are able to recognize any medical problems, delays in development, and mental health difficulties. Once a child's needs

are identified, proper services are recommended. The CHEC evaluation is administered by both medical and mental health professionals. It includes a complete physical exam and psychological evaluation.

Emotional abuse. Emotional abuse refers to behaviors that harm a child's self-worth or emotional well-being. Examples of emotional abuse include name calling, shaming, rejection, withholding love, and threatening (CDC, 2016). In this study, emotional abuse is defined as a participant's report that he/she experienced one of the abovementioned examples at least once during the psychological evaluation, as measured by the CHEC mental health protocol.

Health risk factors. For the purposes of this study, health risk factors are metabolic risk factors and/or biomarkers that have been linked to the top 10 leading causes of death in the United States in 2019. Metabolic risk factors are defined as risk factors that have been found to increase risk of cardiovascular disease, ischemic heart disease, diabetes, and cancer (Aya et al., 2007). The American Medical Association and the International Diabetes Federation define metabolic risk factors for children younger than 16 years of age as increased blood pressure (SBP $\geq$ 130 mmHg or DBP $\geq$ 85 mmHg or treatment with antihypertensive medication), high blood sugar levels (> 100mg/dl), high triglyceride levels ($\geq$ 110 mg/dL), obesity (BMI $\geq$ 85th percentile), and low levels of good cholesterol (HDL $\leq$ 40 mg/dL) (Al-Hamad & Raman, 2017; DeBoer, 2019). In this study, specific markers (obesity and increased blood pressure) were measured by findings reported in the CHEC medical evaluation, and/or reports that are included in the child protection caseworker referral for CHEC psychological evaluation.

Household criminal activity. Household criminal activity is defined as imprisonment of a household member (CDC, 2016; Felitti et al., 1998). In this study, household criminal activity is defined as a participant's report that a household family member was incarcerated during the

psychological evaluation and/or by a report from the DCP&P caseworker about household criminal activity and/or in the DCP&P documentation provided for the purposes of this psychological evaluation, as measured by the CHEC mental health protocol.

Household mental illness. Household mental illness is defined as a household member who is depressed or otherwise mentally ill, or attempted suicide (CDC, 2016; Felitti et al., 1998). In this study, household mental illness is defined as a participant's report that he/she witnessed either of the abovementioned behaviors at least once during the psychological evaluation and/or by a report from the DCP&P caseworker about household mental illness and/or in the DCP&P documentation provided for the purposes of the psychological evaluation, as measured by the CHEC mental health protocol.

Household substance abuse. For the purposes of the present study, household substance abuse is defined as a household member who is reported to be a problem drinker or alcoholic or a household member who is reported to have used street drugs (CDC, 2016; Felitti et al., 1998). In this study, household substance abuse is defined as a participant's report that he/she witnessed any of the abovementioned behaviors at least once during the psychological evaluation and/or by a report from the DCP&P caseworker about substance abuse within the family and/or in the DCP&P documentation provided for the purposes of the psychological evaluation, as measured by the CHEC mental health protocol. The CHEC household substance abuse question is as follows: "Did anyone at your house ever drink alcohol or use drugs?" For children who reported witnessing their parents "smoke," additional follow-up questions are used to ascertain what substance the parent was smoking (i.e., cigarettes or marijuana).

Mother or female caregiver treated violently. "Mother or female caregiver treated violently" is defined as the mother or stepmother being pushed, grabbed, slapped, had something

thrown at her, kicked, bitten, hit with a fist, hit with something hard, repeatedly hit for more than at least a few minutes, or ever threatened or hurt by a knife or gun by the father (or stepfather) or mother's boyfriend (CDC, 2016; Felitti et al., 1998). In this study, "mother or female caregiver treated violently" is defined as a participant's report that he/she witnessed any of the abovementioned behaviors at least once during the psychological evaluation and/or by a report from the DCP&P caseworker about domestic violence history within the family and/or in the referral summary for the psychological evaluation, as measured by the CHEC mental health protocol. The CHEC domestic violence assessment questions are as follows: "Did anyone at your house ever yell at each other? Did anyone at your house ever hurt each other?"

Neglect. Neglect is the failure to meet a child's basic physical and emotional needs. These needs include housing, food, clothing, education, and access to medical care (CDC, 2016). In this study, neglect was measured via two separate categories: physical and emotional neglect.

Emotional neglect. Emotional neglect is defined as a caregiver ignoring the child, denying emotional responsiveness, or not providing adequate access to mental health care (CDC, 2016). In this study, emotional neglect is defined as a participant's subjective report that he/she experienced a lack of attention/care; lack of appropriate boundaries, rules, and/or structure; or lack of supervision as reported at least once during the psychological evaluation and/or by a report from the DCP&P caseworker and/or in the DCP&P documentation for the purposes of this psychological evaluation, as measured by the CHEC mental health protocol. The CHEC emotional neglect assessment is embedded in the process of assessing the child's understanding of the reason for removal and their emotional experiences. Children are also asked about family relationships, which provides an opportunity for them to speak to the quality of their emotional relationships.

Physical neglect. Physical neglect is defined as a caregiver failing to provide adequate

nutrition, hygiene, or shelter; or failing to provide clothing that is adequately clean, appropriate

size, or adequate for the weather (CDC, 2016). In this study, physical neglect is defined as a

participant's report that he/she experienced one of the abovementioned examples at least once

during the psychological evaluation and/or by a report from the Division of Child Protection and

Permanency (DCP&P) caseworker about the cause of removal and/or in the DCP&P

documentation provided for the purposes of this psychological evaluation, as measured by the

CHEC) mental health protocol. The CHEC physical neglect assessment questions are as follows:

"Do you always have enough to eat? Do you have enough clean clothes now? If it's cold out, do

you have a warm jacket to wear? Are you ever left home alone with no adults for long periods of

time?"

Parental divorce or separation. Parental divorce or separation is defined as parents who

were ever separated or divorced (CDC, 2016; Felitti et al., 1998). In this study, parental divorce

or separation is defined as a participant's report that either incidence occurred between parents

during the psychological evaluation and/or by a report from the DCP&P caseworker about

parental marital status and/or in the DCP&P documentation for the psychological evaluation, as

measured by the CHEC mental health protocol. In addition, when the identity of the child's

biological father is not known to DCP&P, this is also counted as a significant form of parental

separation for the purposes of the present study.

Physical abuse. Physical abuse includes behaviors against an individual that can cause

physical injury. Examples of physical abuse include hitting, kicking, shaking, burning, or other

shows of force against a child (CDC, 2016). In this study, physical abuse is defined as a

participant's report that he/she experienced one of the aforementioned examples at least once

during the psychological evaluation, as measured by the CHEC mental health protocol. The CHEC physical abuse assessment questions are as follows: "If you do something wrong at home, what happens? How are you punished at home?" If child responds that they are "whooped," "spanked," or hit in any regard, follow-up questions can include: "What does it mean to be 'whooped?' Have you ever had marks on your body after you are punished or had to see a doctor after being punished?" Physical abuse is assessed regarding the child's previous home as well as in the current resource or foster placement to ensure the safety of the child's current living situation.

Physical health. Physical health is defined as the physical condition of an individual's body. For the purposes of the present study, good physical health is defined as the absence of disease and/or any medical conditions as well as the absence of health risk factors: Body Mass Index (BMI) > 85th percentile increased blood pressure (SBP $\geq$ 130 mmHg or DBP $\geq$ 85 mmHg or treatment with antihypertensive medication), high blood sugar levels (> 100mg/dl), high triglyceride levels ($\geq$ 110 mg/dL), and low levels of good cholesterol (HDL $\leq$ 40 mg/dL), as found in the Comprehensive Health Evaluation for Children (CHEC) medical evaluation and/or reports that are included in the child protection caseworker referral for psychological evaluation.

Resilience. Masten and Obradovic (2008) defined resilience as "the processes of, capacity for, or patterns of positive adaptation during or following exposure to adverse experiences that have the potential to disrupt or destroy the successful functioning or development of the person" (p. 9). In the present study, the resilience factor measure was "self-esteem," as discussed by Emler (2001) and Garcia-Reid et al. (2013) and measured by the Negative Self-Esteem subscale from the Children's Depression Inventory 2 (CDI-2). An elevated

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score on the Negative Self-Esteem subscale reflects feelings of low self-esteem, while lower/non-elevated scores represent the absence of negative self-esteem.

Sexual abuse. Sexual abuse involves pressuring or forcing a child to engage in sexual acts, or to be exposed to sexual material in person, via social media or other media forms. Sexual abuse may include behaviors such as fondling and/or penetration, and exposing a child to other sexual activities (CDC, 2016). In this study, sexual abuse is defined as a participant's report that he/she experienced any of the abovementioned behaviors at least once during the psychological evaluation, as measured by the CHEC mental health protocol. The CHEC sexual abuse assessment question is as follows: "Did anyone at your house ever touch you in a way that made you feel uncomfortable?" If the child responds that they have been touched in a way that made them feel uncomfortable, follow-up questions include: "Can you tell me more about it?" The evaluator will then gather specifics about the sexual abuse by asking questions including: "Who touched you inappropriately? When did the abuse happen? Where did the abuse happen? What parts of your body were touched? How did the abuse occur?" These additional follow-up questions are asked based on the evaluator's clinical judgement, as this evaluation is not intended to be an in-depth trauma assessment. Follow-up questioning is at the evaluator's discretion.

Research Questions and Hypotheses

The goal of this study was to gain an understanding of the cumulative effects of multiple ACEs on childhood physical health. This study used physical health risk factors for six of 10 leading causes of death in adulthood including ischemic heart disease, cancer, stroke, chronic obstructive pulmonary disease, and diabetes to assess whether there is a relationship between those risk factors and adverse experiences in childhood. The study sought a greater understanding of the role of adverse experiences in childhood, and whether the physical health effects that have been documented in adults with a history of ACEs can be seen in childhood. In

effort to explore the relationship between adverse childhood experiences and childhood physical health, the primary research question was "What is the impact of adverse childhood experiences on childhood physical health?"

The research hypothesis for this question was as follows:

Hypothesis 1. In a population of children with a history of abuse and neglect, exposure to childhood adversity will negatively impact physical health as measured by an overall physical health composite calculated by the presence of medical conditions and health risk factors. As seen in previous ACE research, the impact of adverse childhood experiences will have a graded dose-response on the presence of medical conditions. In other words, as exposure to traditional ACEs increases, so will the reported number of medical conditions in children.

Previous research assessing the role of resiliency as a protective factor in the relationship between ACEs and mental health has often found that resiliency factors (specifically self-esteem) moderated the relationship between ACEs and mental health. No research has been done specifically on the role of self-esteem in the relationship between ACEs and physical health in welfare-involved populations. Thus, the second research question becomes: "Does self-esteem moderate the relationship between ACEs and physical health in welfare-involved children?" The research hypothesis for this investigation is as follows:

Hypothesis 2. It is hypothesized that the positive relationship between child maltreatment and poor physical health will be moderated by self-esteem.

Previous research has examined age and gender as moderators in the relationship between ACEs and poor health outcomes. However, the few studies examining age and gender have reported contradictory findings. Thus, the third research question becomes: "Do age and gender

moderate the relationship between ACEs and physical health in welfare-involved children?" The research hypothesis for this investigation is as follows:

Hypothesis 3. It is hypothesized that the positive relationship between child maltreatment and poor physical health will be moderated by age.

Hypothesis 3A. It is hypothesized that the positive relationship between child maltreatment and poor physical health will be affected by gender.

Significance of the Study

A substantial body of research has revealed that adverse childhood experiences have detrimental long-term effects specifically on adult physical health and many health conditions. However, most of these studies are based on retrospective reports by adults. There is a dearth of research on the effects of adverse childhood experiences on childhood physical health and ways to prevent the impact of ACEs on physical health. A large body of research has demonstrated that investments in early childhood can yield significant social and economic returns in adulthood and that this developmental stage should be prioritized for investments, particularly for disadvantaged youth (Heckman, 2006, 2008). According to the CDC (2019), reducing the effects of ACEs could reduce many health conditions including up to 21 million cases of depression, up to 1.9 million cases of heart disease, and up to 2.5 million cases of overweight/obesity. Potential reductions of negative outcomes in adulthood include 27% decrease in chronic obstructive pulmonary disease, 24% decrease in asthma, 16% decrease in kidney disease, 15% decrease in stroke, 13% decrease in coronary heart disease, 6% decrease in cancer, and 6% decrease in diabetes (CDC, 2019). The present study expanded the literature base related to the impact of adverse childhood experiences on childhood physical health within a high-risk sample. This study also identified childhood health markers for five of the 10 leading causes of adult deaths. The variety of poor health outcomes in the research demonstrates the

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significant effect that ACEs may have on every child and adult who experiences them, making ACEs pertinent to many fields. By investigating the relationship between adverse childhood experiences and childhood physical health, the findings from this study inform social policy and provide important information for clinicians/practitioners, physicians, social workers, psychologists, educators, and other individuals who provide services for children and families. The information provided in this study increases awareness of ACEs and their negative proximate impacts. Additionally, investigating the prevalence of ACEs in an understudied pediatric population allowed for deeper understanding of the onset time and impact of trauma on child development. Further investigation of ACEs may help identify children who are at risk for developing diseases later in adolescence and adulthood. Identification of protective factors such as self-esteem may moderate the effects of ACEs, help children and adults thrive, and potentially lower the risk of conditions such as cardiovascular disease, cancer, and diabetes in adulthood. As such, this study's findings can change the trajectory of health risk markers in childhood prior to progression to full-blown disease by positively impacting future health outcomes and decreasing the economic burden of adult illness on society.

CHAPTER II: REVIEW OF THE LITERATURE

Introduction

Research addressing ACEs and their sequelae on adult physical health first began in the late 1990s. When researchers at CDC-Kaiser Permanente conducted a large-scale study on child abuse prompted by the high prevalence of sexual abuse within the patient population at their obesity clinic (Felitti et al., 1998). The researchers wanted to understand not only the causes and effects of child abuse but also childhood adversity. Consequently, they created a questionnaire that asked patients about several types of adverse childhood experiences, dividing them into three broad types (abuse, neglect, and household dysfunction) with ten categories. Felitti et al. (1998) defined abuse as emotional abuse, physical abuse, and sexual abuse; neglect consisted of emotional and physical neglect; and household dysfunction included exposure to domestic violence, substance abuse, mental illness, parental separation or divorce, and incarceration of a household family member. The researchers then compared the number of abuse categories experienced by participants to measures of adult risk behavior, health status, and disease (Felitti et al., 1998).

A total of 17,337 adults were included in both waves 1 and 2 of the study. Felitti et al. (1998) found a graded relationship between the number of categories of childhood exposure and each of the adult health risk behaviors and diseases that were studied ($p < .001$). Additionally, people who experienced four or more categories of childhood exposure compared to those who had experienced none had 4- to 12-fold increased health risks for alcoholism, drug abuse, depression, and suicide attempt; a 2- to 4-fold increase in smoking, poor self-rated health, ≥ 50 sexual intercourse partners, and sexually transmitted disease; and a 1.4- to 1.6-fold increase in physical inactivity and severe obesity. The number of categories of adverse childhood experiences showed a graded relationship to the presence of adult diseases including ischemic

heart disease, cancer, chronic lung disease, skeletal fractures, and liver disease (Felitti et al., 1998). People with greater exposure to adverse childhood experiences were at greater risk for multiple health risk factors for several of the leading causes of death in adults (Murphy et al., 2018) and many psychosocial outcomes related to mental illness and poor health outcomes. The study by Felitti et al. was the first one to document the connection between adverse childhood experiences and physical health. Subsequent publications addressed the relationship between ACEs and a range of health risk behaviors and physical health/medical disorders (Anda et al., 2006; Brown et al., 2010, 2013, 2019; Bryan, 2019; Dube et al., 2003; Chang et al., 2019; Felitti et al., 2010; Fuller-Thomson & Brennenstuhl, 2019; Lissau & Sorensen, 1994; Williamson et al., 2002).

This literature review examined the prevalence rates of adverse childhood experiences reported in adulthood, the relationship between child maltreatment and adult health risk behaviors (specifically obesity), and the relationship between adverse childhood experiences and adult physical health. The chapter also includes prevalence rates of adverse childhood experiences in pediatric samples as well as the relationship between ACEs and physical health in older children and adolescents. Key theoretical models examining the relationship between childhood adversity and adolescent health outcomes are discussed, and prevalence rates of childhood maltreatment in foster care populations are reviewed. Research addressing the impact of protective factors such as self-esteem on health outcomes of adults who have experienced childhood adversity are discussed, as well as gaps in the literature.

Prevalence and Co-Occurrence of Maltreatment History in Adult Samples

Childhood adversity occurs frequently. Of the participants included in the original ACE study, 52% percent reported exposure to at least one adverse childhood experience, 25% of respondents reported exposure to two or more adverse childhood experiences, and 6.2% reported

four or more (Felitti et al., 1998). Exposure to one ACE category significantly increased the

likelihood of exposure to another ACE category. Additionally, Felitti et al. (1998) found that the

probability of one additional ACE category ranged from 65%–93%, and the probability of two

additional ACE categories ranged from 40%–74%. Data taken from the 2010 Behavioral Risk

Factor Surveillance System (BRFSS), the largest ongoing telephone health survey conducted in

all U.S. states (Centers for Disease Control and Prevention [CDC], 2010) found that

approximately 62% of respondents reported being exposed to ACEs. Likewise, data taken from

the 2011–2014 BRFSS found that of the 214,157 respondents (51% female), 62% had at least

one ACE and 25% reported three or more ACEs. Significantly higher ACE exposures were

reported by participants who identified as Black, Hispanic, or multiracial; those with less than a

high school education; those with income less than $15,000 per year; those who were

unemployed or unable to work; and those who identified as gay/lesbian or bisexual compared to

those who identified as white, those with a high school education or more, those in all other

income brackets, those who were employed, and those who identified as straight (Merrick et al.,

2018). Emotional abuse was the most prevalent ACE (34.42%), followed by parental separation

or divorce (27.63%), and household substance abuse (27.56%) (CDC, 2017; Merrick et al.,

2018).

      According to the CDC, in 2017 61% of adults had at least one ACE and 16% had four or

more types of ACEs from a population sample of 144,017 (Merrick et al., 2019). Additionally,

the CDC reported in 2017 that females and several racial/ethnic minority groups were at greater

risk for experiencing four or more ACEs. Similarly, Petruccelli et al. (2019) reviewed 96 articles

on ACEs from nine different countries and in various settings. The percentage of participants

who had at least one ACE in the included studies was 45.5%. Petruccelli and colleagues (2019)

found that females reported more ACEs than males. At each ACE level females were more likely to have that number of ACEs, and higher ACE levels had increasingly higher proportions of females. Also, nonwhite race/ethnicity, less education, and low socioeconomic status were all significantly associated with reporting an ACE compared to not reporting an ACE. In another study conducted by Rich-Edwards and colleagues (2012), 65% of the 66,798 female participants reported some form of abuse. Physical and sexual abuse were the most common ACE categories reported, and a high co-occurrence between severe physical abuse and forced sexual intercourse was observed. Flores-Torres et al. (2020) conducted a study comprised of 9,853 women. About 61% of participants reported at least one ACE and 14% reported four or more. Cunningham and colleagues (2014) found similar ACE prevalence: about 63.8% of women and 62.2% of men reported one or more ACE in their study.

Research on ACEs is not limited to the United States. Chang and colleagues (2019) conducted a cross-sectional study with 1,501 residents of Macheng, China. The ACE International Questionnaire (ACE-IQ) was used to assess ACEs including psychological, physical, and sexual forms of abuse as well as household dysfunction. A total of 66.2% of participants reported at least one ACE, and 5.93% reported four or more ACEs. Increased ACE scores were associated with increased risks for drinking, chronic disease, depression, and posttraumatic stress disorder in adulthood.

The Impact of ACEs on Adult Physical Health

The ACE score has been shown to have a strong, graded relationship to numerous health problems including ischemic heart disease, cancer, chronic lung disease, skeletal fractures, and liver disease. Exposure to an adverse childhood experience increases the risk of having one or more diseases from the top ten leading causes of death in the United States (Felitti & Anda, 2010). The strongest relationships were observed between the number of ACE categories

endorsed and cancer, ischemic heart disease, chronic obstructive pulmonary disease (COPD), liver disease, skeletal fractures, and poor self-rated health. For example, participants who experienced four or more ACEs had a 1.6-fold increased risk for skeletal fractures and diabetes as adults, and a 2.4-fold increased risk for liver disease and stroke.

Petruccelli et al. (2019) systematically reviewed outcomes associated with the ACEs in the CDC-Kaiser ACE scale to understand the variety of outcomes associated with ACEs. Petruccelli et al. (2019) identified 96 articles that assessed health outcomes associated with the ACEs in the CDC-Kaiser ACE scale. Of the studies that looked at medical outcomes, five conditions had a significant association when one ACE was reported: GI disease, respiratory disease, somatic pain or headache, sleep disturbance, and fracture. With one ACE, respiratory disease was the most strongly associated health outcome in both the adjusted and unadjusted models. A graded relationship was present for respiratory distress, sleep problems, ischemic heart disease, GI disease, somatic pain/headache, and memory impairment meaning, that as ACE scores increased, the risk for disease prevalence increased as well

Chartier and colleagues (2010) found that each additional ACE endorsed corresponded with increased risk of poor adult health. That is, with each additional ACE endorsed, the risk of having two or more medical conditions increased 1.22-fold. Additionally, participants who reported two ACEs had a 48% increase in medical conditions, and participants who reported five or more ACEs had a 172% increase in disease prevalence. Schafer and Ferraro (2012) also found that the absence of different medical conditions increased with decreased ACE exposure. Respondents who were found to have no diseases had lower levels of childhood adversity.

Wegmen and Stetler (2009) examined 24 studies and found a small to medium association between childhood abuse and presence of medical conditions in adulthood.

Neurological and musculoskeletal problems as well as respiratory problems, cardiovascular disease, and metabolic and gastrointestinal disorders were all strongly related to child abuse history. Similarly, Chang et al. (2019) found that the presence of chronic diseases was significantly associated with childhood emotional abuse and physical abuse, being bullied, and family drug abuse.

Exposure to ACEs has been shown to affect physical health, manifesting as conditions including cancer, cardiovascular disease, chronic pulmonary disease, chronic pain disorders, headaches, autoimmune diseases, and diabetes. Each of these medical conditions and their relevant ACE studies are described in detail below.

Cancer. Several studies have shown an increased prevalence of cancer in adults with a history of ACEs. Felitti and colleagues (1998) found a 1.9-fold increase for cancer in participants endorsing four or more ACEs. Similarly, Brown et al. (2013) examined the association between ACEs and cancer diagnosis (childhood and adulthood cancer) in data taken from the 2010 Behavioral Risk Factor Surveillance System (BRFSS). Of the approximately 62% of respondents who reported being exposed to ACEs, about 10% reported being diagnosed with cancer. The prevalence estimate of cancer derived from the study is higher than the estimate of 4.2% derived from the National Cancer Institute (NCI) and census population estimates (Brown et al., 2013) for the population overall. The researchers used principal component analysis (PCA) for ACEs and arranged ACEs into three components. Component 1 included sexual abuse variables, and was significantly associated with adulthood cancer after adjusting for confounders including age, gender, race/ethnicity, income, educational status, marital status, and insurance status.

Health risk behaviors and cancer. The impact of ACEs on cancer may be indirect through their effect on other mechanisms in which stressors and trauma during childhood

negatively affect health. For example, the association between ACEs and cancer in adulthood may be attributable to disease progression through association of ACEs with risk factors for other chronic diseases (Brown et al., 2013). These factors include smoking, obesity, physical inactivity, and alcohol consumption, which have been strongly and consistently linked to cancer incidence (Anda et al., 2006; Dube et al., 2003; Felitti et al., 1998; Maria et al., 2007). Smoking has been established as an important risk factor for several types of cancer including bladder, cervical, colorectal, esophageal, kidney, larynx, lung, oral, and pancreatic cancer (American Cancer Society, 2019). It accounts for approximately 30% of cancer incidence (American Cancer Society, 2019). Approximately one quarter to one third of cancer types including cancer of the breast, colon, esophagus, kidney, and uterus have been attributed to physical inactivity and obesity (American Cancer Society, 2019; Fuller-Thomson & Brennenstuhl, 2009; Hydes et al., 2019). Alcohol consumption of two drinks per day increases the risk of cancers of the mouth, pharynx, esophagus, larynx, and oral cavity, and represents a risk factor for breast cancer among women and colorectal cancer, especially for men (American Cancer Society, 2019; Fuller-Thomson & Brennenstuhl, 2009; Hydes et al., 2019). The risk of cancer related to alcohol use increases as the amount of alcohol use increases (American Cancer Society, 2019).

Brown et al. (2010) found that the ACE score had a graded relationship to the incidence of lung cancer, particularly in patients who suffered premature death from lung cancer. For lung cancer identified in hospital or mortality records, patients with six or more ACEs were roughly 13 years younger on average at presentation than those without ACEs. Compared to people without ACEs, the risk of lung cancer for those with six or more ACES was increased approximately 3-fold. ACEs were also seen to have a graded relationship to smoking behaviors. After *a priori* consideration of a causal pathway (i.e., ACEs → smoking → lung cancer), risk

ratios were attenuated toward the null, although not completely (Brown et al., 2010). This suggests that the increase in risk may only be partly explained by smoking, and indicates other possible mechanisms by which ACEs may contribute to the occurrence of lung cancer, as discussed in detail below (Brown et al., 2010).

Fuller-Thomson and Brennenstuhl (2009) examined the association between physical abuse and cancer in adulthood while controlling for three groups of risk factors: childhood stressors, adult health behaviors, and adult socioeconomic status. Their study used regional data from the Canadian Community Health Survey. Of the 13,092 respondents, 7.4% reported having been physically abused as a child by someone close to them, and 5.7% reported having been diagnosed with cancer by a health professional. The study found that childhood physical abuse was associated with 49% higher odds of cancer when adjusting for age, sex, and race only. However, even after controlling for the three groups of risk factors, the odds ratio decreased only slightly to 47% higher odds of cancer. This research shows that although adult health behaviors are linked to cancer incidence, experiencing child maltreatment can directly impact cancer risk after controlling for the adult health behaviors.

Cardiovascular disease. Adverse childhood experiences have been shown to be related to cardiovascular disease in adults. Jakubowski et al. (2018) analyzed 32 studies comprising 247,393 participants. The studies had a measure of cumulative adversity, an index of at least two adverse childhood experiences from age 0 (birth) to 18 years, and a measure of cardiometabolic disease including cardiovascular disease (CVD) clinical outcomes (hypertension, coronary heart disease, ischemic heart disease, myocardial infarction, stroke, cerebrovascular disease) and metabolic outcomes (diabetes, metabolic syndrome) at age 18 or

older. Combined studies showed a significant estimated effect of cumulative childhood adversity on adult cardiometabolic disease (HR = 1.42, OR = 1.36).

Dong and colleagues (2004) conducted a retrospective study to estimate the strength of the ACE-ischemic heart disease (IHD) relationship and to deduce whether IHD risk factors mediated this relationship. After adjusting for age, sex, race, and education, nine of 10 ACE categories significantly increased the risk of IHD by 1.3- to 1.7-fold compared to the risk for people with no ACEs. The IHD odds ratios for people with 7 or more ACEs was 3.6. Furthermore, a significant association was observed between increased likelihood of reported IHD and depressed affect (2.1) and anger (2.5) as well as traditional risk factors (smoking, physical inactivity, obesity, diabetes, and hypertension), with odds ratios ranging from 1.2 to 2.7 (Dong et al., 2004).

Rich-Edwards et al. (2012) examined associations of child abuse with cardiovascular disease (CVD) events including myocardial infarction, stroke, and ischemic heart attack. Among 66,798 women, severe physical abuse was reported by 9% and forced sex by 11% of participants. After adjusting for race, age, childhood body type, parental education, and family CVD history, participants reporting severe physical abuse in childhood had a 46% increased risk for CVD in adulthood compared to participants reporting no abuse (Rich-Edwards et al., 2012). In relation to severe childhood sexual abuse, participants who reported having "forced sex" had a 56% increased risk for CVD compared to women who did not experience childhood sexual abuse. The increased risk was still significant; however, it decreased to a 25% risk after adjusting for adult lifestyle and medical risk factors. This study shows that severe childhood abuse is a prevalent risk for CVD.

Chronic obstructive pulmonary disease (COPD). Chronic obstructive pulmonary disease (COPD) has been found to be linked to adverse childhood experiences. Felitti et al. (1998) found that participants who endorsed four or more ACEs had a 3.9-fold increase of COPD (e.g., chronic bronchitis and chronic emphysema). There was also a strong, graded relationship between COPD and ACE score. Anda et al. (2008) also found that the ACE score had a graded relationship to the occurrence of COPD. Compared to people with an ACE score of zero, those with an ACE score of 5 or more had 2.6 times the risk of prevalent COPD, 2.0 times the risk of incident hospitalizations, and 1.6 times the rate of prescriptions (Anda et al., 2008). These associations were reduced after adjustment for smoking; however, they still remained significant. Additionally, as ACE scores increased, the age of hospitalization as a result of COPD decreased.

Merrick and colleagues (2019) found that participants who had exposure to childhood adversity also had a higher prevalence of COPD. Participants who endorsed having experienced one ACE had 1.3 times the risk of having COPD; ACE scores of 2–3 had 1.7 times the risk, and ACE scores greater than 4 had 2.8 times the risk. Also, data from 26,546 women and 19,015 men aged 18 years and older in five states using the 2011 Behavioral Risk Factor Surveillance System were analyzed by Cunningham et al. (2014). Cunningham and colleagues (2014) found that gender-related differences between adverse childhood experiences and COPD existed. COPD was reported by 4.9% of women and 4.0% of men. In women (but not men) there was a higher likelihood of COPD associated with verbal abuse, sexual abuse, living with a substance-abusing household member, witnessing domestic violence, and parental separation/divorce during childhood compared to those with no individual ACEs (Cunningham et al., 2014). Reporting five

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or more ACEs compared to none was associated with a higher likelihood of COPD among women only.

Chronic pain disorders. A number of studies have examined the impact of adverse childhood experiences and chronic pain. A variety of chronic pain disorders in adulthood have been linked to child maltreatment. For participants with a history of child abuse, Sachs-Ericsson et al. (2007) found that 37% reported having a health problem. Among the participants with health problems, those who experienced child abuse reported more pain than those who had not experienced childhood maltreatment. Sachs-Ericsson et al. (2017) conducted a follow-up study on ACEs and pain-related medical conditions including arthritis or rheumatism, chronic back and/or neck problems, frequent or severe headaches, and any other chronic pain. Rates for the various disorders were 23% arthritis or rheumatism, 25.9% back and neck problems, 21.9% frequent severe migraines or headaches, and 12.1% for "any other" type of chronic pain. Adverse childhood experiences were associated with chronic pain conditions, and this relationship was partially mediated by anxiety and depression. Likewise, Chartier and colleagues (2010) examined the relationship between ACEs and pain that restricted daily activity. Risk of pain that restricts daily activity increased 1.24-fold for each ACE endorsed, as well as risk of disability related to a medical condition.

Headaches. Felitti et al. (1998) found in their original study that participants who reported adverse childhood experiences were also more likely to report having severe headaches. Similarly, Anda et al. (2010) conducted a follow-up study and found that each of the ACEs were associated with an increased prevalence and risk of frequent headaches. Furthermore, as the ACE score increased, the prevalence and risk of frequent headaches increased in a dose-response manner (similar to other medical conditions) in both men and women. The risk of frequent

headaches increased more than 2-fold in participants with an ACE score $\geq$ 5 compared to participants with an ACE score of 0.

Diabetes. Diabetes has also been found to have a relationship with adverse childhood experiences. Felitti et al. (1998) originally found the relationship between ACEs and diabetes to be cumulative, with diabetes risk increasing as the number of ACEs increased. Additionally, Rich-Edwards et al. (2010) investigated associations of child and adolescent abuse with adult diabetes. Data from the Nurses' Health Study 2 of 67,853 participants was used. Of these, 54% reported physical abuse and 34% reported sexual abuse. Rich-Edwards and colleagues (2010) adjusted their models for age, race, body type at age 5 years, and parental education and history of diabetes. Compared to women who reported no physical abuse, the hazards ratio (HR) was 1.03 for mild physical abuse, 1.26 for moderate physical abuse, and 1.54 for severe physical abuse. Compared to women reporting no sexual abuse in childhood or adolescence, the HR was 1.16 for unwanted sexual touching, 1.34 for one episode of forced sexual activity, and 1.69 for repeated forced sex. Adult BMI accounted for 60% of the association of child and adolescent physical abuse and 64% of the association of sexual abuse with diabetes.

Campbell and colleagues (2018) investigated the differential impact of individual ACE categories on diabetes risk, and whether this relationship is gender-specific. Data was acquired from the 2011 BRFSS which included 48,526 adults who completed the ACE module across five states. Using logistic regression, Campbell et al. (2018) examined the odds of diabetes in adulthood related to eight individual categories of ACEs: sexual abuse, physical abuse, verbal abuse, mental illness, substance abuse, incarceration, separation/divorce, and violence. In adjusted analyses, sexual abuse (OR 1.57) had the strongest positive association, followed by verbal abuse (OR 1.29) and physical abuse (OR 1.26). Having a parent with mental illness was

also significantly associated with increased odds of diabetes (OR 1.19). No interaction between ACEs and diabetes status by gender in any of the eight categories was found.

Huang et al. (2015) conducted a meta-analysis of six studies including a total of 87,251 participants and 5879 incident cases of type 2 diabetes reported in these studies. The exposure of ACEs was positively associated with the risk of diabetes with a combined odds ratio of 1.32 in the total participants. The influence of neglect was most prominent (odds ratio 1.92), while the effect of physical abuse was least strong (odds ratio 1.30). Lastly, the odds ratio associated with sexual abuse was 1.39. Overall, the results support a significant association of adverse childhood experiences with an elevated risk of type 2 diabetes in adulthood.

Adverse Experiences in Childhood and Adult Health Risk Behaviors

Felitti et al. (1998) found that people who experienced adverse childhood experiences were more likely to report adult health risk behaviors. Persons who had experienced four or more categories of childhood exposure (compared to those who had experienced none) had 4- to 12-fold increased health risks for alcoholism, drug abuse, depression, and suicide attempt; a 2- to 4-fold increase in smoking, poor self-rated health, ≥ 50 sexual intercourse partners, and sexually transmitted disease; and a 1.4- to 1.6-fold increase in physical inactivity and severe obesity (Felitti et al., 1998). Furthermore, researchers including Felitti et al. (1998) have argued that health behaviors are the primary pathway through which child adverse experiences result in chronic health conditions in adulthood. This hypothesis is consistent with additional research studies that have also shown that childhood maltreatment is associated with elevated levels of obesity, physical inactivity, adult smoking, and alcohol use (Anda et al., 2006; Dube et al., 2003; Felitti et al., 1998; Maria et al., 2007). However, only obesity is discussed in this chapter because the remaining health risk behaviors have not been studied in pediatric samples.

Obesity. As a result of the strong association between childhood neglect and adult

obesity shown by the original ACE study (Felitti et al., 1998), researchers wanted to learn more

about the etiology of obesity and the role of childhood factors. BMI is a measure of body size

that combines a person's weight with their height. The BMI measurement is a screening tool that

can indicate whether someone has a healthy weight or is underweight, overweight, or obese.

According to Panuganti and Kshirsagar (2019) a BMI score less than 18.5 is classified as

underweight, scores between 18.5 and 24.9 are classified as healthy weight, scores between 25.0

and 29.9 are classified as overweight, and scores over 30 are classified as obese.

In a study conducted by Williamson et al. (2002), 13,177 participants from the California

Health Maintenance Organization completed self-report measures on four types of child abuse:

sexual, verbal, physical, and fear of physical. Like the original ACE study, their study found that

66% of participants reported one or more type of abuse. Physical abuse and verbal abuse were

most strongly associated with body weight and obesity (Williamson et al., 2002). Compared with

no physical abuse (55%), being "often hit and injured" (2.5%) had a 4.0 kg higher weight and a

1.4 relative risk of BMI $\geq$ 30. Compared with no verbal abuse (53%), being "often verbally

abused" (9.5%) had a relative risk of 1.9 for BMI $\geq$ 40. Overall, the study conducted by

Williamson et al. (2002) showed that obesity risk increased with number and severity of each

type of abuse. This study provided further evidence of the correlation between childhood

adversity and adult obesity.

The link between obesity and child maltreatment is not limited to physical and verbal

abuse. Lissau and Sorensen (1994) also found that a lack of parental support and neglect

during childhood increased the risk of obesity in young adults. Researchers studied 881 children

ages 9–10 years (time 1) based on family structure and parental support information provided by

teachers and general hygiene data supplied by school medical services. The researchers

evaluated 756 of the students 10 years later (time 2). Children receiving no parental support as

perceived by the teacher were at significantly higher risk of becoming obese at time 2 than were

children raised in a supportive environment (Lissau & Sorensen, 1994). Students considered

dirty and neglected during childhood (at time 1) were almost 10 times more likely to be obese

as young adults at time 2 than children with average general hygiene.

Prevalence and Co-Occurrence of Adult Reported Child and Adolescent Maltreatment Samples

Childhood adversity has been shown to occur frequently when tested retrospectively in

adult samples as well as adolescent samples. Balistreri and Alvira-Hammond (2016) analyzed

data from a nationally representative cross-sectional study to examine the proximate effects of

ACEs on health and emotional well-being. Their study used data from the 2011–2012 National

Survey of Children's Health (NSCH), a large nationally representative survey sponsored by the

U.S. Maternal and Child Health Bureau in collaboration with the National Center for Health

Statistics. Participants in the NSCH were selected from U.S. households with children under 18

years old from all states. In each identified household, one child was randomly selected to be the

subject of the interview. Interviewers asked a parent or guardian who lived in the household

about the health and well-being of the child, including questions about the child's health status,

family functioning, and adverse childhood events (Balistreri & Alvira-Hammond, 2016). The

2011–2012 NSCH is the first national child-level data source on ACEs. The 2011–2012 dataset

included 34,601 adolescents aged 12–17 years. Balistreri and Alvira-Hammond (2016) found

that a majority of parents/caregivers (56%) reported that adolescents have experienced at least

one adverse life event. Approximately 38.8% have experienced one or two events, and 17% have

experienced three or more. In general, non-Hispanic black adolescents were more likely to

experience any ACE (68.8%) compared to non-Hispanic other (57.8%), non-Hispanic white (52.4%), or Hispanic adolescents (58.2%). Adolescents identified as having a special health care need were also more likely to have experienced at least one ACE (29.5%) compared to adolescents without a special health care need (19.8%). Balistreri (2015) also used the 2011–2012 NSCH dataset to assess the effects of adverse childhood experiences on the well-being of children. The dataset included information on 28,207 children and adolescents ages 6–11 years. Of the participants, 36.6% were reported to have one or two ACEs and 12.7% were found to have three or more ACEs. With regard to the 2011–2012 dataset, a limitation concerns parent reports. The reports on adverse experiences and physical and emotional well-being were delivered via parents or guardians. It may be that the responding adult underreported socially undesirable events (such as parental incarceration or drug abuse) or overreported the health and emotional well-being of the child.

Similarly, Brockie et al. (2015) examined the relationship between the number of types of exposures to ACEs (emotional, physical, and sexual abuse; physical and emotional neglect; witness to intimate partner violence) and risk behaviors and mental health outcomes among reservation-based Native American adolescents and young adults. In 2011, data were collected from Native American tribal members ($N = 288$; 15–24 years of age) from a remote plains reservation using an anonymous web-based questionnaire. Seventy-eight percent of the sample reported at least one ACE and 40 % reported at least two. The cumulative impact of the ACEs was significant for the four outcomes (p < .001), with each additional ACE increasing the odds of suicide attempt (37 %), poly-drug use (51 %), PTSD symptoms (55 %), and depression symptoms (57 %).

Burke et al. (2011) investigated adverse childhood experiences (ACEs) in youth in a low-income urban community. Data from a retrospective chart review of 701 youth between the ages of birth and 20.9 years from the Bayview Child Health Center in San Francisco were used. The mean age of patients was 8.13 years and median age 7.33 years. The majority of subjects (67.2%, $N = 471$) had experienced one or more categories of adverse childhood experiences (ACE $\geq$ 1) and 12.0% ($N = 84$) had experienced four or more ACEs (ACE $\geq$ 4). Similarly, Jimenez et al. (2016) conducted a secondary analysis of data from the Fragile Families and Child Wellbeing Study, a national urban birth cohort. Jimenez and colleagues (2016) examined the associations between teacher-reported academic and behavioral outcomes and ACE scores by using logistic regression. In the study sample of 1,007 children, 55% had experienced one ACE and 12% had experienced three or more.

Research has also examined the prevalence of adverse experiences during childhood in the special-needs population. Sullivan and Knutson (2000) assessed the prevalence of abuse and neglect among a population of children identified as a function of an existing disability and specific types of disabilities to specific types of abuse. The authors conducted an electronic merger of school records with the Central Registry, Foster Care Review Board, and police databases followed by a detailed record review of the circumstances of maltreatment. Analyses of maltreatment established a 9% prevalence rate of maltreatment for nondisabled children and a 31% prevalence rate for disabled children, as well as a significant association between the presence of a learning disability and maltreatment. Also, children with any type of disability were 3.44 times more likely to be a victim of some type of abuse compared to children without disabilities (Sullivan & Knutson, 2000). Similarly, Euser and colleagues (2015) examined the prevalence of child sexual abuse (CSA) in out-of-home care for children with mild intellectual

disabilities in 2014. The study found that children with mild intellectual disabilities in out-of-home care have a risk of CSA nearly 3 times higher than children in regular out-of-home care. Also, different types of disabilities have differing degrees of risk for exposure to violence. For example, Sullivan (2003) reported that those with behavior disorders face greater risk of physical abuse, whereas those with speech/language disorders are at risk for neglect.

The Impact of ACEs on Child and Adolescent Physical Health

Adverse childhood experiences have been consistently linked in a strong and graded fashion to a host of health problems in later adulthood, but few studies have examined the more proximate effect of ACEs on physical health (Balistreri, 2015; Balistreri & Alvira-Hammond, 2016; Baron-Lee et al., 2015; Bright et al., 2015; Brockie et al., 2015; Burke et al., 2011; Clarkson Freeman, 2014; Duke et al., 2010; Jimenez et al., 2016; Su et al., 2014, 2015). Consistent with the existing literature on the impact of ACE on adult health, poor health outcomes have been seen in samples of children and adolescents. Brown and colleagues (2019) identified the impact of ACES on complex health concerns of child-welfare-involved children. Data was obtained from Wave I of the National Survey of Child and Adolescent Well-Being (NSCAW II). The NSCAW II collected data from families with children ages birth to 17 years, investigated for child maltreatment and from their child protective services caseworkers, including demographic characteristics of the children, their histories of adversity, and a wide range of health concerns. Brown et al. (2019) described health concerns as the following: physical health, which was composed of reports of general health conditions (e.g., under/overweight, hearing, eyesight), acute conditions (e.g., serious injury or accident), or chronic conditions (e.g., allergy, asthma, headaches); developmental health (speech/language and/or social-emotional, cognitive, and neurodevelopmental); and behavioral health (temperament or internalizing, externalizing, and trauma symptoms). If a child, parent, or

caseworker affirmed any of the aforementioned health concerns, the child was given a score of 1. Results indicated that for children between the ages of 6 and 17 years, experiences of physical abuse alone as well as experiences of physical abuse involving a caregiver with mental illness were most strongly associated with complex health concerns. For children ages 2–5 years, results suggest that caregiver mental illness is a key adverse experience associated with complex health concerns.

Balistreri and Alvira-Hammond (2016) found that from a sample of over 30,000 adolescents, 56% reported experiencing one ACE. Of those who experienced ACEs, approximately one out of six (16.5%) were reported to have poor health as measured by asking a parent/guardian "In general, how would you describe [name's] health?" measured on a Likert-type scale with five possible responses (*excellent*, *very good*, *good*, *fair*, or *poor*). This measure was dichotomized into *poor* (*good*, *fair*, or *poor*) versus *good* (*very good* or *excellent*) health, comparable to published reports and previous studies using the NSCH. Flaherty et al. (2006) prospectively examined the association between ACE exposure and child health outcomes at 4 and 6 years of age. Flaherty et al. (2006) found that children who had been exposed to one ACE (compared to zero ACEs) at the age of 4 were 1.89 times more likely to have "poor general health" at their follow-up screening at age 6. With regard to multiple ACE exposures, the authors found that 4-year-old children who had four or more ACE exposures were 2.83 times more likely to need medical attention for a reported illness.

Kerker et al. (2015) also assessed the association between ACE exposure among young children (ages 18–71 months) and health conditions. Kerker et al. (2015) specifically assessed chronic medical conditions such as autism, anxiety, asthma, AIDS, arthritis/joint issues, attention-deficit/hyperactivity disorder, blood problems, cystic fibrosis, cerebral palsy, dental

issues, Down syndrome, diabetes, depression, ear infections, hypertension, heart issues, hypertension, headaches, eating disorders, and other health issues. Such conditions were measured using a screening tool developed by Stein et al. (2013) specifically for Wave II of the National Survey of Child and Adolescent Well-Being (NSCAW). Significant findings from Kerker and colleagues (2015) revealed that children with a chronic medical condition were exposed to more ACEs than their peers with no chronic medical issues (3.9 ACEs vs. 3.4 ACEs, $p = .009$).

Su et al. (2014) evaluated cardiovascular disease risk in determining whether exposure to ACEs was associated with greater peripheral resistance, arterial stiffness, blood pressure, or elevated circulating endothelin-1 levels in a sample of 221 healthy adolescents and young adults (mean age, 21 years; range, 13–29 years). They found a graded association of ACE exposure with plasma endothelin-1 levels, of which an average 18% and 24% were higher in participants with one ACE and two or more ACEs (respectively) compared to those with no ACEs. Participants with moderate/severe exposure to ACEs (two or more ACEs) had significantly higher total peripheral resistance index (+12%), diastolic blood pressure (+5%), and pulse wave velocity (+9%) compared to those who were not exposed. These associations to disease risk were independent of age, race, sex, body mass index, and childhood socioeconomic status. The results found by Su et al. (2014) indicate that early life stress promotes cardiovascular disease risk, specifically detrimental vascular and cardiac function, and is detectable in young adulthood.

Su and colleagues (2015) expanded upon the previous study and conducted a longitudinal study to assess the long-term effect of adverse childhood experiences (ACEs) on blood pressure (BP) trajectories from childhood to young adulthood, and to examine whether this relation is explained by childhood socioeconomic status (SES) or risk behaviors that are associated with

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ACEs. Systolic and diastolic blood pressure were measured up to 16 times (13 times on average) over a 23-year period in 213 African Americans and 181 European Americans 5–38 years of age. Retrospective data on traumatic experiences including abuse, neglect, and household dysfunction before 18 years of age were collected. No main effect of ACEs on average BP levels was found. However, a significant interaction of ACE score with age 3 years was observed (systolic BP, $P = 0.033$; diastolic BP, $P = 0.017$). Subjects who experienced multiple traumatic events during childhood showed a faster rise in BP levels after 30 years of age than those with no ACEs.

Several studies identified a relationship between adverse childhood experiences and childhood obesity. Burke et al. (2011) studied the effects of ACEs on childhood obesity and found that for BMI ≥ 85%, age, ethnicity, and an ACE score of 4 or more (OR = 2.0, $p = 0.02$) were associated with increased likelihood of being overweight or obese compared to children with an ACE score of 0. Heerman et al. (2016) conducted cross-sectional analysis of the 2011–2012 National Survey of Children's Health, including children aged 10–17 years. Weighted estimates of 31,258,575 children were based on interviews with 42,239 caregivers. Caregiver reports of nine psychosocial risk factors measured AFEs (adverse family experiences, a subset of ACEs) during childhood. Adolescent overweight and obesity were derived by caregiver-reported child height and weight. Nearly one third of children (30.5%) had experienced two or more AFEs. The prevalence of obesity among children experiencing two or more AFEs was 20.4%, compared to 12.5% among children with zero AFEs. Children with two or more AFEs in childhood were more likely to have obesity (AOR = 1.8) than those with no AFEs; non-Hispanic white children were most affected.

Lynch and colleagues (2016) also evaluated AFEs and overweight/obesity

in children aged 10 years or older. Data was collected from the 2011–2012 National Survey

of Children's Health data. Caregivers reported their child's height, weight, and exposure to nine

AFEs; body mass index (BMI) was classified by the Centers for Disease Control and

Prevention's (CDC) guidelines. Exposure to two or more AFEs was independently associated

with increased odds of overweight (1.33) and obesity (OR, 1.45) status after adjustment for age,

household income, parents' education level, race, and sex. Death of a parent (OR, 1.59) and

hardship due to family income (OR, 1.26) were independently associated with obesity status,

with adjustment for other AFEs and sociodemographic factors. Additionally, Isohookana et al.

(2016) found that adolescent girls who experienced sexual abuse were more likely to be obese

and to demonstrate extreme weight loss behaviors (EWLB). Among these female participants,

those with parental unemployment were associated with an increased likelihood of obesity and of

being underweight. Also, proneness to exercising excessively was found among girls who had

witnessed domestic violence and those whose parent(s) had died. This study showed that female

adolescents with a history of traumatic experiences or difficult family circumstances exhibited an

elevated likelihood of being obese and engaging in unhealthy weight control behaviors.

Danese and colleagues (2009) conducted a longitudinal study to understand why children

exposed to adverse psychosocial experiences are at elevated risk for age-related disease, such as

cardiovascular disease. A total of 1,037 members of the Dunedin Multidisciplinary Health and

Development Study were recruited. During their first decade of life, study members were

assessed for exposure to three adverse psychosocial experiences: socioeconomic disadvantage,

maltreatment, and social isolation. At age 32 years, study members were assessed for the

presence of three age-related-disease risks: major depression, high inflammation levels (high-

sensitivity C-reactive protein level > 3 mg/L), and the clustering of metabolic risk biomarkers (overweight, high blood pressure, high total cholesterol, low high-density lipoprotein cholesterol, high glycated hemoglobin, and low maximum oxygen consumption levels). Children exposed to adverse psychosocial experiences were at elevated risk of depression, high inflammation levels, and clustering of metabolic risk markers. Children who had experienced socioeconomic disadvantage had an 89% increased risk for elevated age-related disease. Additionally, children who had experienced maltreatment had an 81% increased risk compared to those who endorsed social isolation (87% increased risk) for elevated age-related-disease risks in adulthood. The effects of adverse childhood experiences on age-related-disease risks in adulthood were nonredundant, cumulative, and independent of the influence of established developmental and concurrent risk factors (Danese et al., 2009).

Links Between ACEs and Physical Health in Children and Adolescents: Two Theoretical Models

Two major theories have been proposed to explain the relationship between adverse experiences in childhood and physical health in childhood. The biological theory states that adverse childhood experiences cause dysregulation in bodily systems (e.g., hyperarousal in the immune system) during a critical period in development. As a result, there is continual under- and overregulation in response to external and internal stimuli, such as additional external stress and the child's response to it (Danese et al., 2007; Danese & McEwen, 2012; Middlebrooks & Audage, 2008; Taylor et al., 2011). Cumulative risk theory states that health problems are caused by the accumulation of risk factors, independently of the presence or absence of specific risk indicators (Rutter, 1979; Sameroff, 2000). Each of these theories is discussed below.

Biological Theory

Stressful and/or traumatic experiences during childhood may have neurodevelopmental impacts that persist over the lifespan. Exposure to adverse childhood experiences during critical periods of brain development can disrupt and dysregulate vulnerable biological processes, leading to the development of a low stress threshold and overreaction to adverse experiences throughout life (Middlebrooks & Audage, 2008). Evidence from animal models, clinical studies, and neuroimaging studies suggest that child maltreatment affects brain regions (e.g., hippocampus, amygdala, and prefrontal cortex) and circuits such as the hypothalamic-pituitary-adrenal (HPA) axis and norepinephrine systems which mediate stress response (Bremmer, 2003). According to Teicher et al. (2003), the neurobiological changes that child maltreatment produces occur on multiple levels, from neurohumoral (especially the HPA axis) to structural and functional. The major structural consequences of early stress include reduced size in midportions of the corpus callosum and attenuated development of the left neocortex, hippocampus, and amygdala (Teicher et al., 2003). Major functional consequences include increased electrical irritability in limbic structures and reduced functional activity of the cerebellar vermis (Teicher et al., 2003).

In another landmark study, ACEs researchers and neuroscientists integrated data on the neurobiological effects of childhood trauma with the epidemiologic data from the original ACEs study. Anda et al. (2006) conducted a brief review of the neurobiology of trauma. Then the researchers used the Adverse Childhood Experiences (ACE) Study as an epidemiological "case example" of the convergence between epidemiological and neurobiological evidence of the effects of childhood trauma. Anda and colleagues (2006) used the number of ACEs as a measure of cumulative childhood stress and hypothesized a "dose-response" relationship of the ACE score to 18 selected outcomes and to the total number of these outcomes (comorbidity). Based

upon logistic regression analysis, the risk of every outcome in the affective, somatic, substance abuse, memory, sexual, and aggression-related domains increased in a graded fashion as the ACE score increased. The mean number of comorbid outcomes tripled across the range of the ACE score. The results showed that the graded relationship of the ACE score to 18 different outcomes in multiple domains theoretically parallels the cumulative exposure of the developing brain to the stress response, with resulting impairment in multiple brain structures and functions.

According to Bryan (2019), ACEs have a profound effect on the developing brain because neurons grow, and "wire" together based on the experiences that a person has. Furthermore, children who are exposed to adversity and stressful situations will have brains that are wired to operate in survival mode (Bryan, 2019). The impairments and structural brain changes can impact the child in many ways. For example, alterations in the limbic circuitry can impact physical and emotional responses to environmental stimuli (Bryan, 2019). Additionally, alterations in prefrontal cortex development can impact functions such as attention, executive function, and self-regulation (Bryan, 2019).

In addition to impairing brain structures (changes that persist through adulthood), ACEs affect the endocrine system and the immune system via the HPA axis (Bryan, 2019). The HPA axis is the central stress response system in humans. The HPA axis is responsible for the neuroendocrine adaptation component of the stress response (Lever-van Milligen et al., 2020). This response is characterized by the release of corticotropin-releasing factor (CRF) from the hypothalamus. When CRF binds to CRF receptors on the anterior pituitary gland, adrenocorticotropic hormone (ACTH) is released. ACTH binds to receptors on the adrenal cortex and stimulates the release of glucocorticoids such as cortisol. At low levels glucocorticoids can fight inflammation and work with the immune system to treat many health problems (Hannibal,

& Bishop, 2014). The release of cortisol will occur for several hours after encountering the stressor (Lever-van Milligen et al., 2020). Once at a certain blood level, cortisol will exert negative feedback to the hypothalamus to inhibit the release of CRF, decreasing release of ACTH and essentially cortisol, to reach a level of homeostasis.

However, repeated exposure to stressors leads to repeated and sustained HPA axis activation, causing a chronic biological stress response (van der Kolk, 2014). Additionally, early stressors may have lasting effects on the HPA axis, possibly by increasing glucocorticoid response to subsequent stress (Bremmer, 2003; Heim et al., 2002). Furthermore, disruptions in HPA signaling may sustain inflammatory processes through altered release of glucocorticoid hormones and disturbances in the balance between pro- and anti-inflammatory mechanisms, thereby affecting immune activation and inflammation (Hannibal, & Bishop, 2014). Although temporary increase in inflammation can help to fight infection, sustained levels of inflammation can cause disease (Hannibal, & Bishop, 2014). As a result, these sustained inflammatory processes may have a role in developing cancers, heart disease, and immune disorders (Brown et al., 2010). For example, Kiecolt-Glaser (2005) found that couples who engaged in hostile interactions had elevated inflammatory markers, which led to delayed healing for wounds. Similarly, Danese and colleagues (2007) found that childhood adversity was linked to elevated inflammation within the body measured by elevated levels of c-reactive protein (biomarker for inflammation). Elevated levels of c-reactive protein have also been linked to cardiovascular disease (Taylor et al., 2011).

Elevated cortisol levels can cause myriad health issues within the body. For example, the immune response that can protect against the growth of tumors is suppressed by elevated levels of cortisol (Dube et al., 2009; Fuller-Thomson et al., 2009). Childhood maltreatment has been

linked to elevated levels of cortisol and ACTH in participants (Heim et al., 2002). A study conducted by Taylor and colleagues (2011) found that elevated cortisol levels have been shown to be a predictor of early mortality in patients with metastatic breast cancer. This information is consistent with a study conducted by Reiche et al. (2004) in which elevated cortisol levels created by persistent activation of the HPA axis increased DNA damage and inhibited DNA repair and apoptosis. Additionally, elevated cortisol levels have been found to impact the physical health risk factors measured within this study. Sustained elevated levels of cortisol can lead to an increase in body fat and cause obesity. Cortisol can move fat molecules (triglycerides) from storage and relocate them to fat cells located around the abdomen (Fraser et al., 1999; O'Connor et al., 2020). Cortisol also aids the development and maturation of fat cells called adipocytes (Fraser et al., 1999). According to O'Connor (2020), fat cells located around the abdomen have more cortisol receptors, making them more susceptible to elevated cortisol levels. Also, cortisol stimulates the release of blood sugar as well as increased production of sugar (Hepsen et al., 2020). As a result, elevated cortisol levels can lead to increased blood sugar levels, increasing the risk for diabetes (Hepsen et al., 2020). Elevated cortisol levels are known to have harmful effects on blood pressure and lead to hypertension. Cortisol has a direct impact on heart and blood vessels (Iob & Steptoe, 2019). It narrows the arteries while the epinephrine (also released with cortisol) increases heart rate (Whitworth et al., 2005). The combination of arterial constriction and increased heart rate force blood to pump harder and faster, resulting in elevated blood pressure (Iob & Steptoe, 2019; Whitworth et al., 2005). As such, Hepsen and colleagues (2020) found that cortisol levels were significantly higher in patients with high blood pressure or diabetes and patients who were obese. Overall, the HPA-axis is a crucial stress response system in humans. Chronic stress can lead to sustained HPA activation and

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impairments in key brain structures. Toxic stress that occurs during critical periods of development in children can lead to maladaptive responses in the body, resulting in disease and a variety of health conditions (Dobbins et al., 2012; Nusslock & Miller, 2016; Taylor et al., 2011; Teicher et al., 2003; van der Kolk, 2014).

Cumulative Risk Theory

Cumulative risk theory states that the greater the accumulation of risk factors, the worse the outcome (Rutter, 1979; Sameroff, 2000). In the seminal study done by Rutter (1979), he found that children ages 9–11 years who had two of the six risk factors (large family size, paternal criminality, low SES status, severe marital discord, maternal mental disorder, and foster placement) were four times more likely to have a mental disorder. Additionally, children who had four risk factors were 10 times more likely to have a mental disorder (Rutter, 1979). Another seminal study conducted by Sameroff (2000) examined the following risk factors: rigid parental values/beliefs about child development, observation of few positive child-parent interactions, low maternal educational status, disadvantaged minority status, history of maternal mental disorder, high maternal anxiety, single parenthood, stressful life events, and large family size. Sameroff (2000) found that children who had more than eight of the 10 risk factors were 7 times more likely to have negative academic outcomes.

Research has shown a cumulative component to adverse childhood experiences, resulting in increased risk of both physical and mental health outcomes with higher numbers of ACEs (Anda, 2006; Felitti et al., 1998; Felitti & Anda, 2006). Previous research has shown that ACEs are interrelated and typically occur together (Dong et al., 2003, Finkelhor et al., 2012). For instance, children who experience neglect or abuse often also experience different types of household dysfunction such as domestic violence, parental mental illness, parental drug and alcohol abuse, and parental incarceration (Anda et al., 1999; Dong et al., 2003; Dube et al., 2003;

Felitti et al., 1998). Moreover, Dong and colleagues (2004) reported that if an individual experienced a single type of ACE, he or she has a 75% probability of experiencing a second type of ACE. Larkin et al. (2014) stated that examining single types of ACEs can be misleading, and that the cumulative value is needed to better understand the impact of ACEs on outcome.

However, cumulative risk theory has certain limitations. Evans and colleagues (2013) reported that because cumulative risk dichotomizes risk factors, the duration, intensity, and frequency of trauma exposure are lost. Also, as the model is additive, it precludes the possibility of statistical interactions between risk factors (Evans et al., 2013). Additionally, cumulative risk theory might be applicable only to certain outcomes. For example, O'Hara et al. (2015) assessed performance on cognitive tasks among children who were only neglected and among children who were both neglected and physically abused. The results of the study showed that children who experienced neglect alone achieved lower scores on cognitive measures than children who were neglected and physically abused. This study shows that when considering intelligence outcomes, additional abuse may not additively accumulate risk for neglected children. This finding suggests that cognitive development may be a factor when looking at the cumulative effects of neglect and other adverse childhood experiences. Nonetheless, cumulative risk theory has many advantages and fits well with underlying theoretical models such as the biological model described above. Cumulative risk theory in conjunction with the biological model supports the current study aims and hypotheses that children who have experienced a greater number of adverse childhood experiences are more likely to have negative physical health outcomes.

Foster Care

By definition, children in the child welfare system have suffered at least one ACE. Children who are placed in foster care for their protection have experienced many conditions that

may threaten their safety and well-being. The removal from home can be devastating and confusing for children (Barber & Delfabbro, 2004). Once in foster care, children may experience prolonged stays in care. According to 2014 AFCARS data, of the 238,230 children who exited foster care in fiscal year 2014, 53% had been in care 12 months or more (Barber & Delfabbro, 2004). The longer a child is in placement, the greater the chance that he or she will move from one foster placement to another, placing the child at further risk of negative social and emotional outcomes (DePanfilis, 2006). Recent research from the National Survey of Child and Adolescent Well-Being 1994-2014 (NSCAW I) found that children and youth in foster care have high levels of mental health needs, and that those needs are not being met (McCue Horwitz et al., 2012). Children and youth with mental health disorders who are in foster care stay in foster care longer, rely more on expensive residential treatment placement, experience more moves in care, have more involvement with the criminal justice system, and have poorer educational outcomes (McCue Horwitz et al., 2012).

Recent studies have shown that in comparison to the general population, welfare-involved children are far more likely to have experienced at least four ACEs (42% vs. 12.5%; CDC, 2017). Clarkson Freeman et al. (2014) examined the effects of ACEs on the well-being of children within the child welfare system. Data from the National Survey of Child and Adolescent Well-Being was used and children ages birth to 6 years were studied 59 to 97 months after the close of investigation or assessment. The NSCAW I Child Protective Services (CPS) dataset is a nationally representative sample of 5,501 children and families investigated by CPS between October 1999 and December 2000. By the age of 6, approximately 70% of children experienced three or more ACEs, and there were strong relationships between ACEs. Numerous ACEs were associated with long-term behavioral problems, and results supported a dose-response effect

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(Clarkson Freeman et al., 2014). Three or more ACEs more than quadrupled the risk of experiencing internalizing problems, and almost quadrupled the risk of experiencing either externalizing or total problems at 59 to 97 months postinvestigation. Based on these findings, Clarkson Freeman and colleagues (2014) reported that the need for early screening/assessment and increased collaboration between child welfare and early intervention programs was "crucial."

Physical Health Outcomes

In addition to the effects of involvement in the child welfare system one's mental health, poor physical health outcomes have also been seen. Stein and colleagues (2013) examined the presence of chronic health conditions (CHCs) among a nationally representative sample of children investigated by child welfare agencies. The study included 5,872 children from birth to 17.5 years old whose families were investigated for maltreatment between February 2008 and April 2009. Data from the second National Survey of Child and Adolescent Well-Being was used to examine the proportion of children with CHC. Stein et al. (2013) developed two categorical and two noncategorical measures of CHC from the available data and analyzed them by using bivariate and multivariable analyses. Depending on the measure used, 30.6% to 49.0% of all children investigated were reported by their caregivers to have a CHC. In the multivariable analyses, children with poorer health were more likely to be male, older, and receiving special educational services but not more likely to be in out-of-home placements (Stein et al., 2013).

Additionally, Jee and colleagues (2006) used data from the National Survey of Child and Adolescent Well-Being and found that 20% of foster caregivers reported that their foster child had one chronic medical condition, 3.8% reported two chronic medical conditions, and 3.1% reported three or more. Also, approximately 3% of caregivers reported that their child had a chronic condition but did not identify the condition. Jee et al. (2006) stated that the most

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common chronic condition diagnoses reported by foster caregivers were asthma (32.8%), other

respiratory problems (12.8%), and a category including severe allergies, repeated ear infections,

and recurrent eczema (6%) (Jee et al., 2006). Jackson and colleagues (2016) studied a sample of

foster care youth aged 8 to 18; 49% had a diagnosis of a chronic condition listed in their medical

records. Of the chronic conditions reported, chronic pain was the most common (44%), followed

by asthma (30%), constipation/enuresis (12%), and obesity (11%; Jackson et al., 2016).

Overweight and obesity are also growing problems for children in foster care.

Schneiderman et al. (2013) identified the prevalence of overweight and obesity in an urban

ethnic minority population of children ages 2–19 years in long-term foster care ($N = 312$) in Los

Angeles, California. The estimates of prevalence of overweight/obesity ($\geq$ 85th percentile)

and obesity ($\geq$ 95th percentile) were presented for gender, age, ethnicity, and placement type.

The prevalence of overweight/obesity was almost 40% and obesity was 23% for the study

population. Children placed in a group home had the highest prevalence of overweight/obesity

(60%) and obesity (43%) compared to other types of placements.

Potential Moderators of Physical Health Outcomes: Age and Gender

Research has shown that poor physical health outcomes could be impacted by age and

gender. For instance, Kools and colleagues (2013) examined health outcomes of adolescents

(ages 11-18 years) and developed health profiles based on four dimensions of health including

satisfaction with health, risks, resilience, and discomfort. Scores on these four dimensions were

combined to create four health status rankings: 1) *Best Health Status* (average or excellent health

in all four domains), 2) *Fair Health Status* (poor health in one domain), 3) *Poor Health Status*

(poor health in two domains), and 4) *Worst Health Status* (poor health in three or four domains).

Most of the youth in the sample fell into the *Best Health Status* category (38.9%), followed by

Fair Health category (30.5%), *Poor Health* category (17.6%), and *Worst Health* category

(13.0%). Kools and colleagues (2013) found that 11- to 13-year-olds were the most likely age group to be in the *Best Health* category. However, youth ages 14–16 years were represented in higher proportions as the health status category worsened: 14- to 16-year-olds made up 50% of the *Fair Health* category, 56.5% of the *Poor Health* category, and 82.4% of the *Worst Health* category. A similar pattern was also seen in Schneiderman et al.'s (2013) abovementioned study. Older children (ages 12–19 years) were more likely to be overweight/obese than normal weight compared to children between 2 and 5 years old when controlling for gender, ethnicity, and placement (OR = 2.10). These findings suggest that older age may be a risk factor for obesity and poor health status.

With regard to gender, the study by Kools et al. (2013) showed that adolescent girls reported significantly worse health than adolescent boys. For example, 82.6% of the *Poor Health* and 70.6% of the *Worst Health* categories were made up of adolescent girls. Additionally, the study conducted by Stein et al. (2013) found a statistically significant difference between reported chronic health conditions in males and females. Males were more likely to have a chronic illness (53.1%) compared to females (44%). Thompson et al. (2004) examined gender differences in the associations of physical abuse in childhood with health problems in adulthood. Although males were significantly more likely than women to have experienced physical abuse, women were significantly more likely than men to have acquired a physical health condition in adulthood and report having unfavorable health (Thompson et al., 2004). The mixed results for gender differences could be explained by the fact that there are many different forms of maltreatment, and those various forms differ in prevalence for boys and girls. For example, Finkelhor et al. (1990) found that girls were more likely than boys to be abused by family members. Kohn Maikovich-Fong and Jafee (2010) found that girls are also more likely to

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experience penetrative abuse. Additionally, Asscher et al. (2015) found that in a sample of juvenile delinquents, females were more often victims of sexual and physical abuse and more often had a history of neglect and maltreatment than males. Sundaram and colleagues (2008) hypothesized that the difference in prevalence rates is because of possible underreporting of sexual abuse victimization by males. As such, this theory is supported by researchers who have found that males experience neglect and physical abuse more often. Titus and colleagues (2003) found that boys were victims of physical abuse more often than girls. Similarly, Sickmund et al. (1997) found that boys were more often targets of neglect and physical abuse. Although the research findings on physical health outcomes and maltreatment prevalence contradict one another, these studies show that gender does impact physical health outcomes. As a result, additional studies are needed to examine the effects of gender.

Resilience

Over the years, resilience has been defined by several researchers. It is a concept referring to a level of perseverance that allows individuals to overcome adversity (Masten & Obradovic, 2008). Masten and Obradovic (2008) defined resilience as "the processes of, capacity for, or patterns of positive adaptation during or following exposure to adverse experiences that have the potential to disrupt or destroy the successful functioning or development of the person" (p. 9). Many studies have focused particularly on resiliency in children and adolescents. One study involved a Delphi inquiry concerning the characteristics of resiliency specific to African American children/youth. The study was conducted with a large group of African American parents who were considered experts in resiliency because they had graduated from high school and had at least one child who had graduated from high school (Jones et al., 2014). Through a series of three Delphi surveys, the parents discussed the most important characteristics of resiliency that contributed to their success and the success of their children, as well as those

that hindered their success and the success of their children (Jones et al., 2014). According to

Jones et al. (2014), the main characteristics of resiliency identified by the parents as contributing

to or hindering their success or the success of their children included (a) spiritual/faith, (b)

positive/negative personal traits, (c) family involvement/problems, (d) positive/negative

educational supports, (e) inappropriate behaviors, and (f) resources.

Several authors consider self-esteem to be part of resilience on the individual level

(Kumpfer, 1999; Masten & Coatsworth, 1998). As such, self-esteem has been extensively

studied as a resilience factor (Akin, & Radford, 2018; Aliyev & Gengec, 2019; Karaman &

Efilti, 2019; Prihadi et al., 2018). Self-esteem has been defined as an individual's self-evaluation

of their own worth (Prihadi et al., 2018) and is a major component of an individual's self-

concept. Low levels of self-esteem have been correlated with depression and anxiety (Butler &

Gasson, 2005; Byrne, 2000). Furthermore, higher levels of self-esteem can act as a buffer against

several high-risk behaviors and are associated with greater overall functioning (Emler, 2001;

Garcia-Reid et al., 2013). In an adult sample of all females who experienced sexual abuse in

childhood, one study defined self-esteem as the ability to think well of oneself and was

significantly predictive of subjective health among these participants (Jonzon & Lindblad, 2006).

Additionally, another study examined the effects of self-esteem on adult females who had

experienced childhood sexual abuse and found that self-esteem was protective against

interpersonal problems and high-risk sexual behaviors (Lamoureaux et al., 2012).

Cicchetti et al. (1993) investigated school-age disadvantaged maltreated ($N = 127$) and

non-maltreated ($N = 79$) children attending a summer camp program, assessing multiple areas of

adaptation (social adjustment, risk for school difficulty, psychopathology) from self, peer, and

camp counselor perspectives and school records. They developed a composite index of adaptive

functioning and created levels of competence. The researchers evaluated personality dimensions and personal resources including cognitive maturity, self-esteem, ego-resiliency, and ego-control as mechanisms promoting individual differences in successful adaptation. Maltreated children as a group had lower overall competence compared to non-maltreated children. Ego-resiliency, ego-control, and self-esteem were each found to predict individual differences in competent functioning (Cicchetti et al., 1993).

Additionally, Moran and Eckenrode (1992) examined whether personality characteristics such as locus of control orientation and self-esteem were protective against depression among female adolescent victims of maltreatment, and examined whether the presence of these characteristics was related to the age of the victim when maltreatment began. Thirty-three maltreated adolescent females and a comparison group of 112 non-maltreated female adolescents were administered a questionnaire containing scales measuring locus of control orientation, self-esteem, and depression. Results revealed that personality characteristics interacted with maltreatment status in predicting depression, suggesting that they are protective factors (Moran & Eckenrode, 1992). Results also revealed that adolescents who first experienced maltreatment during childhood were significantly less likely than those who first experienced maltreatment during adolescence to have these protective personality characteristics (Moran & Eckenrode, 1992).

Gao and colleagues (2019) studied resilience and self-esteem among adolescents who were left behind in China by their parents. Gao and colleagues (2019) examined the association between negative life events and positive social adjustment, and how resilience and self-esteem mediate this association. The results showed that negative life events were not only directly related to positive social adjustment ($\beta = -0.187$), but also showed an indirect effect

on positive social adjustment ($\beta = -0.541$) through resilience ($\beta = -0.370$) and self-esteem ($\beta = -0.171$). The total effect of negative life events on positive social adjustment was -0.728, where 74.31% was mediated by resilience and self-esteem. Results suggest that higher self-esteem may provide more resources to deal with daily stresses, making children better able to avert social maladjustment (Gao et al., 2019).

Children who are part of the foster care system may have feelings of low self-esteem. Unrau et al. (2008) found that children involved in the foster care system expressed themes that were associated with a decrease in self-esteem. However, in another study conducted by Luke and Coyne (2008), self-esteem increased when the children perceived their foster parent as a source of support and secure attachment. Additionally, another study examined self-concept (as measured by the global self-worth scale) and trauma symptoms in sexually abused children. Findings indicated that a child's self-concept was associated with all the trauma symptoms except sexual concerns, and did account for a significant amount of variance in relation to trauma symptomatology (Reyes, 2008). Moreover, self-esteem can be characterized as a malleable variable that can serve as a protective factor for youth who have experienced adverse childhood experiences. The abovementioned studies support self-esteem as an individual inner protective factor and an important psychological resource that can be used to achieve positive social outcomes (Gao et al., 2019).

The current study looked at self-esteem as a measure of resiliency in a high-risk population of children who have experienced maltreatment. There are few standards to guide the operational definition of resilience (Heller et al., 1999) in the literature, and fewer standards within the resilience to child maltreatment literature. As a result, it is difficult to compare resilience across groups and studies. Thus, information gained from this study could help to

determine and evaluate interventions pertaining to resilience in children placed in the foster care system. This study increases knowledge about fostering resilience in such marginalized groups and expands the literature on self-esteem as a protective factor. Additionally, these research findings may be valuable for child welfare professionals advocating for improved child physical health outcomes and long-term improved health in adulthood.

Limitations of Existing Literature

There currently exists a gap in the literature examining ACE categories in pediatric samples. Petruccelli et al. (2019) examined 96 ACE studies and found more studies focusing on psychosocial/behavioral outcomes than on medical outcomes. The majority of the studies included were retrospective and observational, and relied on the same dataset (Petruccelli et al., 2019). The retrospective studies also introduced the possibility of response bias. There is a possibility that patients who remember ACEs as adults were affected differently by them than those who do not remember the adverse experiences of their childhood (Petruccelli et al., 2019). Of those 96 articles, only 12 studies reported research conducted on children. Furthermore, among the articles examining adverse childhood experiences in children, many used the same dataset. Additionally, of the datasets used, the measures completed were reports from parents about their children rather than self-reports directly from the children. A majority of pediatric samples focused solely on psychosocial and mental health outcomes, without attention to physical health. Of the several studies that addressed impacts on physical health, almost all studied childhood obesity. As such, there is a lack of research examining the effects of ACEs on physical health outcomes in pediatric samples. The current research study is important because it took into account the mind-body interaction. Neurological pathways connect parts of the brain that process emotions with other systems within the body such as the cardiovascular, digestive, and immune systems. These intersecting systems establish the mind-body connection which

influences one's health and the development of disease. ACEs are psychosocial stressors that have been shown to negatively impact health in children, adolescents, and adults. Youth involved in the foster care system are particularly at higher risk for poor health outcomes because of their increased exposure to adversity. Therefore, investigating ACEs in this specific pediatric population allows for deeper understanding of time onset and the impact of trauma on continuing development. Moreover, further investigation of ACEs within this sample may help to identify children who are at risk for chronic diseases and/or poorer health outcomes throughout later adolescence and adulthood.

CHAPTER III: METHODS

Overview

The purpose of the present study was to examine the relationship between adverse childhood experiences (ACEs) and childhood physical health. Furthermore, this study considered self-esteem, age, and gender as moderator variables in the relationship between ACEs and childhood physical health. This study enhanced the existing literature on ACEs and recognized their impact on overall childhood physical health.

Participants

Participants included youth ages 8–16 years who were referred for and received a Comprehensive Health Evaluation of Children (CHEC) due to recent removal from their home and placement into the foster care system, or for transitioning into a new foster home. The decision to incorporate youth between ages 8 and 16 was based upon the limited data for this specific age range as well as the availability of archival data based on youth within this range. The archived psychological and medical evaluation records of CHEC participants in this study included evaluations that took place between the years 2014 and 2019 at a regional diagnostic center that serves child maltreatment victims in a large urban area in northeast New Jersey. Of note, only individuals who received both a psychological and a medical evaluation were included in the present study. Most participants who completed the evaluations typically identify as either African American or Hispanic/Latinx, with the minority of participants identifying as Caucasian, Asian, or other. Results from G*Power for a multiple regression with 5 predictors and medium effect size ($f^2 = 0.15$) suggest a sample size of $n = 77$ to examine moderation analyses with $\alpha \leq 0.05$ and $1\text{-}\beta = 0.8$. A larger group sample ($n = 119$) would allow for higher power ($1\text{-}\beta = 0.95$).

Procedures

Inclusion in the present study required that the youth and a caregiver (who was either a

Division of Child Protection and Permanency [DCP&P] caseworker or foster parent) completed

both the medical and psychological portions of a Comprehensive Health Evaluation for Children

(CHEC) between the years of 2014 and 2019. CHEC evaluations typically involve an interview

with both the youth and the accompanying adult, and completion of self-report measures

assessing depressive symptomatology, trauma, and anxiety symptoms as well as a brief measure

of cognitive functioning. The structured psychological interview protocol for the CHEC

evaluation includes specific questions about the child's behavior, recent emotions, current

placement, previous placement, the reason for the removal or change in placement, and

demographic information.

Prior to the evaluation, the DCP&P caseworker provided consent for the youth to be

evaluated, since DCP&P has legal guardianship of the child once the child is removed from the

parent's care. During the CHEC psychological evaluation, the interviewing clinician also

assessed the youth's experience and level of understanding of the removal. Any youth who is not

comfortable or is unable to answer a question is not required to answer the question. However,

responses are strongly encouraged by rephrasing and offering children alternate ways (e.g.,

writing responses) to provide answers to difficult questions.

During the CHEC medical evaluation, the nurse practitioner or medical doctor will

initially meet with the DCP&P worker and foster parent to obtain information about the child's

medical history. If the child is verbal, the nurse practitioner or medical doctor will then speak

with the child, followed by a complete head-to-toe physical exam. Vision and hearing screenings

as well as laboratory testing may be performed or recommended. Depending on the child's immunization status, vaccines may be given.

CHEC Psychological and Medical Report Data

Scores from the following psychological measure and the semistructured interviews (described above) completed by the youth, child protection caseworker referral information and interview data, all gathered at the time of the standard CHEC evaluation, were included in the study. The archived psychological written reports from the raw data were used in the current study to gather demographic information including age, gender, race and/or ethnicity, and reason for removal from the home. For the purposes of the current study, an estimated "childhood adversity score" was calculated for each youth based on information included in the final psychological and medical reports. Previous researchers (O'Donnell, 2018) used the information from archival CHEC data to code for an adversity score based on the 10 ACE categories. For each ACE category, the researchers gave a score of 1. Then the individual ACE categories were summed together to create a "childhood adversity score." It is important to note that these calculated "ACE" scores may be lower than youths' true adversity scores due to information missing from reports. Additionally, since ACE measures were meant for adult populations, the research calculated scores may differ from what study participants might receive by the time they reach 18 years of age. Furthermore, ACE scores are self-rated retrospectively by an adult sample, and the present study's "calculated childhood adversity score" (CCAS) is judged by researchers based on available data in a childhood population. The data coded by O'Donnell (2018) covers a portion of the database used in the current study ($n = 59$). As such, for the remainder of the sample ($n = 60$), the author repeated the procedure conducted by O'Donnell (2018) to code for an adversity score. Another coder examined the scores to ensure consistency in the coding and interrater reliability for the calculated childhood adversity score.

Medical information for this study was obtained from the archived written medical portion of the CHEC evaluation. Medical information included the youth's height, weight, BMI, blood pressure, birth history, and the presence or absence of multisystem medical conditions. Additional medical data was obtained from available CHEC archived medical records. This included metabolic risk factors such as increased blood pressure (SBP $\geq$ 130 mmHg, DBP $\geq$ 85 mmHg, or treatment with antihypertensive medication), and obesity (BMI $\geq$ 85th percentile) (Al-Hamad & Raman, 2017; DeBoer, 2019).

Childhood Depression Inventory, Second Edition (CDI-2). The CDI-2 is a self-report measure for children and adolescents ages 7–17 that helps assess cognitive, affective, and behavioral signs of depression. The full-length CDI-2 is a 28-item assessment that yields a total score, two scale scores (i.e., Emotional Problems and Functional Problems), and four subscale scores (i.e., Negative Mood/Physical Symptoms, Negative Self-Esteem, Interpersonal Problems, and Ineffectiveness). For each item, the respondent is presented with three choices that correspond to three levels of symptomatology: 0 (*absence of symptoms*), 1 (*mild or probable symptom*), or 2 (*definite symptom*). The CDI-2 has been standardized in a sample that included 1,705 participants (913 girls and 792 boys) from 26 different states in the United States and a clinical sample of 102 participants (60 girls and 42 boys; Masip et al., 2010). The standardized sample was evenly proportioned in terms of age and gender, with 50 males and 50 females at each age. The racial/ethnic distribution of the sample very closely matches the U.S. Census distribution (i.e., all races were within 1% of census targets, based on the 2000 U.S. Census report). Overall, the standardized sample included a reasonable spread of geographical locations of all four major regions of the United States (Kovacs, 1992).

The present study used only the CDI-2's Negative Self-Esteem subscale, which consists of five items. The prompt for each question asks the youth to identify the response that most accurately reflects their feelings (Kovacs, 1992). Examples of responses on the Negative Self-Esteem subscale include "I hate myself," "I do not like myself," and "I like myself." Previous studies examining this subscale on the CDI have found good test-retest reliability for this measure (Kovacs, 1992). For instance, a recent study conducted by Cole and Martin (2015) found that the correlation between the first and second administration, which were 6 months apart, was .72 for adolescents and .73 for children. Additionally, the normative sample's internal consistency of the CDI-2 was found to be .86 (Kovacs, 1992). Research has also been conducted on the predictive validity for the CDI. Ialongo et al. (2001) studied a large sample of schoolchildren ($N = 946$) when they were in the first grade and again when participants turned 14. The results showed that self-reports of depressive symptoms by the CDI in the first grade predicted a diagnosis of major depressive disorder at age 14 as well as a need for mental health services. Similarly, Kumpulanien et al. (2000) gave 1,268 children the CDI at age 12 and found that the results predicted depression severity at age 15.

Data Collection

All data collection in this study was retrospective and archival. The records reviewed and used for data collection in this study included a selected standardized psychological measure that was administered as part of the CHEC psychological evaluation. The CHEC medical evaluation includes information pertaining to the medical conditions and metabolic risk factors. Institutional Review Board (IRB) approval for this study was obtained from the author's university in addition to IRB approval from the regional center where the data was collected, prior to conducting analyses using the retrospective data. Additionally, the researcher obtained a data use agreement between the researcher's university and the regional center. All information collected

through the review of both the psychological and medical CHEC evaluations was de-identified

prior to use and confidential. There was no identifying information used in the analyses or in any

subsequent publication that might arise from the research. Patient information was stored on a

secure electronic database within the regional center, as were the final written reports.

Plan for Analysis

Data evaluation initially required entry of self-report assessment results collected from

both children and legal guardians into a database in a standard statistical software program, the

Statistical Package for the Social Sciences (SPSS). Nonnumerical variables including age,

gender, race/ethnicity, and trauma history were coded and entered into SPSS. The PROCESS

tool (Hayes, 2012) was also downloaded and utilized to conduct moderation analyses in SPSS.

Hypothesis Testing

Hypothesis 1. Exposure to childhood adversity will negatively impact physical health as

measured by an overall physical health composite calculated by the presence of medical

conditions and health risk factors. As seen in previous ACE research, the impact of adverse

childhood experiences will have a graded dose-response on the presence of medical conditions,

meaning as exposure to traditional ACEs increase, so will the reported amount of medical

conditions in children. A linear regression will be used to investigate whether the calculated

childhood adversity score (CCAS) predicts poor physical health as measured by overall physical

heath composite score in childhood. CCAS will be entered as the predictor variable, with overall

physical health composite score as the outcome variable. An exploratory analysis (a secondary

multiple regression) will be conducted with number of adverse childhood events (adversity

score) and presence of certain medical conditions and health risk factors.

Hypothesis 2. It is hypothesized that exposure to multiple categories of ACEs will have a

negative impact on childhood physical health. This relationship will be moderated by self-esteem

in youth. As such, higher self-esteem scores will weaken the relationship between the calculated childhood adversity score (CCAS) and childhood physical health problems and health risk factors.

A moderation analysis will be carried out using the PROCESS tool to investigate whether negative self-esteem moderates the relationship between CCAS and overall physical health composite score.

Hypothesis 3. It is hypothesized that a positive relationship will exist between child maltreatment and poor physical health. This relationship will be moderated by age. An exploratory moderation analysis will be carried out using the PROCESS tool to investigate how age moderates the relationship between CCAS and overall physical health composite score.

Hypothesis 3A. It is hypothesized that the positive relationship between child maltreatment and poor physical health will be affected by gender. An exploratory moderation analysis will be carried out using the PROCESS tool to investigate how gender moderates the relationship between CCAS and overall physical health composite score.

CHAPTER IV: RESULTS

Overview

The purpose of this study was to examine the relationship between adverse childhood experiences (ACEs) and childhood physical health. Additionally, this study considered self-esteem, age, and gender as moderator variables in the relationship between ACEs and childhood physical health. This study enhanced the existing literature on ACEs and recognized their impact on overall childhood physical health in an understudied population.

Research Questions and Hypotheses

Hypothesis 1

In a population of children with a history of abuse and neglect, exposure to childhood adversity will negatively impact physical health as measured by an overall physical health composite calculated by the presence of medical conditions and health risk factors. As seen in previous ACE research, the impact of adverse childhood experiences will have a graded dose-response on the presence of medical conditions, meaning as exposure to traditional ACEs increases, so will the reported number of medical conditions in children.

Previous research assessing the role of resiliency as a protective factor in the relationship between ACEs and mental health has often found that resiliency factors, specifically self-esteem, moderate the relationship between ACEs and mental health. No research has been done on the role of self-esteem in the relationship between ACEs and physical health, specifically in welfare-involved populations. Thus, the second research question becomes, "Does self-esteem moderate the relationship between ACEs and physical health in welfare-involved children?" The research hypothesis for this investigation is as follows:

Hypothesis 2

It is hypothesized that the positive relationship between child maltreatment and poor physical health will be moderated by self-esteem.

Previous research has examined age and gender as moderators in the relationship between ACEs and poor health outcomes. However, the few studies examining age and gender have reported contradictory findings. Thus, the third research question becomes, "Do age and gender moderate the relationship between ACEs and physical health in welfare-involved children?" The research hypothesis for this investigation is as follows:

Hypothesis 3

It is hypothesized that the positive relationship between child maltreatment and poor physical health will be moderated by age.

Hypothesis 3A

It is hypothesized that the positive relationship between child maltreatment and poor physical health will be affected by gender.

<div align="center">

Preliminary Analyses

</div>

Data

All data collection in this study was retrospective and archival. Only individuals who received both a psychological and a medical evaluation were included in the present study. Based on these criteria, six participants were deleted from the data. Four participants were outside of the 8- to 16-year-old age range and were removed from the data. Lastly, three participants appeared twice in the data. For these participants, their most recent psychological and medical evaluations were used and their older evaluations were removed from the data. These edits resulted in a final total of 106 participants.

Descriptive Analyses

Participant Characteristics

Demographic variables are detailed in Table 1. The distribution of males and females was approximately equal. Most participants identified as African American. Of the 105 participants, seven identified as "Other," which included recent immigrants from Haiti, Jamaica, Nigeria, and Ghana. Of the 105 participants, approximately 72% were removed from their homes for neglect and 6.7% were removed because the parent surrendered the child to DCP&P. The mean age for this sample was 11.61 ($SD = 2.74$).

Table 1.

Demographic Variables

	N	%
Gender		
Male	51	48.6
Female	54	51.4
Race/Ethnicity		
African American	70	66.7
Hispanic/Latinx	17	16.2
Caucasian	6	5.7
Biracial	1	1.0
Asian	3	2.9
Other	7	6.7
Age		
8	17	16.2
9	13	12.4
10	13	12.4
11	12	11.4
12	5	4.8
13	15	14.3
14	9	8.6
15	10	9.5
16	11	10.5

	N	%
Reason for Removal		
Neglect	76	72.4
Physical Abuse	9	8.6
Sexual Abuse	2	1.9
Other	7	6.7
Neglect and Physical Abuse	9	8.6
Neglect and Sexual Abuse	1	1.0
Physical and Sexual Abuse	1	1.0

Frequency of Calculated Childhood Adversity Score (CCAS)

For this sample, the mean calculated childhood adversity score (CCAS) was 3.89 ($SD = 1.47$). Table 2 details the frequency and percentage of child adversity scores. A CCAS of 3 was most commonly reported (32.4%), followed by scores of 4 and 5 (21.9% and 14.3%, respectively). All participants reported exposure to at least one childhood adversity, with nearly all (98.1%) reporting exposure to two or more childhood adversities, and over half (52.4%) reporting exposure to four or more childhood adversities.

Table 2.

Calculated Child Adversity Score (CCAS) Frequencies (ACE Score Frequencies)

CCAS	N	%
1	2	1.9
2	14	13.3
3	34	32.4
4	23	21.9
5	15	14.3
6	10	9.5
7	7	6.7

Table 3 details CCAS by gender. Females were slightly more likely to report a CCAS of 3 or higher (87% vs. 82.3%), although the difference was not statistically significant. Table 4 details the frequency of endorsement for each adversity category, and Table 5 includes a gender breakdown. Parental divorce or separation was most frequently reported by participants (82.9%,

$n = 87$), followed by household substance abuse (68.6%, $n = 72$), then physical neglect (59.0%,

$n = 62$). The least commonly reported adverse experience was emotional neglect (2.9%, $n = 3$).

A chi-square test of independence was performed to assess the relationship between reported

sexual abuse and gender. There was a significant relationship between the two variables, χ^2 (1, N

$= 105) = 6.72$, $p = .01$. Females were more likely than males to report sexual abuse.

Table 3.

Calculated Child Adversity Score (CCAS) by Gender

	Female ($n = 54$)		Male ($n = 51$)	
CCAS	n	%	n	%
1	1	1.9	1	2.0
2	6	11.1	8	15.7
3	20	37.0	14	27.5
4	11	20.4	12	23.5
5	8	14.8	7	13.7
6	6	11.1	4	7.8
7	2	3.7	5	9.8

Table 4.

Child Adversity Category Frequencies

Child Adversity Category	N	%
Emotional Abuse	28	26.7
Physical Abuse	45	42.9
Sexual Abuse	16	15.2
Emotional Neglect	3	2.9
Physical Neglect	62	59.0
Parental Separation	87	82.9
Caregiver Domestic Violence	31	29.5
Household Substance Abuse	72	68.6
Household Mental Illness	31	29.5
Household Incarceration	33	31.4

Table 5.

Child Adversity Category Frequencies by Gender

	Female (*n* = 54)		Male (*n* = 51)	
Child Adversity Category	*n*	%	*n*	%
Emotional Abuse	13	24.1	15	29.4
Physical Abuse	25	46.3	20	39.2
Sexual Abuse	13	24.1	3	5.9
Emotional Neglect	1	1.9	2	3.9
Physical Neglect	30	55.6	32	62.7
Parental Separation	43	79.6	44	86.3
Caregiver Domestic Violence	15	27.8	16	31.4
Household Substance Abuse	35	64.8	37	72.5
Household Mental Illness	15	27.8	16	31.4
Household Incarceration	18	33.3	15	29.4

Health Problems

Physical health composite scores ranged from 2 to 15, with a mean score of 6.47

(*SD* = 2.14). A health score of 7 was most reported (20.0%), followed by scores of 5 and 6

(17.1% and 15.2%, respectively). Approximately 94.3% of participants were found to have four

or more health problems. Female participants had a mean health composite score of 6.56

(*SD* = 2.20). Male participants had a mean score of 6.37 (*SD* = 2.10). Table 6 details the

frequency of health problem categories endorsed. Table 7 provides a breakdown of self-esteem

classifications for all participants. Dental issues, specifically dental cavities, were most endorsed

by participants (96.2%, *n* = 101), followed by mental health diagnoses (89.5%, *n* = 94) and

vision problems (72.4%, *n* = 76). Of the mental health problems, depression and PTSD were the

most common diagnoses. Additionally, of the "Other Health Conditions," recurrent infections

(strep throat), gastrointestinal problems, and reproductive/gynecological health problems were

reported. Irregular periods and heavy periods were the most reported among the gynecological

problems.

Table 6.

Frequency of Health Problem Categories

Health Problem Categories	*N*	%
Dental	101	96.2
Vision	76	72.4
Hearing	2	1.9
Cardiac	5	4.8
Obesity	56	53.3
Skin	26	24.8
Neurologic/Headaches	14	13.3
Allergies	27	25.7
Surgeries	9	8.6
Hospitalizations	21	20.0
STIs	4	3.8
Sickle Cell	1	1.0
Lead Exposure	2	1.9
Aches and Pains	22	20.9
Delayed Vaccinations	41	39.0
Sleep Issues	23	21.9
Autoimmune	0	0
Diabetes	1	1.0
Ear Infections	4	3.8
Developmental Delays	8	7.6
Respiratory Issues/Asthma	43	41.0
ADHD/Learning Disability	25	23.8
Mental Health	94	89.5
Other Health Conditions	72	68.6

Table 7

Negative Self-Esteem T-Score Frequencies

T-Score	Classification	*N*	%
70+	Very Elevated Score	5	4.7
65–69	Elevated Score	4	3.8
60–64	High Average Score	5	4.7
40–59	Average Score	91	86.7
> 40	Low Score	0	0

<center>**Linear Regression Analysis**</center>

Assumptions of Linear Regression

       The data were examined for potential linear regression assumption violations including

continuous variables, linearity, normality, independence, and homoscedasticity. The data met

assumptions for regression, and contained continuous variables. No significant outliers were seen

via scatterplot. Additionally, a scatterplot matrix was used to examine linearity and

homoscedasticity, with no major violations noted. Independence of observations was examined

using the Durbin-Watson test, which was found to be normal at 1.562. A histogram showed that

residuals were normally distributed, indicating that a linear model was appropriate for the data.

Impact of Childhood Adversity on Childhood Physical Health

       The first research question examined the impact of childhood adversity on childhood

physical health. To investigate this relationship, a simple linear regression was conducted. The

predictor was calculated childhood adversity score and the outcome variable was physical health

composite score. The results of the regression indicated that the model was found to be

insignificant (F = 1.605, p =.208). It was found that childhood adversity did not significantly

predict childhood physical health (β = .18, p =.208). As a result of the results being insignificant,

secondary post hoc analyses were not completed.

<center>**Moderation Models**</center>

       The next research question sought to examine whether self-esteem moderated the

relationship between ACEs and physical health in welfare-involved children. The PROCESS tool

(Hayes, 2012) was utilized to conduct moderation analyses in SPSS. The outcome variable for

analysis was health composite score and the predictor variable was calculated adversity score.

Self-esteem was entered as the moderator variable. The model was found to be insignificant (r^2 =

<center>70</center>

.0519, F = 1.5679, p = .2030). Additionally, the interaction between adversity score and self-esteem was also found to be insignificant (p =.1447).

To investigate whether age moderated the relationship between ACEs and physical health, another moderation analysis was conducted. The outcome variable for analysis was health composite score and the predictor variable was calculated adversity score. Age was entered as the moderator variable. The overall model was found to be significant (r^2 = .0858, F =3.1616, p = .0279). However, the interaction between adversity score and age was found to be insignificant (p =.2441). Thus, the findings did not indicate that age moderates the relationship between adversity and physical health. A linear regression was conducted to understand the relationship between age and health composite score alone, and it was found to be significant (r^2 = .055, p = .016), indicating that age did significantly predict physical health. Furthermore, as a child increases in age, there is an increase in diagnosed health problems.

Lastly, to investigate whether gender moderated the relationship between ACEs and physical health, another moderation analysis was conducted. The outcome variable for analysis was health composite score, and the predictor variable was calculated adversity score. Gender was entered as the moderator variable. The model was found to be insignificant (r^2 = .0197, F = .6751, p = .5693). Additionally, the interaction between adversity score and gender was also found to be insignificant (p = .6462).

CHAPTER V: DISCUSSION

The purpose of this study was to examine the relationship between adverse childhood experiences and childhood physical health in a high risk, understudied pediatric population. There has been extensive research on adverse childhood experiences and adult physical health (Anda et al., 2006; Brown et al., 2010, 2013, 2019; Bryan, 2019; Chang et al., 2019; Dube et al., 2003; Felitti et al., 1998; Felitti et al., 2010; Fuller-Thomson & Brennenstuhl, 2019; Lissau & Sorensen, 1994; Williamson et al., 2002). But despite extensive data gathered from adults who experienced ACEs, fewer studies have addressed the immediate physical health effects of adverse childhood experiences during childhood. There are currently gaps in the literature in terms of examining ACE categories in pediatric samples. Furthermore, among high-risk samples such as welfare-involved children, exposure to multiple adversities is common, although the literature on the impact of ACEs in this population is scarce.

Recent studies have shown that in comparison to the general population, these children are far more likely to have experienced at least four ACEs (42% vs. 12.5%; CDC, 2016). Their risks for poor health outcomes are greatly increased based upon their higher ACE prevalence. Furthermore, the studies that have researched welfare-involved children investigated early adversity in young children specifically, those age 1–6 years. There is limited information on the impact of ACEs on physical health for older children and adolescents involved in the child welfare system; this study was one of only a few studies to research this.

Childhood Adversity in Foster Children

Exposure to one or more ACEs was reported by 100% of participants in this study. This rate was higher than the rate of exposure in the original ACEs study. Felitti and colleagues (1998) found that approximately 50% of participants endorsed exposure to one or more ACEs, approximately 25% endorsed exposure to two or more ACEs, and approximately 10% endorsed

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exposure to four or more ACEs. As noted in Chapter IV, foster children endorsed higher ACE scores at greater rates; 98.1% of participants endorsed two or more ACEs, 84.8% reported exposure to three or more childhood adversities, and 52.4% reported exposure to four or more childhood adversities.

It is not surprising that the present study had higher rate of exposure to ACEs compared to the study by Felitti et al. The original ACE study relied on data predominantly collected from white middle- to upper-middle-class adults (Felitti et al., 1998), while the participants in the present study were mostly racial and ethnic minority children and adolescents from low-income neighborhoods. Recent studies have shown that in comparison to the general population, welfare-involved children are far more likely to have experienced at least four ACEs (42% vs. 12.5%; CDC, 2017). Clarkson Freeman et al. (2014) examined the effects of ACEs on the well-being of children within the child welfare system. In a sample of 5,501 children and families involved with child protective services, approximately 70% of children had experienced three or more ACEs by age 6 (Clarkson Freeman et al., 2014). Balistreri and Alvira-Hammond (2016) found that a majority of parents/caregivers (56%) reported that adolescents in foster care have experienced at least one adverse life event. Approximately 38.8% have experienced one or two events, and 17% have experienced three or more. In addition to being welfare-involved children, this sample was taken from an urban low-income neighborhood. Burke et al. (2011) investigated adverse childhood experiences among youth in a low-income urban community. Data from a sample of 701 youth between the ages of birth and 20.9 years showed that most subjects (67.2%, $N = 471$) had experienced one or more categories of adverse childhood experiences (ACE $\geq$ 1), and 12.0% ($N = 84$) had experienced four or more ACEs.. This sample showed higher rates of

exposure (52.4% vs.12%) to childhood adversity. There are several possible explanations for why ACE exposure was higher in this study compared to other studies.

First, it is possible that there was a difference in how the ACEs were scored by prior researchers. Of note, studies often use different definitions regarding what qualifies as meeting criteria for an ACE category. Some studies utilize "yes" and "no" response options (MMWR, 2010). Some studies consider a participant to have met criteria for a category if they answer "sometimes" to a question, whereas other studies considered the participant to have met the criteria only if they respond "often" or "very often." As a result, cross-study comparisons of rates of ACEs should be done with caution.

Second, it is possible that the datasets used to calculate the ACE scores varied in the amount of information about childhood adversity. As a result, datasets could have lacked information about ACEs and failed to provide an accurate picture of ACE exposure. For example, Burke et al. (2011) completed a retrospective chart review from a medical center to gather data about childhood adversity. The depth of information about adversity and trauma in medical notes is uncertain. Additionally, Balistreri and Alvira-Hammond (2016) analyzed data from a nationally representative cross-sectional study to examine the proximate effects of ACEs. Their study used data from the 2011–2012 National Survey of Children's Health (NSCH), a large nationally representative survey sponsored by the U.S. Maternal and Child Health Bureau in collaboration with the National Center for Health Statistics. Interviewers asked a parent or guardian who lived in the household about the health and well-being of the child, including questions about the child's health status, family functioning, and adverse childhood events (Balistreri & Alvira-Hammond, 2016). Regarding this 2011–2012 dataset, a limitation concern included parent reports. The reports on adverse experiences and physical and emotional well-

being were delivered by parents or guardians. It may be that the responding adult underreported

socially undesirable events (such as parental incarceration or drug abuse) or overreported the

health and emotional well-being of the child. Consequently, the same limitation can be found in

data from the National Survey of Child and Adolescent Well-Being (NSCAW). The NSCAW I

Child Protective Services (CPS) dataset is a nationally representative sample of 5,501 children

and families investigated by CPS. The data is based upon reports from children, caregivers, and

teachers. Again, there is lack of knowledge about the accuracy of what is reported and found in

the dataset.

In addition to response bias, the datasets mentioned above could have selection bias

because they were based on surveys. Those who responded to the surveys may in fact have had

less exposure to ACEs. The current dataset was created from the Comprehensive Health

Evaluation for Children (CHEC) program, whose assessment identifies the physical,

developmental, and mental health treatment needs for children entering foster care. All foster

children in the region must have an evaluation completed within 30 days of placement. In

contrast, the data from the present study was not based on individuals who self-selected to

participate. However, since the evaluations are meant to assess the safety of homes, they are

tailored to questioning about various forms of abuse, which could lead to higher rates of ACEs

being reported. Additionally, the evaluations include information from records reviews which are

frequently based on third party (DCP&P) assessment of ACEs and not the child's experience.

For example, the child may be removed from the home for neglect even though it is possible that

the child does not feel neglected. This could also lead to reports of higher ACE exposure than a

self-report would include. On the other hand, children completing these evaluations could also

underreport ACEs in the belief that it could lead to quicker reunification with biological parents.

ACE Score and Health

Research has established a link between ACEs and health problems in adult community samples regarding self-rated health (Chartier et al., 2010; Corso et al., 2008) and specific disorders and health problems (Anda et al., 2008; Danese et al., 2013; Dong et al., 2013; Felitti et al., 1998; Wegman et al., 2009). Consistent with the existing literature on the impact of retrospectively reported ACEs on adult health, poor health outcomes have been seen in samples of children and adolescents (Balistreri, 2015; Balistreri & Alvira-Hammond, 2016; Baron-Lee et al., 2015; Bright et al., 2015; Brockie et al., 2015; Burke et al., 2011; Clarkson Freeman, 2014; Duke et al., 2010; Jimenez et al., 2016; Su et al., 2015). In line with previous research on the impact of ACEs on health in child and adolescent community samples (Brown et al., 2019; Kerker et al., 2015; Su et al., 2014), it was expected that higher ACE scores would predict more health problems in foster care youth.

This hypothesis was not supported by the present study. Exposure to more adverse childhood experiences did not predict a greater number of health problems. One explanation for why the hypothesis was not supported is that the measure used to calculate ACEs did not provide an accurate picture of the overall level of adversity these children have experienced. A growing number of researchers (Heberle et al., 2014; Winslow & Shaw, 2007; Wright et al., 2013) have expressed concerns about the impacts of community level adversity on child health outcomes. These researchers argue that the original ACE study does not account for these stressors, particularly among minority populations. To account for these differences, the Philadelphia ACE research committee was created to survey Philadelphia residents about the original ACEs plus five additional community-level stressors (Cronholm et al., 2015). Using a more socioeconomically and racially diverse urban population, the authors measured ACEs categorized as Conventional (within the household) and Expanded (community-level; including

witnessing violence, living in foster care, bullying, experiencing racism or discrimination, and feeling unsafe in one's neighborhood) to attempt to understand whether Conventional ACEs alone could sufficiently measure adversity, particularly among various subgroups (Cronholm et al., 2015). Cronholm and colleagues found that of 1,784 adult participants, seven in 10 had experienced one ACE and two in five had experienced four or more. Almost 40% of participants had experienced four or more of the expanded community-level ACEs. There were higher levels of exposure to Conventional ACEs than reported by participants in the original Kaiser study, supporting previous studies that higher levels of adversity are seen among minority and lower-income populations. However, by including community-level factors (Expanded ACEs) in their measure of adversity, the researchers identified an additional 14% of participants who were exposed to adversity within the community, but not at home (Cronholm et al., 2015). Further, Wade and colleagues (2016) found that exposure to Expanded ACEs (without Conventional ACEs) was linked to poorer health outcomes.

Although the Expanded ACEs provide additional insight into the adversities these children and adolescents face, it still does not provide the full picture. Of the children and adolescents in the present study, all would meet the criteria for one Expanded ACE because they are all welfare-involved youth. Approximately 90% identified as Black and/or Hispanic. As per DCP&P reports, over 90% reported residing in a low-income neighborhood with about 20% ($N = 21$) who were placed into foster care because of unstable housing and homelessness. However, children in the present study experienced significant additional stressors within the household. For example, of participants with the five highest physical health composite scores, two had elevated ACE scores of 5 and 6. The remaining three participants had ACE scores of 4. Of those three, two had parents who passed away. One child witnessed their parent's death in the

home from a drug overdose. The third participant did not experience parental loss, but did suffer a near fatal gunshot wound at the hands of his brother, who accidentally found the firearm in the household.

Previous research has highlighted the impact of parental loss in adolescence, including mental health issues such as depression (Babore et al., 2016; Feigelman et al., 2017), suicidality (Serafini et al., 2015), and substance abuse (Cerniglia et al., 2017). Additionally, a growing body of research has found that in addition to the poorer mental health outcomes, early parental death also plays a predictive role for negative physical health outcomes in adolescence (McEwen & Lasley, 2002; van de Pavert et al., 2017) including chronic illness (Raposa et al., 2014), cortisol dysregulation (Biank & Werner-Lin, 2011), and premature death (Li et al., 2014; Smith et al., 2014). Of the current sample, about 13% ($N = 12$) experienced parental loss. It is also important to note that 82.9 % ($N = 87$) of the sample had parents who were separated or divorced. Many of the children and adolescents in this study were living in single-parent homes. Thus, it is uncertain how much greater the impact of parental loss would be to a child who has little or no contact with his/her other living parent. One might hypothesize that the loss of both parents would have a greater effect on a child.

ACE Score, Physical Health, and Resilience

Although many studies highlight the negative sequelae of child maltreatment, fewer studies focus on how individuals exposed to adverse experiences were able to overcome them. Although ACEs are prevalent, there are individuals who have been exposed to adversity yet still develop into well-functioning adults (Jones et al., 2014; Prince, 2008; Subramaniam et al., 2017). Resilience has been studied for decades and has been found to have positive effects on psychological functioning (Bonnano, 2004; Singh et al., 2013; Subramaniam et al., 2017). Specifically, self-esteem has been shown to be a determinant of healthy development in

adolescence (Emler, 2001; Gao et al., 2019; Garcia-Reid et al., 2013; Jonzon & Lindblad, 2006; Yun et al., 2019). A high level of self-esteem has been shown to improve psychological adjustment and health-related behavior (Yun et al., 2019). Several studies have reported a close relationship between self-esteem and adjustment, a relationship found to have a lifelong impact (Yun et al., 2019). However, it is not known whether this protective effect will also extend to physical health. Few studies have explored both the role of developmental risk and resiliency factors in the development of health problems.

The present study contributes to a limited body of research on the role of resilience in the relationship between ACEs and health. It is one of the first studies to examine the interplay between self-esteem and physical health in a welfare-involved population. This study explored whether self-esteem could moderate the effects of ACEs on childhood physical health. It was hypothesized that self-esteem would moderate the effects of physical health in foster care youth. However, this hypothesis was not supported by the present study. Self-esteem did not moderate the relationship between adverse childhood experiences and physical health problems.

There are a few explanations for why self-esteem did not moderate the relationship between adverse experiences and physical health. First, of the 105 participants, 12.3% ($N = 13$) had missing scores. Of the 13 participants with missing scores, mean substitution was used (i.e., mean self-esteem scores were used to replace blank responses). According to the participant evaluation reports, the CDI-2 scale (which measures self-esteem) was not completed. Therefore, it is possible that substituting mean scores impacted the statistical analysis. Second, since self-esteem was measured via a subscale from CDI-2, it may have been an inadequate measure of the concept of self-esteem. A measure dedicated to self-esteem may have produced different results. Also, research has shown that self-esteem has an impact on psychological well-being, but there

are no known studies linking positive self-esteem to better physical health. Additionally, the construct of self-esteem itself could have posed difficulty in the analysis. Hosogi et al. (2012) stated that numerous psychologists have defined and debated the definition of self-esteem, but no uniform view has been established. Various psychologists have provided definitions of self-esteem and ways of measuring self-esteem objectively. However, the lack of uniformity would make it difficult to compare studies of self-esteem.

Age

Limited studies have researched the effects of age on adverse childhood experiences and physical health outcomes. Kools and colleagues (2013) found that in comparison to adolescents (ages 11–13), older teens (ages 14–16) who experienced child adversity were in poorer health. A similar pattern was also seen in Schneiderman et al.'s (2013) study, which showed that older children (ages 12–19) were more likely to be overweight/obese than normal weight compared to children between 2 and 5 years old when controlling for gender, ethnicity, and placement. These findings suggest that older age may be risk factor for obesity and poor health status. The current study conducted an exploratory analysis to determine whether a similar pattern would hold true. As a result, it was hypothesized that age would moderate the effects of ACEs on physical health. This hypothesis was partially supported by the present study. Although age did not moderate the relationship between adverse childhood experiences and physical health problems, it did significantly predict physical health.

In the present study it was found that as a participant's age increased, so did their reported physical and mental health problems. There are few explanations as to why age was found to significantly impact physical health. First, older teens have more time to experience more adversity, resulting in increased time to develop more health problems. In addition to increased time to experience adversity, adolescence is a developmentally unique stage. A

maturation of cognitive structures and functions occurs during adolescence, leading to the acquisition of concepts such as the irreversibility and causality of events connected with the concept of death and reelaboration of past traumas (Cerniglia et al., 2015; Corr, 1995). As such, the older the adolescent, the more they can understand the traumas they have experienced, which could take a greater toll on them mentally and physically.

Gender

A small body of literature cites gender differences in the prevalence of ACEs. Girls are more likely to experience sexual abuse and boys are more likely to report physical and verbal abuse and neglect (Baglivio et al., 2014; Dierkhising et al., 2013; Dube et al., 2005; Teague et al., 2008). However, Asscher et al. (2015) found that in a sample of juvenile delinquents, females were more often victims of sexual and physical abuse and more often had a history of neglect and maltreatment than males. Sundaram and colleagues (2008) hypothesized that the difference in prevalence rates is because of possible underreporting of sexual abuse victimization by males.

Gender-specific differences have also been reported in the impact of ACEs on negative health outcomes. Sexual and verbal abuse during childhood were significantly associated with smoking for women but not for men (Fuller-Thomson et al., 2013). Similarly, Cunningham and colleagues (2014) found that women (but not men) had a higher likelihood of COPD associated with verbal abuse, sexual abuse, living with a substance-abusing household member, witnessing domestic violence, and parental separation/divorce during childhood compared to those with no individual ACEs (Cunningham et al., 2014). In contrast, other researchers have not observed gender-specific differences (Campbell et al., 2018). In a study exploring the effect of ACEs on overall health, there were no statistically significant differences between men and women in depressive symptoms or tobacco, alcohol, and marijuana use (Mersky et al., 2013). Due to the

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conflicting data, this study conducted exploratory analyses to determine whether gender moderated the effects of ACEs on physical health.

There was a significant gender difference in the current sample, with girls reporting more experiences of sexual abuse than males. However, the overall hypothesis was not found to be significant. Gender did not moderate the effects of adverse childhood experiences on physical health. It is possible that there was too much variability within the study sample, such that the effects of gender cannot be accurately seen. This sample as well as previous samples investigating gender differences in ACE exposure ranged in age, prevalence of ACEs, race/ethnicity, and SES. The range could explain why there is conflicting data on gender-specific differences in ACEs. Also, it is possible that the differences between genders are based primarily upon underreporting of one gender. For instance, Almuneef et al. (2017) stated that boys are more likely to underreport experiences of abuse, particularly sexual abuse.

Limitations

Several limitations of the present study should be noted. This study used archival data from evaluations conducted for children within the foster care system, and some data was missing from these evaluations. Also, ACEs were calculated based upon information found in the psychological and medical evaluation reports, which did not originally incorporate the ACE scale. For example, household mental illness was not asked about in the evaluations but would be coded for based on reports from DCP&P. If a parent/caregiver suffered from mental illness that was known to DCP&P, then that information would likely be shared during the evaluation. However, if something wasn't explicitly stated in the evaluation, it could not be coded and was presumed not to have occurred. It is very possible that the DCP&P caseworker was unaware of certain information about the family or that the child was unwilling to disclose it, which could have led to the underreporting of ACEs.

Another limitation of this study was the use of the original ACE scale, which did not include revisions such as the additions included in the Philadelphia Expanded ACE scale. The Philadelphia Expanded ACE scale was created to measure adversity for more socioeconomically and racially diverse urban populations compared to the sample in the original study (Cronholm et al., 2015). Since the present study has a demographic similar to the Philadelphia Expanded ACE study, that scale may have been a better fit. However, it is important to note that both scales are limited in other forms of adversity such as parental loss. Additionally, no existing scales account for the severity in ACE exposure nor how long abuse took place, which would have a substantial impact on a child's well-being.

The variability in the definition and scoring of adverse childhood experiences poses another limitation and could help explain why ACE rates differed across many studies. While this study found higher rates of ACE exposure in a child-welfare-involved sample, a review of the ACEs literature revealed that different studies vary in their criteria for what constitutes ACE exposure. Additionally, the earliest studies utilizing the ACEs construct used eight ACE categories rather than 10 (Felitti et al., 1998). The present study used looser definitions of adverse experiences. To meet criteria for the ACE category, participants simply had to report experiencing an ACE. Frequency of ACE exposure was not included in most evaluations, and therefore this was not required to meet ACE criteria. Differences in how ACEs are scored and interpreted across studies make it difficult to compare rates of ACEs across different samples. Despite these limitations, the ACE construct has become a useful and a common way to measure childhood adversity in research. For this reason, the field would likely benefit from a manualized, uniform approach to scoring ACEs. The manualized approach could increase the validity of cross-study comparisons.

Another limitation of the study was the creation of the health composite score. Like the ACE composite score, the health composite score does not consider the severity of certain medical conditions. Additionally, the medical conditions were coded for based on medical categories. However, if a participant had two conditions within the same category, they were only coded once. The medical data was also based on one medical evaluation from one provider, information the DCP&P caseworker had and information from previous DCP&P reports. As a result, medical issues could have been missed if the caseworker did not have the information or if medical issues were not documented in previous reports. Additionally, the data used within the medical evaluations were not based on sophisticated medical testing, like lab work such as cortisol testing or cholesterol levels.

This study relied on participants' self-reports, a form of data collection that may be susceptible to a range of influences. For example, reports of adverse experiences might have been susceptible to forgetting, and it is possible that participants underreported due to denial, shame, and desire to be reunified with biological parents. Research has also demonstrated that participants may under-report or fail to recall adverse experiences (Marcus et al., 2007). Thus, retrospective studies like this one may underrepresent the actual rate of ACEs. Despite these potential influences, self-report methods are widely used in research, and have demonstrated validity and reliability. Dube and colleagues (2004) found that test-retest reliability for retrospective self-reported adverse experiences in childhood ranged from good to substantial.

It is also important to note that this study was conducted in a hospital located in an urban low-income area. Study participants were predominantly African American and Latinx. It is possible that the findings of this study would be different with a more diverse sample of participants, or in a rural setting. Additional research to assess the generalizability of current

findings and assess potential differences in urban versus rural populations and across ethnic groups would contribute to the existing body of research.

Finally, there is much debate in the research regarding how to best define the construct of resiliency and how to best capture resiliency (Hamby et al., 2016; Shaw et al., 2016). This study sought to explore the role of self-esteem as a protective factor to the effects of childhood adversity. It is possible that the scale used to measure self-esteem did not capture the construct well enough. Future studies should focus on defining valid and reliable measures of resiliency in this population to allow for further exploration of how resiliency mitigates the relationship between ACE score and health.

Future Recommendations

The goal of this type of research is to understand the impact on health of adverse experiences in childhood, and to identify effective methods of reducing and preventing the long-term impact of ACEs, particularly in a high-risk population. The findings of this study and the body of research upon which it is based are promising in that they suggest that certain factors have the power to impact the relationship between ACE exposure and health. By investigating the relationship between adverse childhood experiences and childhood physical health, the findings from this study inform social policy and provide important information for clinicians/practitioners, physicians, social workers, psychologists, educators, and other individuals who provide services for children and families. Additionally, the findings can provide information to aid school personnel including teachers, school nurses, Child Study Teams, and the Intervention & Referral Services (I&RS) in referring children to the child welfare system. The information provided in this study increases awareness of ACEs and their negative proximate impacts. Also, further investigation of ACEs may help identify children who are at risk for developing diseases later in adolescence and adulthood.

Future research should focus on elucidating the role of both direct and moderating factors in the relationship between ACEs and health. Future studies should also examine rates of ACEs across different groups, ensuring consistency in how ACEs are calculated across groups. As discussed above, different studies utilize different versions of the ACE questionnaire and different definitions of whether or not criteria are met. A uniform manualized administration tool and scoring guidelines would allow for more valid cross-study comparisons of rates of ACEs in different groups. Additionally, research on differences in ACE exposure in rural and urban settings and across ethnic groups can contribute to our understanding of childhood maltreatment.

A plethora of quantitative studies exist; however, more qualitative studies should be completed to get a better understanding of the effects of ACEs on physical and mental health. Qualitative interviews have the advantage of being interactive and allowing for unexpected topics to emerge and to be taken up by the researcher (Busetto et al., 2020). Qualitative studies can provide information about what people consider trauma, meaning more ACEs can be added. Curtis and colleagues (2016) contend that a more thorough list of adversities should be examined. As described above, Cronholm et al. (2015) compared rates of conventional and expanded ACEs and found that minority groups differed in rates of ACEs when the conventional ACEs were used in comparison to the expanded ones (Cronholm et al., 2015). The researchers emphasized that for different demographic groups a wider range of adversities must be used, since the original CDC-ACEs study was developed with middle-class white participants.

Research should also continue to examine the role of resilience in the relationship between ACEs and health, and why resilience seems to affect health outcomes differently. First, research examining how to operationalize resilience and self-esteem would be beneficial. Replication of the present study can strengthen support for these findings. Additionally,

replication may inform how participant characteristics, study design, and measures may have impacted study findings. Resiliency factors could be different across ethnic and socioeconomic groups. Awareness of these differences can help health providers to implement appropriate and effective community-based interventions.

The difference in rates of ACEs among foster children and adult samples highlights the possibility that the findings were a result of within-group characteristics. For example, the sample ranged in age, reason for removal, and number of times placed in foster care. This sample also varied in therapy referrals. Due to trauma exposure, some adolescents were referred to trauma-focused therapy. It is possible that exposure to therapy could impact the endorsement of ACEs. Trauma-focused CBT has been found to be effective among foster care youth in reducing symptoms of childhood posttraumatic stress disorder (Cohen et al., 2012). In addition, studies have shown that treatment results in improvements in depression, behavior problems, feelings of shame and guilt, and unhealthy trauma-related beliefs (Cohen et al., 2012). One of the first components of TF-CBT is psychoeducation about abuse and trauma; therefore research should examine whether exposure to TF-CBT for childhood maltreatment increases participants' endorsement of ACE categories. Future research should examine whether certain factors can lead to over-endorsement of childhood adversity or increase accurate endorsement of ACE categories.

The ACE literature could also benefit from studies that examine whether psychological factors such as mood can impact patterns of ACE endorsement. For example, studies have examined whether mood impacts the association between socioeconomic status and self-rated health (Krauset et al., 2013), participant reports of negative life events and perceived social support (Ozbay et al., 2007), and satisfaction with life (Yap et al., 2017). Since TF-CBT has been found to reduce symptoms of depression, therapy could impact not only ACE endorsement but

also perceived health. Lastly, it is important to understand whether ACE endorsement changes over time—for example, whether participants will endorse a similar number of ACEs at age 16 and 10 years later at age 26. It would also be helpful to determine whether certain factors can impact ACE endorsement over time. For instance, childhood victimization leads to increased vulnerability for subsequent (re)victimization in adolescence and adulthood (Widom et al., 2008). It is postulated that lack of disclosure, lack of information about trauma, and negative trauma beliefs put victims of abuse at greater risk for being abused again (Widom et al., 2008). As a result, successful completion of therapy could also affect one's likelihood to be victimized again.

Although challenging to implement, prospective longitudinal studies and controlled experiments can contribute to knowledge about causal pathways in the relationship between ACE exposure and health in foster youth (Jackson et al., 2012). Jackson and colleagues (2012) have created the SPARK (Studying Pathways to Resilience and Adjustment in Kids) project to conduct their own research on the mechanisms of resilience for foster youth. Additionally, Jackson et al. (2012) provided researchers with suggestions for recruitment, data collection, retention, and ethical considerations germane to research on youth and families in the foster care community. More research is needed to further elucidate and inform the interrelationships between ACEs, childhood physical health, and resilience.

Conclusion

In conclusion, the purpose of this study was to examine the relationship between adverse childhood experiences and childhood physical health in a high-risk under-studied pediatric population. Although this study did not find a correlation between ACEs and physical health, the findings confirm how high the risk of poorer health outcomes is for the foster care population.

The study also found that older teens were more likely to report more health problems. These findings shed more light on the mind-body connection and the important role of psychology. Also, the study's findings can change the trajectory of health risk markers in childhood prior to progression to full-blown disease by positively impacting future health outcomes and decreasing the economic burden of adult illness on society. Finally, the study provided suggestions for future research. These suggestions and findings should be considered when devising interventions and policies to investigate and combat the effects of child maltreatment.

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APPENDIX

Adverse Childhood Experience (ACE) Questionnaire

1. Did a parent or other adult in the household **often** …
 Swear at you, insult you, put you down, or humiliate you? **or**
 Act in a way that made you afraid that you might be physically hurt?
                 Yes   No   If yes enter 1   _____
2. Did a parent or other adult in the household **often** Push, grab, slap, or throw something at
     you? **or Ever** hit you so hard that you had marks or were injured?
                 Yes   No   If yes enter 1   _____
3. Did an adult or person at least 5 years older than you **ever**…
Touch or fondle you or have you touch their body in a sexual way? **or**
 Try to or actually have oral, anal, or vaginal sex with you?
                 Yes   No   If yes enter 1   _____
4. Did you **often** feel that…
 No one in your family loved you or thought you were important or special? **or**
 Your family didn't look out for each other, feel close to each other, or support each other?
                 Yes   No   If yes enter 1   _____
5. Did you **often** feel that…
 You didn't have enough to eat, had to wear dirty clothes, and had no one to protect you?
or Your parents were too drunk or high to take care of you or take you to the doctor if you
needed it?
                 Yes   No   If yes enter 1   _____
6. Were your parents **ever** separated or divorced?
                 Yes   No   If yes enter 1   _____
7. Was your mother, stepmother, or caregiver:
 Often pushed, grabbed, slapped, or had something thrown at her? **or**
 Sometimes or often kicked, bitten, hit with a fist, or hit with something hard? **or**
 Ever repeatedly hit over at least a few minutes or threatened with a gun or knife?
                 Yes   No   If yes enter 1   _____
8. Did you live with anyone who was a problem drinker or alcoholic or who used street drugs?
                 Yes   No   If yes enter 1   _____
9. Was a household member depressed or mentally ill or did a household member attempt
     suicide?
                 Yes   No   If yes enter 1   _____
10. Did a household member go to prison?
                 Yes   No   If yes enter 1   _____

    Now add up your "Yes" answers: _____ **This is your ACE Score**

Comprehensive Health Evaluation for Children: Child Interview

Child's Name: _____   **Date of Birth**: _____

Examiner: _____

1. Mental status (activity level, affect, mood, relatedness, orientation x3, appearance, etc.) _____

_____

_____

_____

_____

- **Self:** What is your name? When is your birthday? How old are you? _____

_____

- **Academic**: Where do you go to school? Do you like school? What is your most favorite/least favorite part of school? _____

_____

_____

- **Social**: Do you have friends? Do you have a best friend? Do you have a boyfriend/girlfriend? How long have you been dating? What activities do you enjoy? _____

_____

_____

_____

- **Family**: Who is in your family? Do you have any brothers or sisters? (query for relationship- biological, foster) _____

_____

_____

- **Wishes:** If you could have three wishes, what would they be? _____

_____

_____

2. Emotion management

- How do you feel most of the time? _____

_____

- What makes you feel happy? _____

_____

- What makes you feel sad? What do you do when you feel sad? _____

- What makes you feel mad? What do you do when you feel mad? _____

_____

- What makes you feel scared? What do you do when you feel scared? _____

_____

- How do you make yourself feel better when you have difficult feelings? _____

- Do you talk to anyone about your feelings? Who? Does it make you feel better?

_____

3. Assessment of child's problem or high-risk behaviors

Did you ever/do you ever:

- Lie to someone?
- Have nightmares? Have trouble sleeping? much/often?
- Engage in sexual activity? # of partners?
- Hurt animals?
- Play with matches? Set fires?
- Run away from home?
- Get into fights? With whom? How often?

- Take something that doesn't belong to you?
- Use alcohol? Cigarettes? Drugs? How

- Auditory/visual hallucinations
- Think about hurting other people?
- Think about hurting yourself? Hurt yourself?
- Think about killing yourself? Try to kill yourself?

_____

_____

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_____

4. **Understanding of current placement**

- Why don't you live with your biological parents/family? _____

_____

- Did something happen before you moved to your new house? What happened? _____

_____

_____

- Why do you think you weren't allowed to stay in your old house? Who told you that? _____

_____

_____

- Who do you think is responsible for you living in a foster home? _____

_____

- Who is DYFS (DCP&P)? What is their job? _____

_____

- Do you feel safer now that you aren't living in your old house? Did you ever feel unsafe in your old house?

_____

5. Assessment of current placement (and past placements, if relevant)

- Who do you live with now? _____

- Who else lives in the home? _____

_____

- What is your new house like? _____

_____

- Where do you sleep? Do you share a room with someone? _____

_____

- Do you have enough clean clothing? *If it's cold outside*, do you have a warm jacket/winter boots? _____

_____

- Do you always have enough to eat? Do you like the food served in your foster home? _____

_____

- Do you have games/toys? What kind? _____

- Does your foster family ever leave you alone for long periods of time? _____

6. Sense of safety in previous home (prior to removal/past placements)

- Did anyone at your old house yell at each other? Who? Why? _____

_____

_____

- Did anyone at your old house hurt each other? Who? Why?_____

_____

_____

- Did anyone at your old house drink alcohol or use drugs? Who? How often? Did they act different?_____

_____

_____

- Did anyone at your old house touch you in a way you didn't like/made you feel uncomfortable? _____

_____

_____

- When you did something wrong at your old house, what would happen? What was a, "punishment" at your old house? _____

_____

_____

7. Sense of safety in current placement

- Does anyone at your foster home yell at each other? Who? Why? _____

_____

- Does anyone at your foster home hurt each other? Who? Why?_____

_____

- Did anyone at your old house drink alcohol or use drugs? Who? How often? Did they act different?_____

_____

_____

- Does anyone at your foster home touch you in a way you don't like/makes you feel uncomfortable? ____

_____

_____

- When you do something wrong at your foster home, what happens? What is a, "punishment" at your foster home? _____

_____

_____

8. Visits/contact with family members

- Do you see your family? Who do you get to see from your family? _____

_____

- What do you do at visits? _____

_____

_____

- How do you feel during/after visits? _____

_____

- What do you miss most about living at your old house? _____

_____

_____

9. How would you say you have adjusted to living in your foster home? (circle)

Bad/Negative   1   2   3   4   5   Good/positive

10. Recommendations: _____

_____

_____

_____

_____

_____

_____

Comments: _____

_____

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Comprehensive Health Evaluation for Children: Medical Evaluation
MEDICAL HISTORY – RECORDS REVIEW

A. MATERIALS REVIEWED BY CHEC TEAM TO SUPPORT THE OPINIONS & RECOMMENDATIONS IN THIS REPORT

☐ Birth Records Records   ☐ Imaging Studies   ☐ Primary Care Provider

☐ Immunization Records   ☐ Specialty Consultations   ☐ School Information

☐ Hospital Records   ☐ Growth Charts   ☐ Other: _____

☐ DYFS History, 9-7 Referrals   ☐ ER Visits   ☐ Other: _____

NOTE: please indicate if source of information is source other than records review

B. BIRTH HISTORY   ☐ **No information available**

☐ Prenatal Care for Mother   ☐ Prenatal Complications (*specify below*)   ☐ Delivery Complications (*specify below*)

    ☐ Prenatal Hep B   ☐ Neonatal Complications (*specify below*)   ☐ Vaginal   ☐ C Section

    ☐ Prenatal HIV   ☐ Neonatal Immunizations (*specify below*)   ☐ Gestational Age _____

    ☐ Prenatal RPR   ☐ Birth Wt. _____

    ☐ Prenatal Other: _____   ☐ Birth Hospital: _____   Ht. _____ cm   H.C._____ cm

COMMENTS: _____

C. NEONATAL TESTING   ☐ **No information available**

Newborn Screen	**HIV** (date: _____)	**Drug Screening**	**OAE/Hearing, Screen**	**Other**
☐ abnormal	☐ positive	☐ positive _____	☐ failed	_____
☐ normal	☐ negative	☐ negative	☐ passed	_____
☐ unk	☐ unk ☐ not done	☐ unk ☐ not done	☐ unk ☐ not done	_____

COMMENTS: _____

D. MEDICAL HISTORY – _____

Diagnoses _____ ☐ None _____

Medications _____ ☐ None _____

Specialists _____ ☐ None _____

COMMENTS: _____

E. RESULTS OF PREVIOUS SCREENINGS (include dates, results) _____ ☐ NO INFORMATION AVAILABLE _____

Lead _____ **Hemoglobin/Hematocrit** _____

PPD _____ **Hearing** _____

Sickle Cell _____ **Vision** _____

HIV _____ **Other** _____

COMMENTS: _____

F. PERTINENT FAMILY HISTORY (PER RECORDS REVIEW):
FAMILY MEDICAL HX FORM ATTACHED? ☐ Yes ☐ No

MEDICAL HISTORY – ACTIVE INTERVIEW

Date of Visit: _____   **Child accompanied to visit by**: _____

Information provided by: ☐ Patient   ☐ Foster Parent ☐ DYFS Worker ☐ Other: _____

A. MEDICAL CONCERNS _____

B. REVIEW OF SYSTEMS _____

Skin: _____

HEENT: _____

Hematologic: _____

Cardiac: _____

Respiratory: _____

GI: _____

GU: _____

GYN/Menstrual _____

Skeletal/Musc: _____

Nutrition: _____

Development: _____

Neuro/Psych: _____

C. PSYCHOSOCIAL ISSUES _____

Home: _____

Education: _____

Activities/Peers: _____

Drugs: _____

Alcohol: _____

Smoking: _____

Sexuality: _____

Body Image: _____

RN OR MD SIGNATURE _____

Sleep: _____

Violence: _____

Mood: _____

D. Pertinent Family History

E. Additional Comments

PHYSICAL EXAMINATION

T _____	**Wt**._____ kg (____)%	**Hearing** ☐ pass ☐ fail ☐ unable to complete
HR _____	**Ht**. _____ cm (____)%	**Vision** ☐ pass ☐ fail ☐ unable to complete
RR _____	**HC** _____ cm (____)%	**Pain** ☐ no ☐ yes *(specify)* _____
SaO2 _____	**BP** _____	**Allergies** ☐ none ☐ yes *(list)* _____

<u>**GENERAL**</u> _____

Check box if Normal; specify if Abnormal

Normal   *Normal*

☐ **Head** _____   ☐ **Heart** _____

☐ **Eyes** _____   ☐ **Abdomen** _____

☐ **Ears R** _____   ☐ **Extremities** _____

      L _____   ☐ **Back** _____

☐ **Nose** _____   ☐ **Genitalia** _____

☐ **Mouth/Throat** _____   ☐ **Neuro** _____

☐ **Neck** _____   ☐ **Skin** _____

☐ **Nodes** _____

☐ **Chest/Lungs** _____   ☐ **Other** _____

RN OR MD SIGNATURE _____

HEALTH MAINTENANCE/EPSDT

__Dental Care__	__Vitamins & Fluoride__	__Growth/Nutrition__	__Development__	
Behavior				
☐ age appropriate appropriate	☐ _____	☐ age appropriate	☐ age appropriate	☐ age
☐ refer	☐ N/A	☐ at risk ☐ WIC:	☐ at risk	☐ at risk

IMMUNIZATIONS   ☐ Up-to-date prior to CHEC visit   ☐ Additional immunizations still required (see Plan of Care)
   ☐ **Given during CHEC visit:**

☐ DTaP	☐ Hepatitis B	☐ IPV	☐ Influenza	☐ Other
☐ Pediarix	☐ Comvax	☐ MMR	☐ Meningococcal	☐ Other
☐ Prevnar	☐ Hib	☐ Varivax	☐ Td	

SCREENING TESTS   ☐ Up-to-date prior to CHEC visit   ☐ Additional screenings still required (see Plan of Care)

☐ **Performed during CHEC visit:**

☐ CBC	☐ EP	☐ Urine for STD Screen	☐ Hepatitis B	☐ Cholesterol
☐ Lead	☐ UA (dipstick)	☐ Urine Toxicology	☐ Hepatitis C	☐ HIV Screen
☐ PPD- *date to be read:* _____		☐ Other *(consent must be obtained)*		

LAB/TESTING RESULTS: _____

MEDICAL ASSESSMENT AND PLAN

_____
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SETON HALL UNIVERSITY

1 8 5 6

January 15, 2021

Shaneze Gayle
Seton Hall University

Re: 2021-162

Dear Shaneze,

The Research Ethics Committee of the Seton Hall University Institutional Review Board reviewed and approved your research proposal entitled, "Moderators to the Effects of Childhood Traumatic Stress on Childhood Physical Health." as resubmitted. This memo serves as official notice of the aforementioned study's approval as exempt. If your study has a consent form or letter of solicitation, they are included in this mailing for your use.

The Institutional Review Board approval of your research is valid for a one-year period from the date of this letter. During this time, any changes to the research protocol, informed consent form or study team must be reviewed and approved by the IRB prior to their implementation.

You will receive a communication from the Institutional Review Board at least 1 month prior to your expiration date requesting that you submit an Annual Progress Report to keep the study active, or a Final Review of Human Subjects Research form to close the study. In all future correspondence with the Institutional Review Board, please reference the ID# listed above.

Sincerely,

Mara C. Podvey, PhD, OTR
Associate Professor
Co-Chair, Institutional Review Board

Phyllis Hansell, EdD, RN, DNAP, FAAN
Professor
Co-Chair, Institutional Review Board

Office of the Institutional Review Board
Presidents Hall · 400 South Orange Avenue · South Orange, New Jersey 07079 · Tel: 973.275.4654 · Fax 973.275.2978 · *www.shu.edu*
W H A T   G R E A T   M I N D S   C A N   D O