

The Pennsylvania State University

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**ACADEMIC ENGAGEMENT AS A MODERATED MEDIATOR ON READING
ACHIEVEMENT FOR ADOLESCENTS WHO HAVE EXPERIENCED ADVERSITY**

A Thesis in

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by

Casey A. Mullins

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The thesis of Casey A. Mullins was reviewed and approved* by the following:

Carlomagno C. Panlilio
Assistant Professor of Education
Thesis Advisor

Matthew T. McCrudden
Associate Professor of Education

Pui-Wa Lei
Professor of Education
Professor in Charge, Educational Psychology

*Signatures are on file in the Graduate School

Abstract

Students who have experienced early childhood adversity, such as maltreatment or witnessing violence, tend to have lower academic achievement compared to their peers (Bethell et al., 2014; Crozier & Barth, 2005). However, the underlying mechanisms driving these differential outcomes are largely unexplored. Academic engagement, a multidimensional construct that is associated with positive academic outcomes (Fredricks et al., 2004), maybe one such mechanism. Academic engagement is thought to be malleable and to develop through student-context interactions (Fredricks et al., 2004; Skinner et al., 2009). The purpose of the present study is to examine the potential mediation effect of academic engagement on the relationship between experiencing childhood adversity and academic outcomes for adolescents. The present study also explored the potential effects of parent-child and teacher-student relationship quality on the development of academic engagement. Results indicated that academic engagement did not mediate the relationship between experiencing adversity and reading achievement and that parent-child relationship quality and teacher-student relationship quality did not moderate the effect of adversity on academic engagement. However, teacher-student relationship quality did significantly predict academic engagement. These results suggest that teacher-student relationships are especially important in the development of engagement for students who have experienced early childhood adversity. Previous research on engagement in this population focuses largely on engagement as an outcome. The present study contributes to the literature because it examined engagement as a process, offering future researchers an opportunity to better understand the antecedents and consequences of these students' engagement. This understanding could further inform the development of effective interventions for these students.

TABLE OF CONTENTS

LIST OF TABLES.....	vii
LIST OF FIGURES.....	viii
Chapter1. INTRODUCTION.....	1
Chapter 2: REVIEW OF LITERATURE.....	5
Conceptual Framework.....	5
Purpose of this Study.....	9
Chapter 3. METHOD.....	11
Participants.....	12
Eastern site.....	13
Midwestern site.....	14
Northwestern site.....	14
South site.....	14
Southwest site.....	15
Demographics.....	15
Measures.....	16
Demographics.....	16
Childhood Adversity (Adverse Childhood Experiences)- age 8.....	16
Poverty.....	16
Caregiver mental health.....	17
Caregiver substance abuse.....	17
Property victimization.....	17
Having no good friends.....	18

Parents always arguing.....	18
Witnessed family violence.....	18
Neglect, physical, and sexual abuse.....	19
Parent-child relationships- age 12.....	19
Quality of Relationship.....	20
Level of Recent Involvement.....	20
Caregiver’s Educational Aspirations for Child.....	20
Teacher-student relationships- age 12.....	20
Academic engagement- age 14.....	21
Academic outcomes- age 16.....	22
Analytic Strategy.....	22
Simple mediation.....	23
Moderated mediation.....	25
Chapter 4. RESULTS.....	28
Missing Data.....	28
Preliminary Data.....	29
Assumptions.....	29
Linearity.....	30
Model 1.....	31
Model 2.....	31
Model 3.....	32
Independence.....	33
Homoscedasticity.....	33

Model 1.....	33
Model 2.....	34
Model 3.....	34
Normality.....	34
Model 1.....	34
Model 2.....	35
Model 3.....	36
Mediation Models.....	37
Simple mediation (Model 1)	37
Moderated mediation (Model 2)- Parent-child relationships.....	38
Moderated mediation (Model 3)- Teacher-student relationships.....	39
Chapter 5. DISCUSSION.....	41
Mediation Models.....	41
Measurement Limitations.....	42
Threats to validity.....	42
Threats to reliability.....	44
General Limitations.....	45
Contributions to Literature.....	46
Future Directions.....	47
References.....	49
Appendix: Item Descriptions.....	61

LIST OF TABLES

Table 3-1: Demographic Statistics by Sampling Site.....	15
Table 3-2: Sample Demographics of Present Study Sample.....	16
Table 4-1: Descriptive Statistics of Main Variable.....	29
Table 4-2: Person Correlations between Main Variables.....	29
Table 4-3: Model 1 Path Coefficients, Indirect Effects, and Bootstrapping CIs.....	38
Table 4-4: Model 2 Path Coefficients, Indirect Effects, and Bootstrapping CIs.....	39
Table 4-5: Model 3 Path Coefficients, Indirect Effects, and Bootstrapping CIs.....	40

LIST OF FIGURES

Figure 3-1: Overview of the mediation and moderated mediation models.....	12
Figure 3-2: Simple regression and mediation model.....	24
Figure 4-1: Scatter plot matrix of main study variables.....	30
Figure 4-2: Model 1 scatter plot of predicted and residual values.....	31
Figure 4-3: Model 2 scatterplot of predicted and residual values.....	32
Figure 4-4: Model 3 scatterplot of predicted and residual values.....	33
Figure 4-5: Model 1 Q-Q Plot of residual values.....	35
Figure 4-6: Model 2 Q-Q Plot of residual values.....	36
Figure 4-7: Model 3 Q-Q Plot of residual values.....	37

Chapter 1: Introduction

Adverse childhood experiences have been associated with poor academic and life outcomes, including difficulty with behavioral and emotional regulation, lower peer acceptance, higher risk of delinquency, and a higher risk of mental health issues than their peers who have not experienced adversity (Bender, 2012; Crozier & Barth, 2005; Éthier et al., 2004; Johnson et al., 2002; Kim & Cicchetti, 2010; Lemkin et al., 2018; Leonard et al., 2016; Pears et al., 2013; Tyler et al., 2008). The effects of adverse childhood experiences (ACEs) seem to be additive; a study found that children who experienced chronic maltreatment had more emotional difficulties than those who experienced short-lived maltreatment (Éthier et al., 2004). In addition, ACEs were found to be related to increased substance abuse, higher suicide rates, higher rates of risky sexual behaviors, difficulty controlling anger, and a higher risk of committing domestic violence (Anda, Butchart, Felitti, & Brown, 2005; Dube, Anda, Felitti, Chapman, Williamson, & Giles, 2001; Dube, Felitti, Dong, Chapman, Giles, & Anda, 2003). Children who have experienced adversity also demonstrate lower academic performance than their peers (Crozier & Barth, 2005). The mechanisms driving these differential outcomes for students who have experienced adversity are unclear and require further exploration.

Academic engagement may be one such mechanism. Academic engagement is a multidimensional construct that consists of behavioral, emotional, and cognitive dimensions (Fredricks, Blumenfeld, & Paris, 2004; Skinner, Kindermann, Connell, & Wellborn, 2009; Skinner & Pitzer, 2012). From this perspective, the behavioral dimension of engagement is defined as the student's behavior in school, including conduct and participation (Fredricks et al., 2004; Skinner & Pitzer, 2012). The emotional dimension of engagement consists of the student's affective reactions in school, including both positive and negative emotions (Fredricks

et al., 2004; Skinner & Pritzer, 2012). The cognitive dimension includes strategy use, preference for a challenge, and willingness to go above and beyond in the classroom (Fredricks et al., 2004; Skinner & Pritzer, 2012). Academic engagement is potentially a mechanism that drives differential outcomes for students who have experienced adversity because it has been linked to many positive academic and life outcomes, including lower drop-out rates, higher grade point averages, and better standardized test scores (Appleton, Christenson, & Furlong, 2008; Wang & Holcombe, 2010). Within social outcomes, higher levels of academic engagement have also been associated with lower rates of delinquent behaviors such as smoking, drinking, fighting, and truancy (Griffiths et al., 2012; Li & Lerner, 2011; Tyler et al., 2008). However, more research is needed on the potential mediating role of engagement on the effect of early adversity on later academic outcomes. Further, engagement has been conceptualized as being malleable over time (Fredricks et al., 2004; Fredricks & McCloskey, 2012; Skinner et al., 2009), making it an ideal construct to examine within a developmental perspective.

According to Bronfenbrenner's bioecological model of development the proximal processes are the mechanisms that drive development, particularly developmental constructs such as engagement. Proximal processes are defined as "complex reciprocal interaction[s] between an active, evolving biopsychological human organism and the persons, objects, and symbols in its immediate external environment" (Bronfenbrenner & Ceci, 1994; Bronfenbrenner & Morris, 2006, pg. 797). These interactions are exemplified by consistent daily interactions between parents and children during different activities such as playing, reading, or other learning-related skills (Bronfenbrenner & Morris, 2006). Moreover, the strength of these proximal processes is influenced by personal characteristics of both the developing child and the parent, contextual factors, and time (Bronfenbrenner & Morris, 2006). Applied to the concept of

academic engagement, Skinner et al. (2009) conceptualized the development of engagement as a cyclical process reliant upon characteristics and interactions of the child and their environment (e.g., parents and teachers), similar to Bronfenbrenner's conceptualization of development.

Within the Skinner et al. (2009) model, personal characteristics of the developing student are referred to as motivational resources, which includes a sense of efficacy and autonomy. They posit that students who begin school with high levels of motivational resources are more likely to become more engaged as they progress through school; this is referred to as a virtuous cycle (Skinner et al., 2009). Conversely, students who begin school with lower levels of motivational resources are more likely to become less engaged as they progress through school, a vicious cycle (Skinner et al., 2009). This concept may be particularly important when considering students who have experienced adversity given their exposure to environmental factors, such as their parent-child and teacher-student relationships, that do not support the development of these motivational skills; thus, hindering their development of engagement.

Parent-child relationships are thought to influence the development of self-system processes such as perceived competence and self-regulatory skills (Skinner et al., 1998; Deci & Ryan, 1985), both of which are motivational resources said to set students on a virtuous cycle of engagement development (Skinner et al., 2009). However, students who have experienced adversity tend to have lower quality relationships with their parents (Murphy et al., 2014), potentially putting them at a disadvantage in their development of engagement. Similarly, teacher-student relationship quality, including perceived teacher support, has been linked with higher participation in class (Battistich, Solomon, Watson, & Schaps, 1997) and with a lower risk of dropping out of school (Croninger & Lee, 2001). In addition, students who have experienced adversity may have difficulty fostering quality relationships with their teachers,

which mirrors interactions with their parents. In fact, Lemkin et al. (2018) found that in a sample of students who had experienced maltreatment, most were unable to identify a supportive adult in school. This perceived lack of support may hinder their development of engagement, potentially placing them on a vicious cycle. Thus, more research is needed on the effect of these contextual factors on the development of engagement for students who have experienced adversity.

Given the negative impact of early adversity on children's academic achievement and the potential mediating role of engagement, the goal of the present study was to examine academic engagement as a mechanism through which early childhood adversity predicts academic outcomes in adolescents. Further, given the important role that context plays in the development of engagement, this study also explored the potential effects of parent-child and teacher-student relationship quality on the development of academic engagement.

Chapter 2: Review of the Literature

This chapter will present a conceptual framework of engagement that includes a description of what engagement is and how engagement may develop in students who have experienced adversity. This will include the potential effects of personal characteristics, contextual factors, and temporal factors on engagement development.

Conceptual Framework

The present study is framed under the Skinner et al. (2009) model of engagement, which considers the role of motivation, and posits that engagement develops through positive and negative interactions between the developing student and a range of contextual factors. Within this framework, engagement is conceptualized as a multidimensional construct with behavioral, emotional, and cognitive dimensions. The behavioral component of engagement consists of effort, initiation, exertion, persistence, concentration, and involvement. The emotional component consists of interest, enjoyment, satisfaction, zest, and enthusiasm. The cognitive component consists of strategy use, preference for a challenge, follow-through, and willingness to go above and beyond (Skinner & Pritzer, 2012).

The Skinner et al. (2009) model posits that engagement develops over time through multiple iterations of either positive or negative interactions between the developing student and their context (Skinner & Pritzer, 2012). This proposed model of engagement development is supported by Bronfenbrenner's bioecological model of development (Bronfenbrenner & Morris, 2006). The bioecological model posits that the development of traits occurs through proximal processes, which are defined as repetitive interactions between contextual influences and the developing person (Bronfenbrenner & Morris, 2006). The strength of these proximal processes is dependent on the personal characteristics of the developing person and of the people with

which they interact, contextual factors, and time (Bronfenbrenner & Morris, 2006).

Personal characteristics are categorized as demand (e.g., age, race, gender), resource (e.g., housing, educational opportunities, access to good food), and force characteristics (e.g., temperament, persistence; Bronfenbrenner & Morris, 2006; Tudge, Mokrova, Hatfield, & Karink, 2009). The contextual factors that affect the strength of proximal processes are categorized into four systems; the microsystem, the mesosystem, the exosystem, and the macrosystem (Bronfenbrenner & Morris, 2006). The microsystem contains environments which include the developing person and the majority of their interactions (e.g., home, school, sports team); the mesosystem refers to the interrelations of microsystems (Bronfenbrenner & Morris, 2006). The exosystem refers to contexts that do not include the developing person but that do affect their development; the macrosystem refers to the influence of the culture, government and other social structures on the development of a trait (Bronfenbrenner & Morris, 2006). Time is categorized in three levels; micro-time, what occurs during a specific activity or interaction; meso-time, the degree to which these activities and interaction reoccur consistently; and macro-time, the differential effects of historical events on development (Bronfenbrenner & Morris, 2006).

Skinner et al. (2009) discuss the effect of personal characteristics on the development of engagement in terms of a students' *motivational resources*, the students' feelings of solidarity, efficacy, ownership, and identity within the academic community. The authors assert that the students' initial level of motivational resources affect engagement development in that the "rich get richer and poor get poorer" (Skinner et al., 2009; Skinner & Pritzer, 2012). This means that students with more motivational resources become richer in these advantageous skills throughout their time in school, whereas students more deprived of motivational resources will become

poorer throughout their time in school. Skinner et al. (2009) categorize these positive and negative developmental trajectories as either a *virtuous* or a *vicious cycle*, respectively (Skinner et al., 2009). As these cycles are repeated, patterns of engagement or disaffection are internalized in the student. Once internalized, the decision to engage or disengage will become more automatic (Skinner et al., 2009). This means, as the student continues to make the decision to engage at a micro-time level, they will be more likely to engage in future activities in a similar way, at the meso-time level (Skinner et al., 2009). Students who have experienced adversity may not have supportive home lives in which motivational and engagement skills are fostered, starting them at a disadvantage and potentially putting them on a vicious cycle. Therefore, a better understanding of how to foster the development of these skills starting from a young age is needed to ensure that these students start on a virtuous cycle of engagement as they progress through school.

Researchers have identified several contextual factors that are important for the development of motivational and engagement skills. At the microsystem level, interactions at both home and school may affect the development of engagement, meaning parent-child and teacher-student interactions may be proximal processes that drive the development of engagement. Parent-child relationship quality has been repeatedly tied to academic success (Furrer & Skinner, 2003). Researchers posit parent-child relationship quality influences academic performance because a student may be motivated by the connection they feel with their parent (Connell & Wellborn, 1991; Lynch & Cicchetti, 1997). Quality parent-child relationships may also affect the development of motivational resources, such as a sense of competence and self-regulatory skills (Deci & Ryan, 1985; Skinner et al., 1998). One study found that having a positive parent-student relationship helped prevent a decline in student emotional engagement (Wang & Eccles, 2012).

Unfortunately, students who have experienced adversity may not have consistent, responsive, and positive relationships or interactions with birth parents or foster parents. In fact, Murphy et al. (2014) found that early adverse experiences had a negative effect on parent-child relationship quality. These negative relationships may be contributing to the differential development of engagement for these students. Another study found that students who had been removed from an abusive home and placed in foster care had higher engagement compared to students who had not been removed (Font & Maguire-Jack, 2013), pointing to the effect of the home microsystem on the development of engagement. The parent-child relationship may also act as a roadmap for relationships and interactions with other adults, meaning it may affect the teacher-student relationship (Furrer & Skinner, 2003). Thus, if a student has a negative relationship with their parents, like many students who have experienced adversity do, they may have more difficulty fostering a positive relationship with their teacher.

Positive teacher-student relationships are also thought to facilitate the development of engagement (Skinner & Pritzer, 2012). One study found a positive relationship between the quality of teacher-student relationships and engagement levels in elementary children (Birch & Ladd, 1997). Roorda et al. (2011) conducted a meta-analysis of studies that explored the effect of teacher-student relationships on engagement and found that a positive relationship with their teacher provides the student with a sense of security, which may support further engagement (Roorda et al., 2011). Additionally, positive teacher-student relationships promote high perceived teacher support (Lam et al., 2014), which has been linked with higher participation in class (Battistich et al., 1997) and lower dropout rates (Croninger & Lee, 2001). However, students who have experienced adversity may have difficulty cultivating and identifying quality relationships with their teachers. Lemkin et al. (2018) found that most of the students who had

experienced adversity were unable to identify a supportive adult in school. The lack of perceived teacher support may be hindering their engagement development. Evidence also suggests that a student's initial level of engagement will affect their future relationships and interactions with teachers, which subsequently affect future engagement levels (Fredricks et al., 2004; Skinner & Belmont, 1993). Thus, a student who begins school with fewer motivational resources may have a poor relationship with their teachers, subsequently affecting their development of engagement.

The dearth of positive relationships with parents and teachers may be a confounded barrier to the development of engagement for students who have experienced adversity. Conversely, the negative effects of adversity on the development of academic engagement may be mitigated by building quality relationships with parents and teachers. If so, relationship quality may be point of intervention on engagement. These intervention efforts could lessen some of the negative outcomes associated with experiencing childhood adversity by supporting the development of engagement in these students. However, to be able to develop effective interventions, the relationships between childhood adversity, parent-child and teacher-student relationships, academic engagement, and academic outcomes need to be studied further.

Purpose of this study

The purpose of the present study is to examine the potential mediation effect of academic engagement on the relationship between experiencing childhood adversity and academic outcomes for adolescents. The other purpose of this study is to examine how parent-child and teacher-student relationship quality may affect engagement development in adolescents who have experienced adversity. The results of this study will add to the existing literature by exploring academic engagement as process through which students achieve academically, rather

than as an outcome, in a sample of adolescents who have experienced adversity. The following are the research questions guiding the present study:

1. To what extent does academic engagement at the beginning of high school mediate the effect of experiencing early childhood adversity on academic outcomes at age 16?
2. To what extent does the quality of parent-child relationships at age 12 moderate the effect of early childhood adversity on academic engagement in the beginning of high school which goes on to effect academic outcomes at age 16?
3. To what extent does the quality of teacher-student relationships at age 12 moderate the effect of early childhood adversity on academic engagement when entering high school which goes on the effect academic outcomes at age 16?

Chapter 3: Method

Mediation and moderated mediation models were used to investigate the potential indirect effect of early childhood adversity on academic outcomes through academic engagement, and the potential moderation effect of the quality of parent-child and teacher-student relationships on engagement development. Three separate models were tested. First, a simple mediation model was specified to test the potential mediation effect of engagement on the relationship between ACEs and academic outcomes. Second, a moderated mediation model was specified to test the potential moderation effect of parent-child relationship quality on engagement. Third, another moderated mediation model was specified to test the potential moderation effect of teacher-student relationship quality on engagement. See Figure 3-1 for an overview of the models. Secondary data analysis of the Longitudinal Studies of Child Abuse and Neglect (LONGSCAN) dataset was used to test these models. Based on the improved ACEs scale by Finkelhor et al. (2013), eleven indicators were used to assess childhood adversity; poverty, caregiver mental health problem, family member substance use, witnessed family violence, child neglect, property victimization, having no good friends, parents always arguing, and physical, sexual, and emotional abuse. Parent relationship quality and teacher relationship quality was measured via parent-report and teacher-report measures, respectively. Academic engagement was measured using items assessing school orientation and participation. The outcome variable of academic achievement, measured by standardized scores on the Wide Range Achievement Test (WRAT-III) for reading.

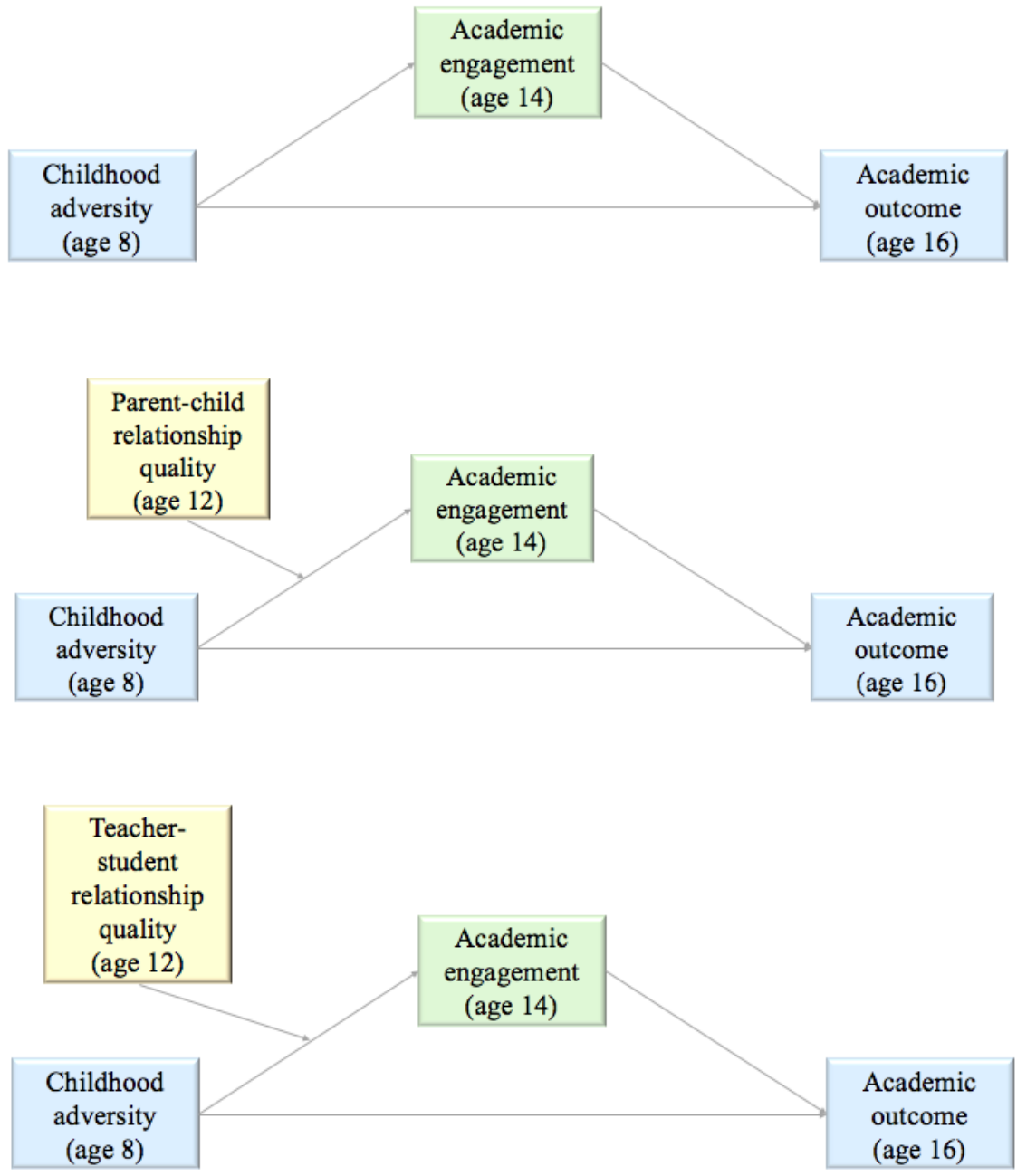


Figure 3-1. Overview of the mediation and moderated mediation models.

Participants

The LONGSCAN study was a nationally representative, longitudinal study of children and families. The goal of the study was to follow children, and their families, who had experienced or were at risk for experiencing adversity, throughout childhood and adolescence

(ages 4-18) and collect information about the antecedents and consequences of adversity. The LONGSCAN study was created in response to a call from the National Research Council (1993) that asked for theory-driven, longitudinal research on child maltreatment. The LONGSCAN study was framed under Bronfenbrenner's (1993) ecological-developmental theory, which posits that children are encapsulated in multiple, embedded social systems with which they interact (both directly and indirectly) and develop through these interactions. The LONGSCAN study gave researchers the opportunity to explore complex questions about the nature of child maltreatment, its antecedents, and its consequences by collecting information about not only the child, but also about his/her family, community, and school (Runyan et al., 1998).

The LONGSCAN study took place over five sites representing all corners of the United States: East, Midwest, Northwest, South, and Southwest. All five sites used systematic measurement, data collection, data entry, and data handling protocols so the dataset can be consolidated across the sites (Runyan et al., 1998; Runyan et al. 2014). The total number of participants recruited for LONGSCAN was 1354 participants across all five sites; the present study sample is a subsample of 750 participants. Adolescents had to have completed up to the age 16 survey and had to be still enrolled in school to be included in the present study.

The children and their families were recruited when the child was 4 years old. Participating children and their caregivers, families, neighborhoods, and schools were interviewed biannually until the child was 18. Each site used different criteria to determine the eligibility of potential participants, which allowed for the sample to represent differing levels of adversity risk.

Eastern site. The Eastern (EA) site was located in Baltimore, Maryland. Its cohort consisted of 282 children with 52.1% of the sample being male and 92.1% of the sample being

African American. See Table 3-1 for more descriptive information. Participants at this site were recruited from pediatric clinics that served low-income families. Clients at these clinics were included in the study if they were deemed at risk for maltreatment in the first year. There were two risk groups and one control group in this cohort. One of the risk groups consists of children who had growth deficits in the first two years of life. The second risk group is composed of children whose parents have either been diagnosed with HIV or use drugs. The control comparison group was of low-income status but had no other risk factors.

Midwest Site. The Midwest site (MW) was located in Chicago, Illinois and consists of 245 children. The MW cohort is 46.9% male and somewhat more diverse than the EA cohort with only 53.5% of the children being African American. See Table 3-1 for more descriptive information. About two-thirds of the participants in the MW cohort were recruited from families who had been reported to Child Protective Services (CPS). The remaining one-third of cohort was the comparison group matched by neighborhood the CPS children.

Northwest site. The Northwest (NW) site was located in Seattle, Washington. The NW cohort contained 254 children; 50.8% of the sample was male and 50% of the sample was Caucasian. See Table 3-1 for more descriptives. Similar to the MW cohort, participants in the NW cohort were recruited from a population of children identified as being at moderate risk after receiving a referral to CPS. About 60% of the CPS referrals in this sample were later corroborated. The NW cohort does not contain a control or comparison group.

South site. The South (SO) site was statewide in North Carolina. Its cohort contained 243 children and was 45.3% male and 63% African American. See Table 3-1 for more descriptive information. Participants at the SO site were recruited from a population identified as high risk at birth by a public health tracking endeavor run by the state. These children did not enter the

LONGSCAN study until they were 4 to 5 years of age. The SO cohort also contains a matched comparison group of non-reported children at a 2:1 ratio.

Southwest site. The Southwest (SW) site was located in San Diego, California. The SW cohort contained 330 children, 47.3% of whom were male and 37.6% of whom were African American. See Table 3-1 for more descriptive information. All of the children in this sample had substantiated claims of maltreatment and had been placed in out-of-home care with either a family member or a foster family. This cohort was recruited into the LONGSCAN study when the children were about 4 years of age.

Table 3-1

Demographic Statistics by Sampling Site

	Total	EA	MW	NW	SO	SW
N	1,354	237	245	254	243	330
Gender n (%)						
Male	657 (48.5)	123 (52.1)	115 (46.9)	129 (50.8)	110 (45.3)	156 (47.3)
Female	697 (51.5)	114 (47.9)	130 (53.1)	125 (49.2)	133 (54.7)	174 (52.7)
Race n (%)						
Caucasian	354 (26.1)	12 (5.0)	32 (13.1)	127 (50.0)	87 (35.8)	94 (28.5)
African American	721 (53.2)	218 (92.1)	131 (53.5)	52 (20.5)	153 (63.0)	124 (37.6)
Hispanic	97 (7.2)	1 (0.4)	34 (13.9)	7 (2.8)	0 (0.0)	55 (16.7)
Mixed	161 (11.9)	3 (1.1)	42 (17.1)	61 (24)	3 (1.2)	52 (15.8)
Other*	20 (1.5)	2 (0.7)	6 (2.4)	7 (2.8)	0 (0.0)	5 (1.5)

* Other includes Native American, Asian, and Pacific Islander

Demographics. The present study sample participants were mostly female (52%) and mostly Black (49.2%). The average age of adolescents was 16.25 (.46) at the age 16 interview. See Table 3-2 for further demographic information.

Table 3-2

Demographic Statistics of Present Study Sample

Characteristic	<i>n</i>	%
Gender		
Male	359	47.9
Female	390	52.0
Race		
White	165	22.0
Black	369	49.2
Hispanic	45	6.0
Asian	2	0.3
Mixed Race	80	10.7
Other	4	0.5

Measures

Demographics. Information about child and caregiver demographics was collected at every biannual assessment. In the present study, child sex, race/ethnicity, and date of birth were assessed using items collected at the age 6 interview. Whether or not the adolescent was still in school will be measured by one item at the age 16 interview.

Childhood Adversity (Adverse Childhood Experiences)- age 8. Following recommendations by Finkelhor et al. (2013), the present study measured childhood adversity using eleven indicators; poverty, caregiver mental health, family member substance abuse, property victimization, having no good friends, parents always arguing, witnessed family violence, child neglect, and physical, sexual, and emotional abuse.

Poverty. Federal guidelines for determining poverty levels (US Department of Health and Human Services) were used to assess if the participant had experienced poverty before age 8. The poverty line based on the number of people dependent on the income was calculated for each participant. If the participant's family had an income below that line at the age 4, 6, or 8

interviews, they were given the code of 1 to represent having ever experienced poverty before age 8.

Caregiver mental health. The *Center for Epidemiologic Studies Depression Scale* (CES-D) (Radloff, 1977) and the *Brief Symptom Inventory* (BSI) (Derogatis, 1993) were used to assess caregiver mental health. At the age 6 interview, 20 items from the CES-D was used to assess depressive symptoms in caregivers. At the age 8 interview, 53 items from the *Brief Symptom Inventory* were used to measure nine scales assessing the following symptoms: somatization, obsession-compulsion, interpersonal sensitivity, depression, anxiety, hostility, phobic anxiety, paranoid ideation, and psychoticism (Knight et al., 2014). The scores from both scales were combined and dichotomized to create a measure of whether or not the adolescent's caregiver had ever suffered from a mental health problem. The CES-D scale's internal consistency is reported to range from .85-.90 across multiple studies (Knight et al., 2014). The concurrent and construct validity of the measure has also been established (Knight et al., 2014). The subscales of the BSI have reported internal consistency reliability that range from .71 to .85 (Knight et al., 2014). The authors determined the BSI to be valid because it was highly correlated to other validated measures of symptomology (Knight et al., 2014).

Caregiver substance abuse. Eleven items from the *Caregiver Substance Abuse* scale were used to assess caregiver substance abuse. Some example items are "have you ever smoked cigarettes," "do you currently smoke marijuana," and "do you use crack or freebase cocaine" (Knight et al., 2014). No reliability or validity statistics were reported for the *Caregiver Substance Abuse* scale.

Property victimization. One item from the *Life Events Scale* (Knight et al., 2014) was used to assess if the adolescent had been a victim of robbery, theft, or vandalism. This item was

measured at ages 6, 7, and 8; responses were summed and dichotomized to represent whether or not the adolescent had experienced property victimization before age 8. The *Life Events Scale* was correlated with a stress scale and determined to be valid; there was no reliability statistics reported (Knight et al., 2014).

Having no good friends. The *Loneliness and Social Dissatisfaction Scale* (Asher, Hymel, & Renshaw, 1984) was used to assess if the adolescent had good friends at age 6. Some example items are “is it easy to make friends at school,” “do you get along with other kids at school,” and “do you have friends at school.” Items are coded as 1 (*no*), 2 (*sometimes*), or 3 (*yes*). The reported internal consistency statistic of the *Loneliness and Social Dissatisfaction Scale* ranged from .61 to .84 and validity was determined by correlating the total score with teacher-reported peer status (Knight et al., 2014).

Parents always arguing. One item from the *Life Events Scale* (Knight et al., 2014) was used to assess if the adolescent’s parents were always arguing. This item was measured at ages 6, 7, and 8; responses were summed and dichotomized to represent whether or not the adolescent had experienced their parents constantly arguing before age 8.

Witnessed family violence. An indicator of whether or not the adolescent had ever witnessed family violence was created by combining items that assessed witnessing a family member be threatened with a weapon, hit, kicked, slapped, stabbed, shot, raped, sexually assaulted, or murdered. These items were collected in both the age 6 and 8 interviews using the *Life Events Scale* (Knight et al., 2014). The items from both interviews were summed and dichotomized to represent whether or not the adolescent had ever witnessed violence before the age 8 interview.

Neglect, physical, emotional, and sexual abuse. Indicators of maltreatment were assessed at every interview using a modified version of the *Maltreatment Classification System*. At every interview, coders from LONGSCAN reviewed the child protective services (CPS) records for each child in sample to determine if there had been any alleged maltreatment in the form of physical, emotional, or sexual abuse, and neglect (Moses & Villodas, 2017). In the present study, these indicators were dichotomized into 0= not alleged and 1= alleged for each maltreatment subtype; participants were coded as 1 if they had ever experienced any of the maltreatment subtypes from birth to 8 years of age.

Once the eleven indicators were dichotomized, they were summed to create a composite childhood adversity score based on the Finkelhor et al. (2013) ACEs survey for each of the participants. The internal consistency of the ACEs measure for the present study sample was $\alpha = .54$.

Parent-child relationships- age 12. Parent-child relationship quality was assessed by a parent-reported survey adapted from the National Longitudinal Study of Adolescent Health (Resnick et al., 1997). The measure has three subscales: Quality of Relationship, Level of Recent Involvement, and Caregiver's Educational Aspirations for Child. A higher score indicates a higher quality relationship. The internal consistency reliability for the Quality of Relationship subscale in the present study is $\alpha = .69$, for the Level of Recent Involvement subscale, in the present study, the internal consistency reliability is $\alpha = .57$. No internal consistency was obtained for the Caregiver's Educational Aspiration for Child subscale because it only contains two items. Validity was determined by correlating both subscale scores across ages 12, 14, and 16 in the LONGSCAN sample; the correlations were all significant and positive (Knight et al, 2014).

Quality of Relationship. The subscale has six items assessing overall relationship quality by asking about level of closeness, trust, getting along, and decision making. The items are scored using a 5-point Likert scale (1=never to 5= always, or 1=not at all to 5=very much). Some example items were “how much do you care about [child]?” and “how often do you feel you understand [child]?” See Appendix for list of Quality of Relationship subscale items.

Level of Recent Involvement. This subscale assesses what activities the caregiver and adolescent did together in the last four weeks. Some example activities are shopping, talking about school, going to the movie, and going to a religious service. The subscale consists of nine yes or no items. See Appendix for a list of the Level of Recent Involvement subscale items.

Caregiver’s Educational Aspirations for Child. This subscale has two items that assess caregiver’s disappointment level if their child did not graduate from either college or high school. It is measured using a five-point Likert scale (1=Not disappointed at all to 5=Really disappointed). See Appendix for a list of Caregiver’s Educational Aspirations for Child subscale.

Teacher-student relationships- age 12. In the present study, teacher-student relationship quality was assessed by 20 items from the Teacher Report Form (TRF). The TRF was developed to measure teacher perception of student academic performance, adaptive functioning and problem behavior (Achenbach, 1991a; Knight et al., 2014). The test-retest reliability for the academic performance and adaptive function subscales was found to have a correlation of about .90; the problem behavior subscale test-retest correlation was determined to be about .92 (Achenbach, 1991b). Validity of scores has been determined in that scores are significantly discriminatory between non-referred and referred match student samples (Achenbach, 1991b). To measure teacher-student relationship quality, the present study pulled items assessing all three

subscales and sum the scores. Internal consistency reliability for the present study was $\alpha = .91$. A higher score indicated higher teacher-student relationship quality.

The items used to assess the adolescent's academic performance ask about the student's recent learning and quality of school work compared to other students in their classroom (e.g. compared to typical pupils of the same age...how much is he/she learning; and the pupil now or within the past 2 months...poor school work). The items used to assess adaptive functioning ask the teachers to rate the student's functioning compared to their peers (e.g. compared to typical pupils of the same age...how happy is he/she and compared to typical pupils of the same age...how appropriately is he/she behaving). The items used to assess problem behavior ask about the recent rates of problem behaviors exhibited by the student (e.g. now or within the past 2 months...argues a lot and now or within the past 2 months...disobedient at school). See Appendix for a full list of items and coding schemes used to assess teacher-student relationship quality.

Academic engagement-age 14. Based on the recommendations from Moses and Villodas (2017), the present study assessed academic engagement by making a composite score of items measuring school orientation and participation in prosocial activities. Because LONGSCAN does not measure academic engagement directly, these items were pulled from two measures administered in the age 14 interview. They were then summed to create a composite score. A higher score indicates a higher level of engagement. The internal consistency reliability for the present sample was $\alpha = .71$. The school orientation items, pulled from the *School Orientation and Behavior Problems* measure (LONGSCAN, 1998), assessed academic performance, the student's behavior in school, and the student's feelings about school. Lastly, the prosocial engagement items, pulled from the *Resilience Factors* measure (LONGSCAN,

1998), assess the student's involvement in their school and community. See Appendix for a full list of the items used.

Academic Outcome- age 16. Academic achievement was assessed at age 16 using a standard score on the Wide Range Achievement Test (WRAT-III) Reading subtest. The WRAT-III is a nationally normed assessment. The reading subset assess students' ability to recognize, name, and pronounce letters and words (Wilkinson, 1993). The reading subtest was selected for the present analyses because it was the only subtest administered at the age 16 interview. No psychometric information was available for the WRAT-III.

Analytic Strategy

Mediation models were run to test the potential conditional indirect relationship between childhood adversity, academic engagement, academic outcomes, and the quality of parent-child relationships and teacher-student relationships. First, the data set was checked for missing data patterns using Little's (1988) missing completely at random (MCAR) test. The assumptions of normality, linearity, homoscedasticity, and independence were assessed to ensure that significance or effect size findings were trustworthy (Osborne & Waters, 2002).

Multicollinearity between all variables was assessed and dealt with by rescaling the variables. Rescaling maybe done by centering the variables at their means or converting the scores into z-scores (Slinker & Glantz, 1985). No multicollinearity issues were detected. The data was also checked for outliers and their influence on estimates using Cook's Distance, Standardized DFFIT, Standardized DFBETA, which are all used to test the impact on the regression coefficient estimates if a specific observation were to be deleted (Muller & Mok, 1997). No outlier effects were detected.

Simple mediation. To answer the first research question, a simple mediation model was specified. A *mediation effect*, also called an *indirect effect*, is one in which an independent variable affects a dependent variable through a third variable; the mediator (Preacher, Rucker, & Hayes, 2007). In the present study, the mediation model specified academic engagement as the means by which childhood adversity affects the performance on the WRAT-III reading subscale. See Figure 3-2 for a visual representation of the simple mediation model. In the figure, a_1 indicates the slope coefficient of academic engagement regressed on childhood adversity, and b_1 and c' indicate the conditional coefficients of the WRAT-III reading score regressed on both academic engagement and childhood adversity when both are included as predictors of WRAT-III reading score (Preacher et al. 2007). These coefficients are estimated using least-squares regression using the following regression equations:

$$M = a_0 + a_1X + e \quad (1)$$

$$Y = b_0 + c'X + b_1M + e \quad (2)$$

where a_0 and b_0 are intercept coefficients and e indicates the residual of the regression equation. The strength and significance of the indirect effect is determined using a_1 and b_1 coefficient estimates (Preacher et al. 2007). In this model, the indirect effect = $(a_1)(b_1)$ the direct effect = c' , and the total effect = $(a_1)(b_1) + c'$ (Mackinnon, Lockwood, & Williams, 2004).

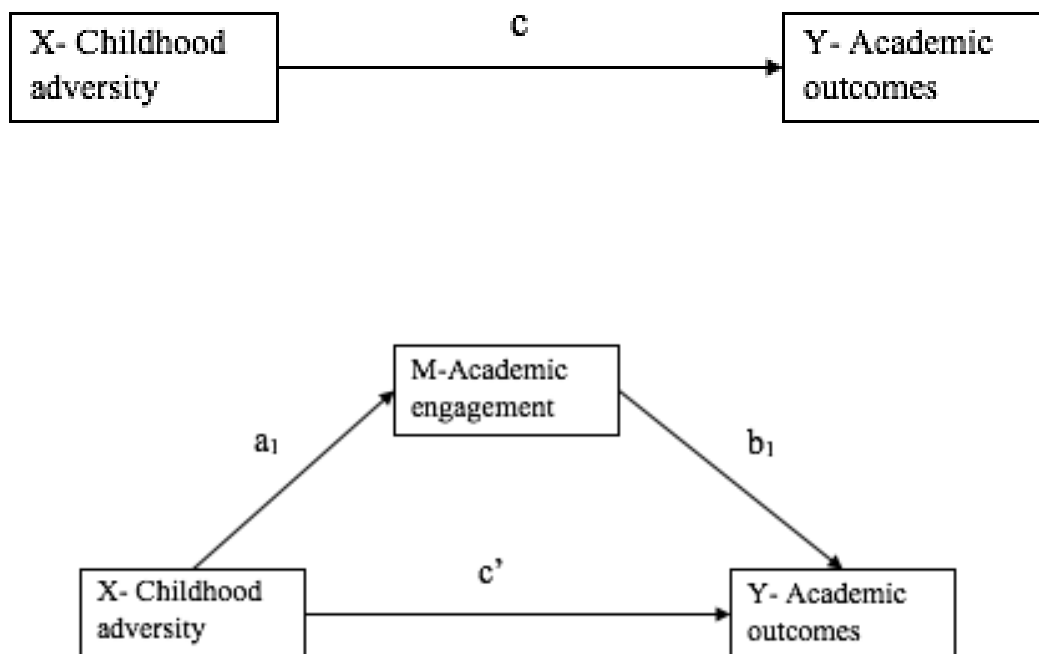


Figure 3-2. Simple regression and mediation model.

Following the recommendation of Baron and Kenny (1986), multiple regression models must be estimated and some conditions must be met to successfully test this mediation model. Childhood adversity must significantly predict academic outcomes; childhood adversity must also significantly predict academic engagement; finally, academic engagement must significantly predict WRAT-III reading score in the third model (Baron & Kenny, 1986). In addition to these conditions being met, a mediation relationship is supported if the predictive effect of childhood adversity on academic outcomes is lower when the mediator (academic engagement) is included in the model (Baron & Kenny, 1986). That is $c > c'$ in Figure 2. There is a full mediation effect of academic engagement on the relationship between childhood adversity and WRAT-III when c' is non-significant; it is a partial mediation when the c' path is significant but is less than the c

path (Hayes, Preacher, & Myers, 2011; Mackinnon, Lockwood, Hoffman, West, & Sheets, 2002).

The significance of the indirect effects $[(a_1)(b_1)]$ was also determined. A commonly used method of testing the indirect effect is called the *Sobel test* (Sobel, 1982) in which the a_1 and b_1 coefficients are multiplied and then divided by their standard error (Hayes et al., 2011; Mackinnon et al., 2002; Preacher & Hayes, 2007). The resulting test statistic is then compared to the critical value at $Z_{\left(\frac{\alpha}{2}\right)}$ (at $\alpha = .05$, $Z = 1.96$) to decide whether to reject or fail to reject the null hypothesis that the population indirect effect is equal to zero (Hayes et al., 2011). However, this test is not always accurate because the $(a_1)(b_1)$ distribution violates the assumption of normality; an assumption that must be met to make trustworthy decisions using the standard normal z distribution (Hayes et al., 2011; Mackinnon et al., 2002). For this reason, *bootstrapping* confidence intervals were used to determine the significance of the indirect effects.

Bootstrapping techniques are also called *resampling methods* and consist of taking k number of repeated samples of the data to construct a sampling distribution of a statistic (Hayes et al. 2011). Bootstrapping is especially useful in estimating indirect effects because it is a nonparametric test that does not have an underlying assumption of normality (Hayes et al. 2011; Preacher & Hayes, 2007). A 95% confidence interval for the indirect effect was drawn from 1,000 iterations of the indirect effect obtained from SPSS. The effect was deemed significant given that zero was not included in the interval (Hayes et al. 2011). SPSS process was used to obtain all of the estimates stated above.

Moderated mediation. To answer research questions 2 and 3, two moderated mediation models were specified. The term *moderated mediation* was coined by James and Brett (1984) and “occurs when the strength of an indirect effect depends on the level of some variable,

or...mediation relations are contingent on the level of a moderator” (Preacher et al., 2007, pg.193). Moderated mediation is also called a *conditional indirect effect* (Preacher et al., 2007). In the present study, the quality of parent-child and teacher-student relationships was included as a moderator that may affect the strength of the relationship between childhood adversity and academic engagement. In other words, a fourth variable (W), the relationship quality, potentially affects the a_1 path from the mediation model above. It is hypothesized that as parent-child relationship quality at age 12 increases, the negative effect of childhood adversity on academic engagement at the beginning of high school decreases. It is also hypothesized that as teacher-student relationship quality at age 12 increases, the negative effect of childhood adversity on academic engagement at age 14 decreases. Refer to Figure 3-1 for a visual display of the two moderated mediation effects that was tested.

Methods similar to those used to probe for significant interaction effects in regression were used to probe the significance of the conditional indirect effects in the present study. When evaluating an interaction effect, the Johnson-Neyman (J-N) technique is used to determine a *region of significance*, a range of values of the moderator for which the simple slope of the dependent variable regressed on the independent variable is significant (Preacher et al., 2007). This method requires specified values of the moderator for which investigating the significance of the indirect effect is meaningful (Preacher et al., 2007), the present study used the moderator’s mean and one standard deviation above and below the mean.

The SPSS process v3 developed by Hayes (2019) was used to run the full model and determine the significance of the indirect effect at the three specified values of the moderator. The process by default presented estimates of the model, the condition indirect effects, and hypothesis test results with the moderator being set to 1 standard deviation above the mean, the

mean, and 1 standard deviation below the mean. The process also generated the conditional indirect effect for values of the moderator that are significant using the J-N technique (Preacher et al. 2007). Percentile bootstrapping confidence intervals were also obtained for all the conditional indirect effects to determine their significance.

Chapter 4: Results

Results are reported in three sections. First, missing data was analyzed. Second, preliminary analyses were conducted to check assumptions, to determine the distributions of the main variables and to examine the bivariate correlations of the main variables. Finally, the three mediation models were specified and probed for significant effects.

Missing Data

When all five core variables were analyzed, the data was found to be missing completely at random using Little's MCAR test ($\chi^2(41) = 46.10, p = .24$). However, when the missingness patterns of each specified model, the simple mediation model (Model 1) was not missing completely at random using Little's MCAR test ($\chi^2(5) = 23.94, p < .001$), the moderated mediation model with parent-child relationship quality (Model 2) as the moderator was not missing completely at random ($\chi^2(16) = 29.38, p = .02$), and the moderated mediation model with teacher-student relationship quality (Model 3) as the moderator was not missing completely at random ($\chi^2(16) = 33.46, p = .01$). Because of these results, pairwise deletion was used to run all analyses and resulted in Model 1 having a sample size of 537, Model 2 having a sample size of 452, and Model 3 having a sample size of 231.

Participants with complete data were not significantly different than participants with missing data in regard to gender ($\chi^2(1) = 1.28, p = .257$) on their academic engagement total score ($t(602) = 0.23, p = .81$), on their parent-child relationship scores ($t(613) = .67, p = .50$), on their teacher-student relationship scores ($t(291) = -1.12, p = .26$), and on their ACEs score ($t(748) = -1.56, p = .118$). However, the two groups did differ on their WRAT-III reading subtest score ($t(645) = -2.88, p < .001$); the non-missing group ($M = 96.83, SD = 13.16$) scored significantly higher on the WRAT-III than the missing group ($M = 91.35, SD = 16.07$). The two

groups also differed on their racial/ethnicity group ($\chi^2(5) = 885.36, p < .001$); the non-missing group had significantly more white students than the missing group and the missing group had significantly more black students than the non-missing group.

Preliminary Analyses

Preliminary analyses were conducted to determine the distributions and bivariate correlations of the main study variables and to check assumptions. See Table 4-1 for distribution statistics and Table 4-2 for bivariate correlations.

Table 4-1

Descriptive Statistics of Main Variable

	<i>n</i>	<i>M</i>	<i>SD</i>	<i>Min</i>	<i>Max</i>
ACEs	750	6.19	2.12	1	11
Parent-child Relationships	615	46.00	4.37	29	57
Teacher-student Relationships	293	36.48	10.92	9	58
Academic Engagement	604	10.89	3.09	2	18
WRAT-III Reading	647	92.01	15.84	45	129

Table 4-2

Pearson Correlations between Main Variables

	1	2	3	4	5
1. ACEs	-				
2. Parent-child Relationships	-.10*	-			
3. Teacher-student Relationships	-.06	.07	-		
4. Academic Engagement	-.05	.08	.158*	-	
5. WRAT-III Reading	.06	-.06	.272**	.05	-

* $p < .05$ ** $p < .01$

Assumptions

Linear regression assumptions (linearity, homoscedasticity, independence, and normality) were checked for each mediation model.

Linearity. Linearity was first determined by visually inspecting the scatterplot matrix of the main study variables. See Figure 4-1 for scatter plot matrix. Based on the matrix, it was determined that there was no evidence of nonlinearity. Second, the predicted and residual values obtained by regressing WRAT-III scores on the ACEs, Academic Engagement, Parent-child Relationship Quality, and Teacher-student Relationship Quality were plotted to determine the linearity of each model. The Lowess curve was also used to determine the linearity of the relationship.

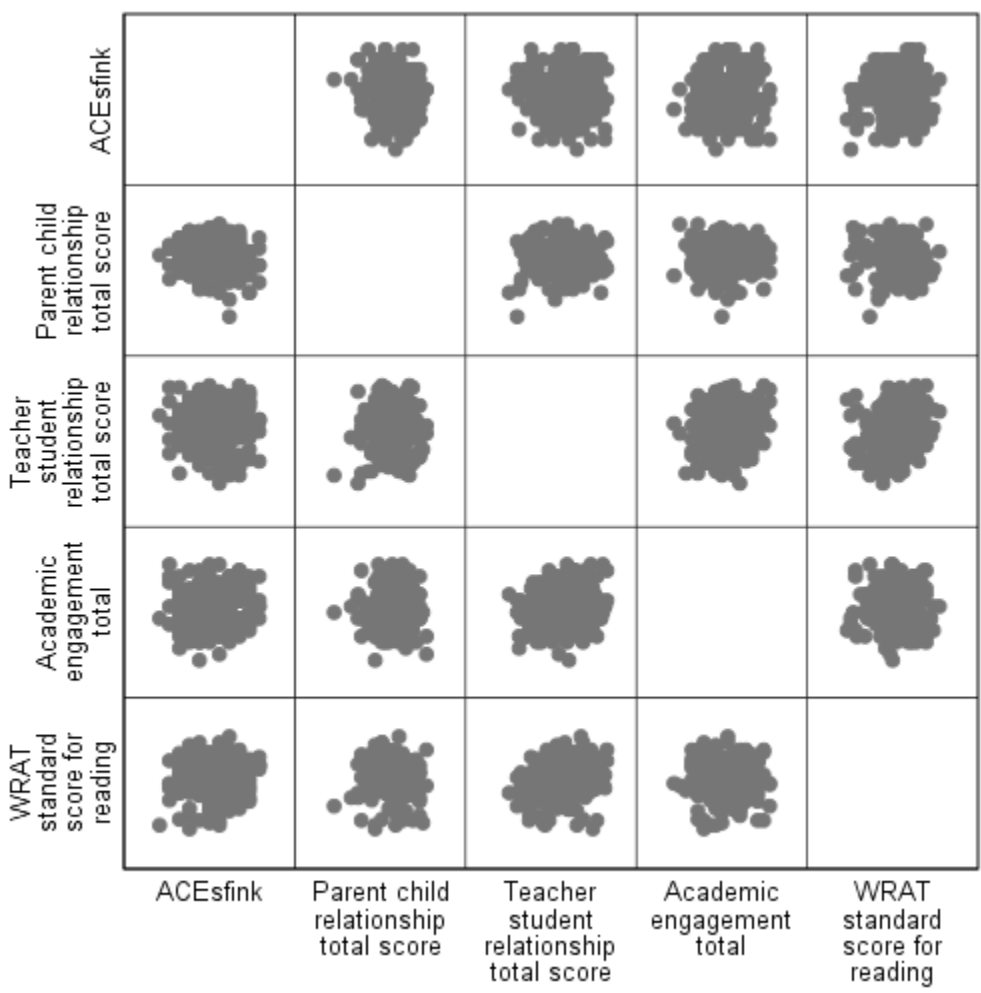


Figure 4-1. Scatter plot matrix of main study variables.

Model 1. Linearity of Model 1 was determined by visually examining the scatter plot of the predicted and residual values obtained by regressing WRAT-III scores on ACEs and academic engagement. The assumption of linearity was met because the points seem to spread equally along the zero line and the Lowess curve is close to the zero line. See Figure 4-2 for Model 1 scatter plot.

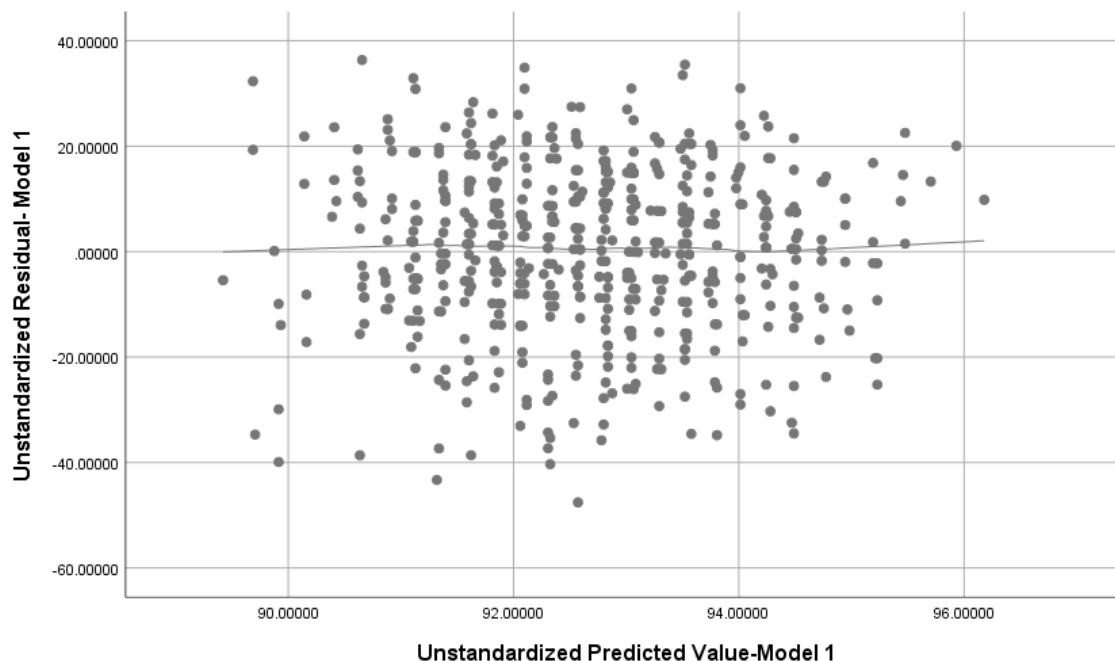


Figure 4-2. Model 1 scatterplot of predicted and residual values.

Model 2. Linearity of Model 2 was determined by visually examining the scatter plot of the predicted and residual values obtained by regressing WRAT-III scores on ACEs, academic engagement, and parent-child relationship quality. The assumption of linearity was met because the points seem to spread equally along the zero line and the Lowess curve is close to the zero line. See Figure 4-3 for Model 2 scatter plot.

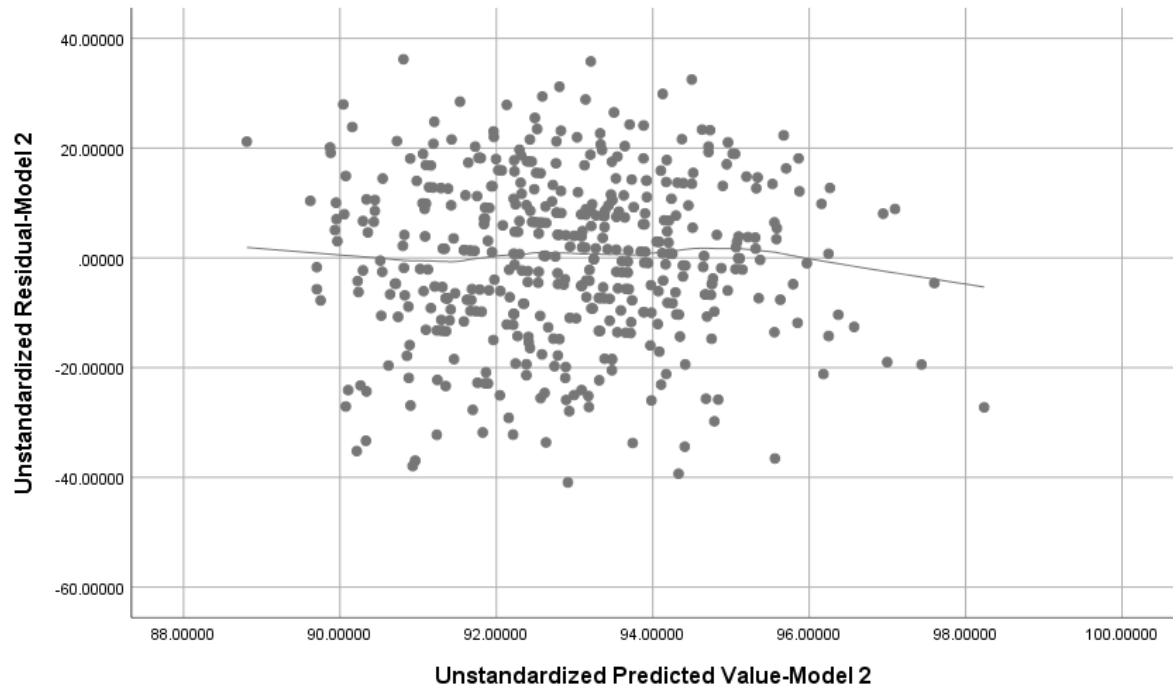


Figure 4-3. Model 2 scatterplot of predicted and residual values.

Model 3. Linearity of Model 3 was determined by visually examining the scatter plot of the predicted and residual values obtained by regressing WRAT-III scores on ACEs, academic engagement, and teacher-student relationship quality. The assumption of linearity was met because the points seem to spread equally along the zero line and the Lowess curve is close to the zero line. See Figure 4-4 for Model 3 scatter plot.

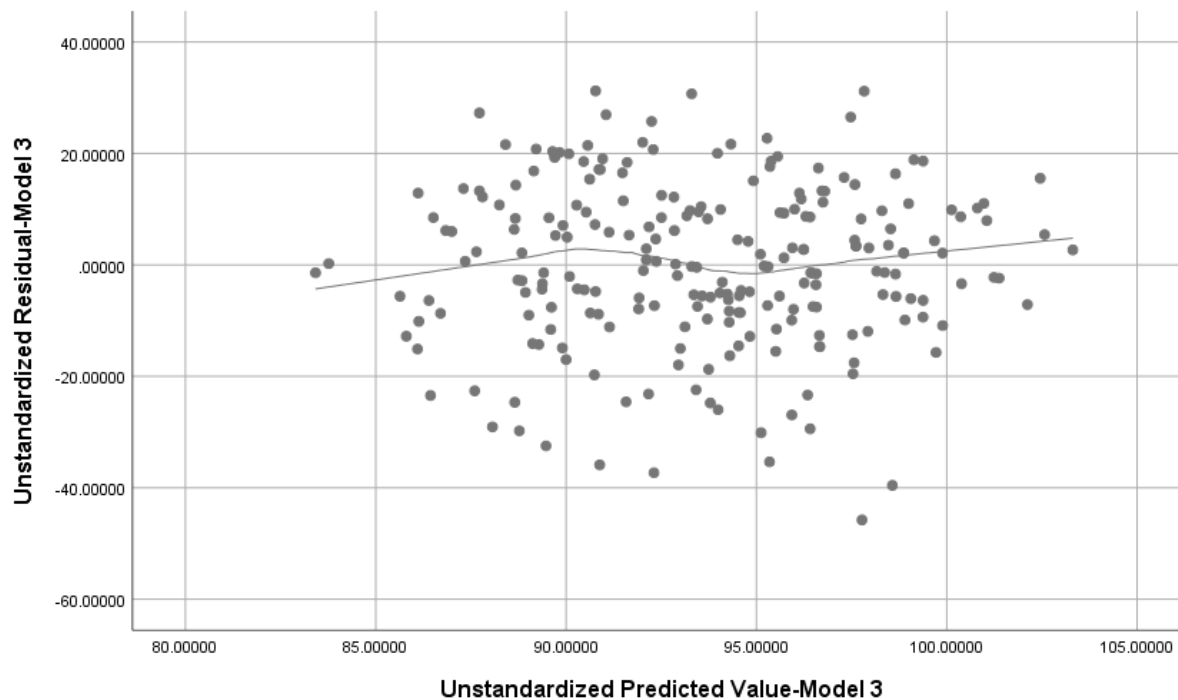


Figure 4-4. Model 3 scatterplot of predicted and residual values.

Independence. The assumption that the residual values in the regression model were independent was tested using the Durbin-Watson (1950; 1951) statistic. This statistic ranges from 0-4; the criterion used to determine if the independence assumption is met by the Durbin-Watson statistic is between 1.5 and 2.5 (Brooks, 2014). Based on this criterion, all three models were determined to have met the assumption of independence with Durbin-Watson statistics of 1.78 for Model 1, 1.84 for Model 2, and 1.83 for Model 3.

Homoscedasticity. Homoscedasticity of variances was also assessed using visual inspection of the scatterplot between the standardized predicted values and standardized residual values.

Model 1. Model 1 was determined to have met the assumption of homoscedasticity because the spread of the variance of the residuals seems to be equal across all points of the predicted values. See Figure 4-2 for Model 1 scatterplot.

Model 2. Model 2 was determined to have met the assumption of homoscedasticity because the spread of the variance of the residuals seems to be equal across all points of the predicted values. See Figure 4-3 for Model 2 scatterplot.

Model 3. Model 3 was determined to have met the assumption of homoscedasticity because the spread of the variance of the residuals seems to be equal across all points of the predicted values. See Figure 4-4 for Model 3 scatterplot.

Normality. The normality of the distribution of the residuals for each specified model was determined using the Shapiro-Wilk test (1965) of the unstandardized residual values. The Shapiro-Wilk statistic W ranges from zero to one; as the W value approaches one, the data approaches normality (Razali & Wah, 2011). The null hypothesis is the data is normally distributed, thus a p-value larger than .05 indicates normality of the data (Razali & Wah, 2011). However, the Shapiro-Wilk test is sensitive to large sample sizes. In a simulation study, Field (2006) found that as sample size increases, the power of Shapiro-Wilks test approaches 1.00, leading to higher rates of Type I error. They suggest visual examination of the Q-Q plots of the residuals as an additional determination of normality (Field, 2006).

Model 1. The residual values of Model 1 were determined to be normally distributed based on Shapiro-Wilk test ($W(537) = .99, p < .01$). Although the test was significant, pointing to a non-normal distribution, the sample size is large, which may affect the significance and the statistic is very close to one, indicating normality. Additionally, a visual inspection of the Q-Q plot indicates normality because most of the residuals fall on the expected normal line. See Figure 4-5 for Model 1 Q-Q plot of residuals.

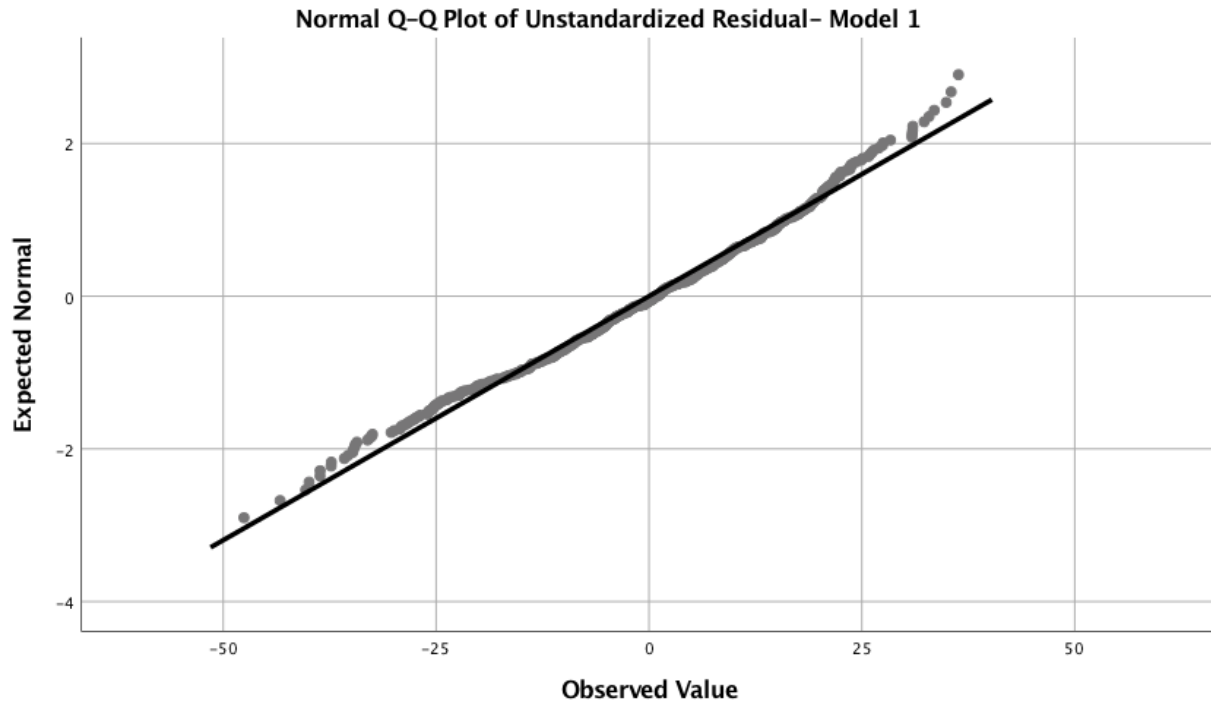


Figure 4-5. Model 1 Q-Q Plot of residual values.

Model 2. The residual values of Model 2 were determined to be normally distributed based on Shapiro-Wilk test ($W(452) = .99, p < .01$). Although the test was significant, pointing to a non-normal distribution, the sample size is large, which may affect the significance and the statistic is very close to one, indicating normality. Additionally, a visual inspection of the Q-Q plot indicates normality because most of the residuals fall on the expected normal line. See Figure 4-6 for Model 2 Q-Q plot of residuals.

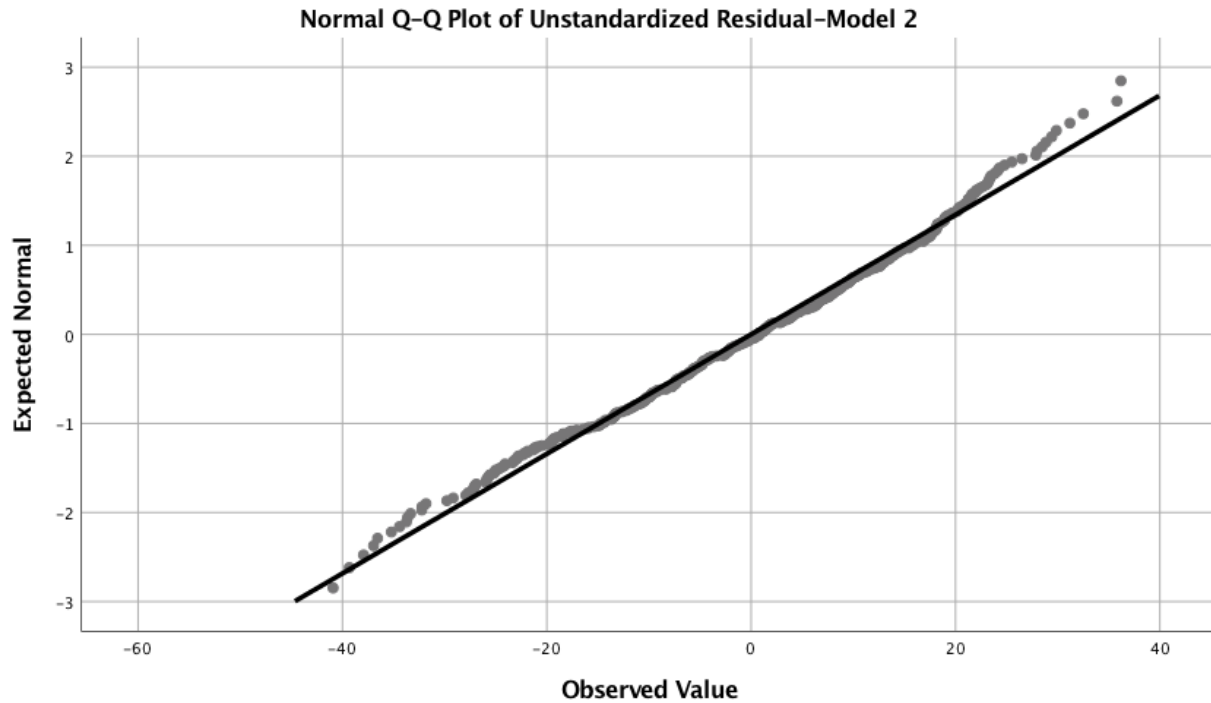


Figure 4-6. Model 2 Q-Q Plot of residual values.

Model 3. The residual values of Model 3 were determined to be normally distributed based on Shapiro-Wilk test ($W(231) = .99$, $p = .04$). Although the test was significant, pointing to a non-normal distribution, the sample size is large, which may affect the significance and the statistic is very close to one, indicating normality. Additionally, a visual inspection of the Q-Q plot indicates normality because most of the residuals fall on the expected normal line. See Figure 4-7 for Model 3 Q-Q plot of residuals.

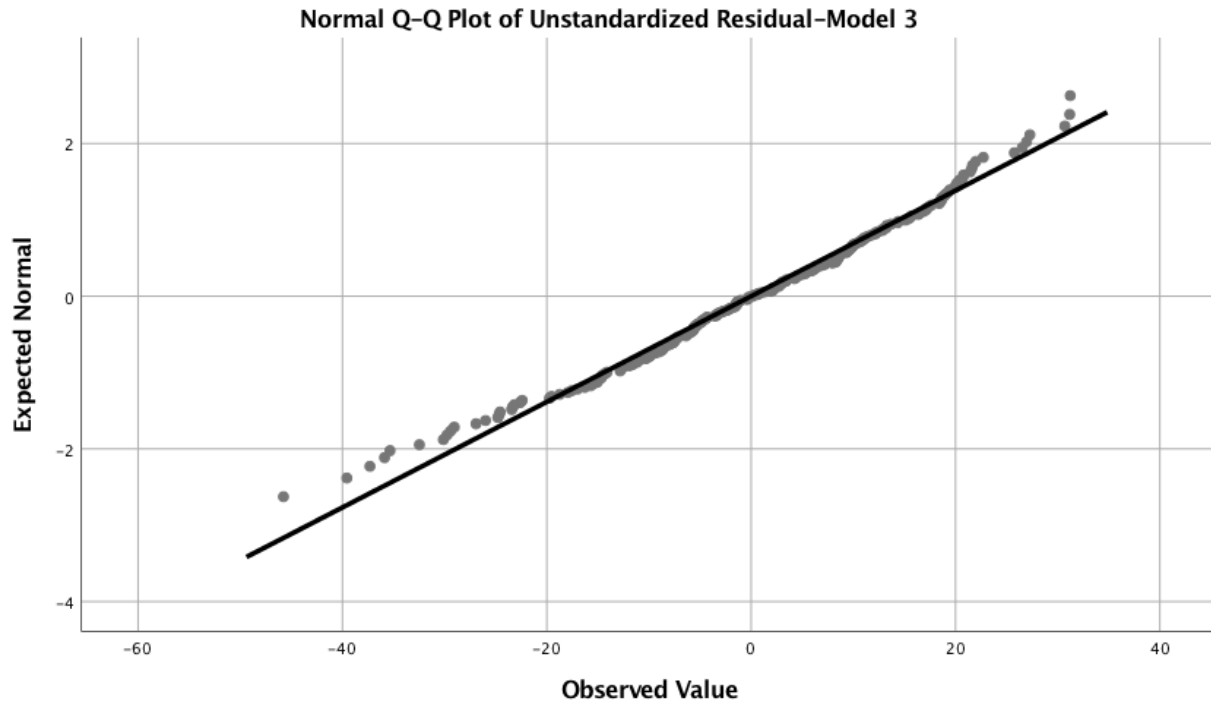


Figure 4-7. Model 3 Q-Q Plot of residual values.

Mediation Models

Results of the simple mediation model are reported first followed by the results of the moderated mediation models.

Simple mediation (Model 1). Model 1 did not significantly predict WRAT-III reading scores ($R^2 = .01$, $F(2, 534) = 1.71$, $p = .18$). See Table 4-3 for path coefficients, direct and indirect effects, and bootstrapping confidence intervals. The total effect (path c) of ACEs on WRAT-III was not significant ($p = .15$). The direct effect (path c') of ACEs on WRAT-III, with academic engagement held constant, was also not significant ($p = .14$). ACEs did not significantly predict academic engagement (path a ; $p = .41$) and academic engagement scores (path b) did not significantly predict WRAT-III reading score ($p = .26$). Thus, the mediation conditions, set by Baron and Kenny (1986), were not met. However, other researchers suggest that a mediation effect can still be detected by examining the indirect effect using bootstrapping

(Hayes et al., 2011; Mackinnon et al., 2002; Preacher et al., 2007). The indirect effect (path *ab*) was also not significant (95% CI[-0.07, 0.03]) because the bootstrapping confidence interval contained zero. Taken together, there was no evidence to suggest that academic engagement mediated the relationship between ACEs and WRAT-III scores.

Table 4-3

Model 1 Path Coefficients, Indirect Effects, and Bootstrapping CIs

Path	Effect	LLCI	ULCI	SE	<i>t</i>	<i>p</i> -value
Total effect (<i>c</i>)	0.46	-0.16	1.08	0.32	1.46	.15
Direct effects						
<i>c</i> '	0.48	-0.15	1.10	0.32	1.50	.14
<i>a</i>	-0.05	-0.18	0.07	0.06	-0.83	.41
<i>b</i>	0.25	-0.18	0.67	0.22	1.13	.26
Indirect effect						
<i>ab</i>	-0.01	-0.07	0.00	0.03	-	-

Note. LLCI, bootstrapping lower limit confidence interval; ULCI, bootstrapping upper limit confidence interval; SE, standard error; SE for indirect effect, bootstrapping standard error.

Moderated mediation (Model 2)- Parent-child relationships. Model 2 did not significantly predict WRAT-III scores ($R^2 = .01$, $F(2, 449) = 1.20$, $p = .30$). See Table 4-4 for path coefficients, indirect effects, moderation effects, and bootstrapping confidence intervals. The direct effect (path *c*') of ACEs on WRAT-III scores, with academic engagement and parent-child relationship quality held constant, was not significant ($p = .13$). ACEs did not significantly predict academic engagement (path *a*; $p = .25$) and parent-child relationship quality (*w*) did not significantly predict academic engagement ($p = .13$). The interaction between ACEs and parent-child relationship (*a-w*) quality was not significant ($p = .23$), meaning parent-child relationship quality did not moderate the effect of ACEs on academic engagement. Academic engagement did not significantly predict WRAT-III scores (path *b*; $p = .69$). The conditional indirect effects were not significant at the moderator's mean and at one standard deviation above and below the

mean based on 95% bootstrapping confidence intervals. These results suggest that there is not a moderated mediation relationship of ACEs on WRAT-III scores through academic engagement with parent-child relationship quality.

Table 4-4

Model 2 Path Coefficients, Indirect Effects, and Bootstrapping CIs Predicting WRAT-III

Path	Effect	LLCI	ULCI	SE	<i>t</i>	<i>p</i> -value
Direct effects						
<i>c'</i>	0.50	-0.15	1.16	0.33	1.51	.13
<i>a</i>	0.85	-0.60	2.30	0.74	1.16	.25
<i>b</i>	0.09	-0.36	0.54	0.23	0.40	.69
<i>w</i>	0.16	-0.05	0.37	0.11	1.53	.13
<i>a·w</i>	-0.02	-0.05	0.01	0.02	-1.20	.23
Conditional indirect effects						
1 <i>SD</i> below	0.00	-0.04	0.07	0.03	-	-
Mean	0.00	-0.05	0.03	0.02	-	-
1 <i>SD</i> above	-0.01	-0.10	0.06	0.04	-	-

Note. LLCI, bootstrapping lower limit confidence interval; ULCI, bootstrapping upper limit confidence interval; SE, standard error; SE for conditional indirect effects, bootstrapping standard error

Moderated mediation (Model 3)- Teacher-student relationships. Model 3 did not significantly predict WRAT-III scores ($R^2 = .01$, $F(2, 228) = 0.82$, $p = .44$). See Table 4-5 for path coefficients, indirect effects, moderation effects, and bootstrapping confidence intervals. The direct effect (path *c'*) of ACEs on WRAT-III scores, with academic engagement and teacher-student relationship quality held constant, was not significant ($p = .22$). ACEs did not significantly predict academic engagement (path *a*; $p = .07$) and teacher-student relationship quality (*w*) did significantly predict academic engagement ($p = .02$). The interaction between ACEs and teacher-student relationship quality (*a·w*) was not significant ($p = .12$), meaning there was not a moderation effect of teacher-student relationship quality on the effect of ACEs on

academic engagement. Academic engagement did not significantly predict WRAT-III scores (path b ; $p = .82$). The conditional indirect effects were not significant at the moderator's mean and at one standard deviation above and below the mean based on 95% bootstrapping confidence intervals. These results suggest that there is not a moderated mediation relationship of ACEs on WRAT-III scores through academic engagement with teacher-student relationship quality.

Table 4-5

Model 3 Path Coefficients, Indirect Effects, and Bootstrapping CIs Predicting WRAT-III

Path	Effect	LLCI	ULCI	SE	t	p -value
Direct effects						
c'	0.58	-0.34	1.50	0.48	1.24	.22
a	0.69	-0.60	1.43	0.38	1.81	.07
b	0.07	-0.55	0.69	0.31	0.23	.69
w	0.16	0.02	0.29	0.07	2.32	.02
$a \cdot w$	-0.02	-0.03	.00	0.01	-1.58	.12
Conditional indirect effects						
1 SD below	0.02	-0.20	0.22	0.10	-	-
Mean	0.01	-0.09	0.13	0.05	-	-
1 SD above	0.00	-0.09	0.11	0.05	-	-

Note. LLCI, bootstrapping lower limit confidence interval; ULCI, bootstrapping upper limit confidence interval; SE, standard error; SE for conditional indirect effects, bootstrapping standard error

Chapter 5: Discussion

The present study explored the mediation effect of academic engagement on the relationship between adverse childhood experiences (ACEs) and WRAT-III letter and word recognition scores for adolescents. It was hypothesized that academic engagement levels at age 14 would explain some of the effect of ACEs on WRAT-III scores. In addition, parent-child relationship quality and teacher-student relationship quality were hypothesized to moderate the relationship between ACEs and academic engagement, meaning as the quality of relationship increased, the negative effect of ACEs on academic engagement would be less powerful. In the following chapter, the results, limitations, strengths, and future directions of the present study are discussed.

Mediation Models

Overall, there was no evidence to suggest that academic engagement mediates the relationship between ACEs and WRAT-III scores in this sample. The total effect of ACEs on WRAT-III scores was not significant, meaning experiencing adversity before the age of 8 did not seem to affect WRAT-III scores at age 16. When academic engagement total scores were added to model as a mediator, the direct effect of ACEs of WRAT-III scores was also not significant and was slightly higher than the total effect. The indirect effect was also found to be non-significant. These results indicate that academic engagement does not mediate the relationship between ACEs and WRAT-III scores.

There was also no evidence to suggest that parent-child relationship quality moderates the relationship between ACEs and academic engagement or that it has an effect on the mediation effect of engagement. The interaction effect of ACEs and parent-child relationship quality was not significant and the conditional indirect effects at the moderator's mean and one standard

deviation above and below the mean were all non-significant. These results indicate that parent-child relationship quality at age 12 did not affect academic engagement levels at age 14, which did not go on to significantly affect WRAT-III scores at age 16. There was no evidence to suggest that teacher-student relationship quality moderates the relationship between ACEs and academic engagement or that it has an effect on the mediation effect of engagement. The interaction effect of ACEs and teacher-student relationship quality was not significant and the conditional indirect effects at the moderator's mean and one standard deviation above and below the mean were all non-significant. These results suggest that teacher-student relationship quality at age 12 did not affect academic engagement levels at age 14 and did not go on to significantly affect WRAT-III scores at age 16. Teacher-student relationship quality did significantly predict academic engagement, suggesting that relationships with teachers may be uniquely important in engagement development in this population.

Measurement Limitations

The results of the present study were not consistent with what was hypothesized. There were limitations in the measurement of many of the variables, which may have affected the study's findings. More specifically, there were threats to the validity and the reliability of some of the measures.

Threats to validity. The items used to measure academic engagement may not have been an accurate representation of the adolescent's engagement because they do not map directly onto the Skinner et al. (2009) framework; consequently, there may have been an issue with the structural validity of the measure. This disconnect between theory and measurement is a recurring limitation when academic engagement is studied with students who have experienced adversity; speaking to the need for future interdisciplinary work and better instrument

development. Former studies, which measure school engagement in this population, do not tend to capture the complexity of the construct. For example, the National Study of Child and Adolescent Well-Being (NSCAW) study measures school engagement using 11 items from the Drug Free Schools Outcome Study (U.S. Department of Education, Office of the Under Secretary), however, the items used mostly measure behavioral engagement, thus they do not measure engagement as it is conceptualized. As a result, the term “engagement” is a misnomer.

One persisting practice that may cause validity issues is the use of a composite score. Engagement is a multidimensional construct consisting of three dimensions; thus, the use of a composite score may be a violation of its structural validity. If there is a violation of structural validity, then engagement in these students may not be captured in its totality. Therefore, the results and the conclusions based on those results may not be accurate. The LONGSCAN study does not directly measure academic engagement; as a result, the present study used a composite score of items from two separate measures; following the recommendation of Moses and Villodas (2017). Most of the items chosen assessed behavioral engagement with a few items that may assess emotional engagement and zero items that measure cognitive engagement as defined by the conceptual framework.

Future researchers should use exploratory factor analysis (EFA) to identify potential underlying factors of the engagement measure. If the structural validity of the measure is intact, then there will be three underlying factors; one for behavioral engagement, one for emotional engagement, and one for cognitive engagement. Composite scores of these underlying factors should then be used in the mediation models in place of the engagement composite score. This practice will better uphold the structural validity of the measurement and will lead to more valid results and conclusions. This is important because without it conclusions drawn about these

student's engagement may be based on invalid results. These unfounded conclusions may lead researchers to form inaccurate understandings of engagement in this population, hindering their ability to support engagement development in a meaningful way. Similar validity issues may have been prevalent in the ACEs measure, which may have influenced the study results.

The WRAT-III letter recognition subtest may not have been an accurate representation of academic achievement at age 16. The letter recognition subtest consists of items, which assess the student's ability to recognize, name, and pronounce letters and words. These skills may be too rudimentary to correctly assess student academic achievement at age 16. In addition, the WRAT-III test does not test comprehension, therefore it is often used in conjunction with a comprehension measure to obtain a more comprehensive measure of reading achievement (Wilkinson, 1993). Thus, there may have been a violation of the validity of the measure in using the scores as a sole indication of reading achievement. Future research should use measures that may more accurately represent academic achievement in adolescents, such as reading comprehension tasks, mathematics tasks, GPA, SAT scores, and ACT scores. These measures may offer a more nuanced depiction of academic achievement for adolescents and result in the detection of more significant relationships between the model variables.

Threats to reliability. In addition to threats to validity, the results of the mediation models may have been affected by the poor reliability of some of the measures. The internal consistency reliability of the parent-child relationship quality subscales, of the academic engagement composite score, and of the ACEs composite score were much lower than the standard .80. The lack of reliable measures may have introduced additional measurement error to the models, which may have been a hindrance in identifying significant relationships between the study variables. Further, the use of a composite score to represent multidimensional constructs,

such as academic engagement, affects the reliability of the measure (Rodriguez, Reise, & Havilland, 2016). Thus, future researchers should first determine the structure of the measure using EFA techniques and then evaluate the reliability of the measure based on the resulting factor structure.

The reliability of the measures may have also been affected by the use of different sources across variables. The parent-child relationship quality measure was parent-reported, the teacher-student relationship quality measure was teacher-reported, academic engagement items were student-reported, and the ACEs items pulled from a mix of parent- and child-reported measures. This inconsistency in data sources may affect the interrater reliability of the measures and obscure some of the potential effects between variables. Parent-reported and teacher-reported relationship quality may not be equivalent to child-reported relationship quality. Similarly, parent- or teacher-reported student academic engagement may not be equivalent to child-reported engagement; the same could be true for parent-reported adversity and child-reported adversity. Thus, when different data sources were used in the same model, the multiple raters may introduce measurement error. Future researchers should use the same data source across all variables to minimize the amount of measurement error in the model. Future researchers may also want to compare the results across models using different data sources. For example, it may be of interest to compare the results of the models from a student perspective versus the results from a teacher perspective.

General Limitations

The results of this study are based on secondary data analysis of the LONGSCAN study, resulting in less control over the data collection. A lack of consistency in the data may have contributed to the dearth of significant results. For example, the abundance of missing data

affected the sample size of each model, which may have affected the models' power to detect significant results. Also, the missing data was not missing completely at random, meaning the missingness of the data was related to some specific variable. In this case, participants with missing data differed significantly from participants with complete data on their WRAT-III scores and on their race. Participants with complete data scored significantly higher on the WRAT-III than participants with missing data. Participants with missing data were predominately Black and participants with complete data were predominately White. In addition, LONGSCAN does not offer any information about why participants have missing data. The patterns of missingness in the data potentially influenced the results and conclusions of all three models. The results may be due to preexisting, unaccounted for differences between participants with complete data and participants with missing data instead of due to the hypothesized relationships between the variables. Future researchers may want to include some of these variables as covariates in the model to better account for their effect on the variables of interest.

Contributions to Literature

Previous research on academic engagement with students who have experienced adversity focuses largely on engagement as an academic outcome. This study, instead, framed engagement as a mechanism through which students who have experienced adversity may achieve academically. By framing engagement as a process, the present study opens up the opportunity to discover the antecedents and outcomes of higher levels of engagement in this population. Specifically, the current study found that teacher-student relationship quality significantly predicated academic engagement. The results presented here suggest that teacher-student relationship quality is uniquely important in engagement for students who have experienced adversity. The results also suggest that teacher-student relationships may be more

important in engagement development than parent-child relationships for this population. Thus, intervention efforts should maybe focus more on improving teacher-student relationships with the end goal of improving student engagement.

Future Directions

This study explored academic engagement as a learning process and found that teacher-student relationships have an individual effect on engagement development for students who have experienced adversity. However, the study did not find any of the hypothesized moderation and mediation effects. There were multiple measurement and design limitations, that may have affected the results. Nonetheless, the Skinner et al. (2009) model supports the idea that engagement would mediate the relationship between ACEs and academic outcomes and that engagement would develop over time through quality parent-child and teacher-student interactions. Thus, these relationships should be explored further.

Future work about the engagement of students who have experienced adversity, and the effect of their parents and teachers should employ more complicated or in-depth methods to gain a better understanding of the relationships between variables. Multitrait-multimethod analysis may be used to validate the measures of ACEs, academic engagement, parent-child relationship quality, and teacher-student relationship quality. They can be used to compare the different perspectives that parents, teachers, and students may have on these constructs to assure that the measures being used are both reliable and valid.

Future researchers could also use qualitative methods, such as conducting interviews and observations, in conjunction with quantitative measures to both better understand unexpected results and for measurement development. The researcher could conduct interviews of a small sample to gather more information about why and how they engage in school or about their

relationships with their parents and teachers. These interviews could provide the researcher an opportunity to form a comprehensive view of what these constructs mean to these students and their parents and teachers. Using these methods, future researchers can improve on existing measures or develop new measures of engagement and relationship quality for students who have experienced adversity. Researchers could use these improved measures to detect and understand more of the relationships between adversity, engagement, relationships quality, and academic outcomes. Researchers could then use this information to develop engagement interventions that may be more effective in potentially improving academic and life outcomes for students who have experienced adversity.

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Appendix

Item descriptions

Items	Coding Scheme
How well do you know him/her?	1=Not well, 2=Moderately well, 3=Other
Compared to typical pupils of the same age...How hard is he/she working?	1=Much less, 2=Somewhat less, 3=Slightly less, 4=About average, 5=Slightly more, 6=Somewhat more, 7=Much more
Compared to typical pupils of the same age...How appropriately is he/she behaving?	1=Much less, 2=Somewhat less, 3=Slightly less, 4=About average, 5=Slightly more, 6=Somewhat more, 7=Much more
Compared to typical pupils of the same age...How much is he/she learning?	1=Much less, 2=Somewhat less, 3=Slightly less, 4=About average, 5=Slightly more, 6=Somewhat more, 7=Much more
Compared to typical pupils of the same age...How happy is he/she?	1=Much less, 2=Somewhat less, 3=Slightly less, 4=About average, 5=Slightly more, 6=Somewhat more, 7=Much more
Now or within the past 2 months...argues a lot	0=Not true (as far as you know), 1=Somewhat or sometimes true, 2=Very true or often true
Now or within the past 2 months...fails to finish things he/she started	0=Not true (as far as you know), 1=Somewhat or sometimes true, 2=Very true or often true
Now or within the past 2 months...defiant, talks back to staff	0=Not true (as far as you know), 1=Somewhat or sometimes true, 2=Very true or often true
Now or within the past 2 months...can't play attention for long	0=Not true (as far as you know), 1=Somewhat or sometimes true, 2=Very true or often true

Now or within the past 2 months...can't sit still, restless or hyperactive	0=Not true (as far as you know), 1=Somewhat or sometimes true, 2=Very true or often true
Now or within the past 2 months...cries a lot	0=Not true (as far as you know), 1=Somewhat or sometimes true, 2=Very true or often true
Now or within the past 2 months...demands a lot of attention	0=Not true (as far as you know), 1=Somewhat or sometimes true, 2=Very true or often true
Now or within the past 2 months...difficulty following directions	0=Not true (as far as you know), 1=Somewhat or sometimes true, 2=Very true or often true
Now or within the past 2 months...disobedient at school	0=Not true (as far as you know), 1=Somewhat or sometimes true, 2=Very true or often true
Now or within the past 2 months...has difficulty learning	0=Not true (as far as you know), 1=Somewhat or sometimes true, 2=Very true or often true
Now or within the past 2 months...too fearful or anxious	0=Not true (as far as you know), 1=Somewhat or sometimes true, 2=Very true or often true
Now or within the past 2 months...talks out of turn	0=Not true (as far as you know), 1=Somewhat or sometimes true, 2=Very true or often true
Now or within the past 2 months...sleeps in class	0=Not true (as far as you know), 1=Somewhat or sometimes true, 2=Very true or often true
Now or within the past 2 months...apathetic or unmotivated	0=Not true (as far as you know), 1=Somewhat or sometimes true, 2=Very true or often true
Now or within the past 2 months...poor school work	0=Not true (as far as you know), 1=Somewhat or sometimes true, 2=Very true or often true

Table 1. Items used to assess quality of teacher-student relationship

Items	Coding Scheme
How close do you feel to [child]?	1=Not at all, 2=Very little, 3=Somewhat, 4=Quite a bit, 5=Very much
How much do you care about [child]?	1=Not at all, 2=Very little, 3=Somewhat, 4=Quite a bit, 5=Very much
How often do you trust [child]?	1=Never, 2=Seldom, 3=Sometimes, 4=Often, 5=Always
How often do you feel you understand [child]?	1=Never, 2=Seldom, 3=Sometimes, 4=Often, 5=Always
How often do you and s/he get along well?	1=Never, 2=Seldom, 3=Sometimes, 4=Often, 5=Always
How close do you and [child] make decisions together about things in his/her life?	1=Never, 2=Seldom, 3=Sometimes, 4=Often, 5=Always

Table 2. Quality of Relationship subscale items.

Items	Coding Scheme
In the past four weeks have you... Gone shopping with him/her?	0=No 1=Yes
Played a sport with him/her?	0=No 1=Yes
Gone to religious service or church-related event with him/her?	0=No 1=Yes
Talked with [child] about his/her friends or about things s/he was doing with his/her friends?	0=No 1=Yes
Gone to a movie, play, museum, concert, or sports event with him/her?	0=No 1=Yes
Had a talk with [child] about a personal problem s/he was having?	0=No 1=Yes
Had a serious argument with [child] about his/her behavior?	0=No 1=Yes
Worked on a project for school with him/her?	0=No 1=Yes
Talked with [child] about other things s/he is doing in school?	0=No 1=Yes

Table 3. Level of Recent Involvement subscale items.

Items	Coding Scheme
How disappointed would you be if [child] did not graduate from high school?	1= Not disappointed at all, 2= Not very disappointed, 3= A little disappointed, 4= Somewhat disappointed, 5= Really disappointed
How disappointed would you be if [child] did not graduate from college?	1= Not disappointed at all, 2= Not very disappointed, 3= A little disappointed, 4= Somewhat disappointed, 5= Really disappointed

Table 4. Caregiver's Educational Aspirations for Child subscale items.

Items	Coding Scheme
When given homework, how often do you do it?	1= Never, 2=Sometimes, 3=Almost always, 4= Always, 9=Never get homework
How important is it for you to do well in school?	1= Not important at all, 2= Not very important, 3=Somewhat important, 4= Extremely important
About how many days, in the last 12 months, have you cut school or part of school?	0=Not at all in the past 12 months, 1=1 or 2 times, 2=3-9 times, 3=10 or more times
How many times in the last 12 months have you been suspended?	0=Not at all in the past 12 months, 1=1 or 2 times, 2=3-9 times, 3=10 or more times
Have you ever seriously thought about dropping out school?	0=No, 1=Yes
What is the highest level in school that you expect to reach?	1=Quit before high school graduation, 2=High school graduation, 3= Community college or vocational school, 4= Four-year college, 5= Graduate or professional school

Table 5. School orientation items.

Items	Coding Scheme
In the past year have you been a part of a sports team?	0=No, 1=Yes
In the past year have you been a member of a club at school?	0=No, 1=Yes
In the past year have you received a school award or prize?	0=No, 1=Yes
In the past year have you been on honor roll?	0=No, 1=Yes
In the past year have you been a part of a drama, music, dance, or other performing arts group?	0=No, 1=Yes
In the past year have you been part of a scout troop?	0=No, 1=Yes
In the past year have you been a part of volunteer activities?	0=No, 1=Yes
In the past year have you been part of a religious or church group?	0=No, 1=Yes
In the past year have you received a volunteer or community service award?	0=No, 1=Yes

Table 6. Prosocial engagement items.