THE LONGITUDINAL EFFECT OF TRAUMATIC STRESS AND ATTACHMENT DIFFICULTIES ON ACADEMIC ACHIEVEMENT FOR YOUNG CHILDREN

By

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To my best friend

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National educational achievement statistics show that academic underachievement is a significant problem for all students in the United States and for culturally diverse students in particular. The relationship of attachment and its interaction with traumatic stress has been proposed as an alternative explanation for the persistent underachievement found among marginalized children. This study explored the relationship between early childhood mental health and development and how this might impact children's academic achievement longitudinally using an ecosystemic view. Traumatic stress theory was used to explore the complexity of students' experiences in schools. Specifically, the researcher explored how the relationship between traumatic stress symptoms and difficult attachment symptoms affect the growth trajectory of reading and mathematics achievement for children in kindergarten through fifth grade (n=8,368) while controlling for gender, culture, and socioeconomic status. This quantitative study used the national database Early Childhood Longitudinal Study-Kindergarten 1998 cohort (ECLS-K) collected by the National Center for Education Statistics (NCES) in order to design a latent growth curve model that incorporated traumatic stress symptoms and difficult attachment symptoms and their effects on the growth trajectory. The results of this study indicated that both traumatic stress symptoms and difficult attachment symptoms predicted

significantly lower initial scores in reading and mathematics as well as lower growth trends over time. The results of this study are significant because they suggest that interactive environmental factors, such as traumatic experiences and attachments issues impact academic achievement for young children over time. Recommendations for future research include intervention studies that investigate ways to mediate the effects of traumatic stress and attachment issues during the early childhood years.

CHAPTER 1
INTRODUCTION

Early elementary school is a critical period for young children and an important time to identify any difficulties with behavior and academic concerns, as these can be associated with later negative outcomes for students; including possible aggressive behavior, grade retention, suspension, academic failure, and school dropout (Darney, Reinke, Herman, Stormont, & Ialongo, 2013). Disproportionate poor academic performance tends to be highest among socially marginalized students and these academic underperformance issues are often assumed to be due to a child's personal or cultural deficits (Robinson & Biran, 2006). Such a perspective inhibits the prevention of academic underachievement and instead aggravates underperformance for culturally diverse students (Ford, Harris, Tyson & Trotman, 2002; Goodman &West-Olatunji, 2010; Sue & Sue, 2013; Wycoff, 1996). Deficit perspectives often keep educators from accurately assessing the risks and barriers to academic achievement by marginalized student learners (O'Connor & Fernandez, 2006). As researchers and educators continue to explore underachievement among marginalized students, relatively few researchers have examined how attachment experiences and psychological trauma may be alternative explanations to this problem (Bergin & Bergin, 2009; Goodman, Miller, & West-Olatunji, 2012; Moss, Bureau, St-Laurent, & Tarabulsy, 2011; Moss & St-Laurent, 2001).

Researchers have suggested that there are connections between attachment and subsequent academic achievement (Bergin & Bergin, 2009; Cutrona, Cole, Colangelo, Assouline, & Russell, 1994; Pianta & Harbers, 1996). Attachment research describes children's behaviors through differential attachment styles that includes secure and insecure attachments. These describe children's experiences along a wellness spectrum, that is broken down into 4 styles: (a) secure (most well), (b) insecure-avoidant, (c) insecure-resistant, and (d) insecure-

disorganized-disoriented (most risk to wellness) (Bergin & Bergin, 2009; Delius, Bovenschen, & Spangler, 2008). The less supportive attachment relationships, such as avoidant, resistant, and disorganized-disoriented attachment behaviors often lead to less academic success (Bergin & Bergin, 2009; Pianta & Harbers, 1996). An area research has shown to compromise healthy attachment is traumatic stress experiences (Moss et al., 2011).

Traumatic stress theory has also been used to explore the complexity of student's experiences in schools (Goodman et al., 2012; Goodman & West-Olatunji, 2008b). Traumatic stress theory utilizes an ecosystemic perspective to identify the systemic effects that may be hindering children's functioning when they experience events that are negative, sudden, and/or out of control (Carlson, 1997); such as hegemony (the dominance of one social group over another) (Carter, 2007; Goodman & West-Olatunji, 2010) and transgenerational traumas (Danieli, 2007). The effects of systemic oppression are important in reconceptualizing childhood mental health and overall functioning for culturally diverse and socially marginalized young children (West-Olatunji, 2010). Symptoms of traumatic stress in early childhood include interupted attachment displays of distress such as inconsolable crying, disorientation, diminished interest, aggression, withdrawing from peers, and thoughts or feelings that disrupt normal activities (De Young, Kenardy, & Cobham, 2011a, 2011b; Goodman & West-Olatunji, 2010; Johnson, 1997; Lieberman & Van Horn, 2008; Modrowski, Miller, Howell, & Graham-Bermann, 2013).

Psychological and somatic health problems affect substantial groups of children leading to underachievement and often when students fall behind early they never catch up (Lau, 2002). Mental health professionals and educators who are unaware of a child's attachment and trauma history or its impact may aggravate the situation by labeling children's problems as attention

deficits, conduct problems, or autism (Goodman et al., 2012; Levine & Kline, 2007). By using traumatic stress theory and attachment health to examine the experiences of children in their early years, it may improve the ways in which educators and counselors intervene with children. Particularly, when considering the effects of traumatic stress on the quality of the child's attachment relationship (Metzger, Erdman, & Ng, 2010; Zeanah & Smyke, 2009).

Children's health, cognitive, social, and emotional development has shaped our need to provide direct services for children (Bagnato, 2006; Blanco & Ray, 2011). Professional counselors, more often than others, focus on an ecosystemic perspective, to look at persons, their problems, and resiliencies while considering them in a relational and circumstantial context (Dollarhide, 2012; Lewis, 2012; Lim, Lim, Michael, Cai, & Schock, 2010; Waller, 2001). By using this approach, counselors are able to conceptualize children, families, and communities in culturally sensitive and reciprocal fashions (West-Olatunji, Frazier, & Kelly, 2011). Unfortunately, little attention has been paid to training that focuses on young children's socio-emotional development ages zero to eight years. When young children experience developmental obstacles, such as events that are negative, sudden, and/or out of control (Goodman & West-Olatunji, 2008b), they can experience developmental challenges. These experiences are often complex, multidimensional, and difficult to assess in those affected (Follette, Palm, & Pearson, 2006; Follette & Vijay, 2009). When these difficulties are due to chronic stress, children often exhibit acting out behaviors and distress (Johnson, 1997), resulting in symptoms that appear to be behavioral and not related to crisis. During extreme stresses children can often have lowered abilities to respond to social conditions (Nuru-Jeter, Sarsour, Jutte, & Boyce, 2010). This can affect children's ability to perform in school. Chronic stress can interrupt cognitive functions such as planning, working memory, and mental flexibility (Johanson, 2006; Nuru-Jeter et al.,

2010; Wilkerson, Johnson & Johnson, 2008), leading to academic underachievement (Goodman et al., 2012).

Conceptualization is hindered by the often disparaging nature of descriptions, discussions about social class still being framed within mainstream values, and differences in parenting styles often resulting in families in poverty becoming victims to classism or racism when our communities promote strategies of parenting and caring for children that do not align with their cultural logic of child rearing (Biles, Mphande-Finn, & Stroud, 2012; Foss, Generali, & Kress, 2011; Sue & Sue, 2013; West-Olatuji & Gibson, 2012). Unfortunately, the field of early childhood mental health does not have consensus on any standards of conceptualization and treatment or collected evidence for the validity or utility of the different approaches (Egger & Angold, 2009). Despite increased attention towards psychosocial development, many children with emotional or behavioral difficulties still go untreated (Gleason, Zeanah, & Dickstein, 2010; Horwitz et al., 2007). There is a minimal use of cultural perspectives and they do not adequately consider developmental issues (Belfer, 2008).

Using a post hoc data set, the purpose of the study is to examine the relationship between the longitudinal trajectory of academic achievement from kindergarten through fifth grade with children's traumatic stress symptoms and difficult attachment symptoms while controlling for the effects of children's culture/ethnicity, gender, and socioeconomic status. The results of this study could indicate the impact of early childhood traumatic stress and attachment difficulties on children's academic performance trajectories. This could bring more attention to the need for developmentally competent counseling interventions in early childhood and elementary schools. This study could also support the use of alternative perspectives to the deficit-oriented view of low achievement among marginalized students (Goodman et al., 2012). This could aid

counselors and educators to develop more accurate conceptualizations for young children's abilities and needs.

Early childhood intervention research is interested in what is most effective and under which circumstance. This study extends prior research by exploring how issues with attachment and traumatic stress moderate academic achievement. The results of this study may indicate a need for counseling interventions in schools and alternative perspectives to the deficit-oriented view of low achievement among marginalized students (Goodman et al., 2012). This could help counselors and educators to more accurately conceptualize young children's abilities and needs, while reducing mislabeled academic performance problems as low ability or problem behavior.

Research Questions

In order to develop an understanding of the relationship between children's traumatic stress symptoms and difficult attachment symptoms with the outcome variables for academic achievement, I will examine a longitudinal multi-level model beginning at school entry into kindergarten and continuing to fifth grade. I am also interested in looking at the relationship with academic achievement and children's culture/ethnicity, gender, and socioeconomic status. Therefore, this study will examine five research questions: (1) What is the relationship between the growth trajectory of reading and mathematics achievement and traumatic stress symptoms for children in kindergarten through fifth grade?, (2) What is the relationship between the growth trajectory of reading and mathematics achievement and difficult attachment symptoms for children in kindergarten through fifth grade?, (3) What is the relationship between the growth trajectory of reading and mathematics achievement and traumatic stress symptoms and difficult attachment symptoms for children in kindergarten through fifth grade?, (4) What is the relationship between the growth trajectory of reading and mathematics achievement and traumatic stress symptoms and difficult attachment symptoms for children in kindergarten

through fifth grade, while controlling for gender, culture, and socioeconomic status? and finally, (5) What is the relationship of an interaction effect between traumatic stress symptoms and difficult attachment symptoms on the growth trajectory of reading and mathematics achievement for children in kindergarten through fifth grade, while controlling for gender, culture, and socioeconomic status?

Hypotheses

The null hypotheses for each of the five research questions were as follows:

- (**Ho1)** There will be a negative relationship between the growth trajectory of reading and mathematics achievement and traumatic stress symptoms for children in kindergarten through fifth grade.
- (**Ho2)** There will be a negative relationship between the growth trajectory of reading and mathematics achievement and difficult attachment symptoms for children in kindergarten through fifth grade.
- (**Ho3)** There will be a negative relationship between the growth trajectory of reading and mathematics achievement and traumatic stress symptoms and difficult attachment symptoms for children in kindergarten through fifth grade.
- (**Ho4)** There will be a negative relationship between the growth trajectory of reading and mathematics achievement and traumatic stress symptoms and difficult attachment symptoms for children in kindergarten through fifth grade, while controlling for gender, culture, and socioeconomic status.
- (**Ho5)** There will be a negative relationship of an interaction effect between traumatic stress symptoms and difficult attachment symptoms on the growth trajectory of reading and mathematics achievement for children in kindergarten through fifth grade, while controlling for gender, culture, and socioeconomic status.

Significance of the Study

Identifying the relationship between reading and mathematics achievement growth trajectories with traumatic stress symptoms and difficult attachment symptoms, as well as their interaction effects, could allow counselors and educators to better understand the relationship these variables have with reading and mathematics achievement. Thereby, allowing us to formulate more accurate and effective direct intervention with young children. It could further

enhance our understanding of how children's traumatic stress symptoms and caregiver(s) attachment symptoms interact with academic performance, thus enabling counselors and educators to more accurately assess and conceptualize children's abilities and needs. This study could aid in the development of more culturally sensitive and developmentally appropriate interventions that will potentially better address the effects of traumatic stress and attachment difficulties, thereby, moving us closer to improving academic performance for marginalized children. By continuing the conversation about how traumatic stress theory may aid policy makers in conceptualizing the needs of students, they may better meet equity and accountability. It could help policy makers develop standards that better serve culturally diverse students. Using the ecosystemic perspective may shed light on the contexts that are enabling disproportionality. This would be a step towards social justice and advocacy, by aligning public interests with student needs (Bemak & Chung, 2011).

This study will extend previous research on academic underachievement and traumatic stress by using a longitudinal nationally representative sample of primary school students and including the attachment symptoms of these students. This study will attempt to investigate issues of culture on the prevalence of traumatic stress and difficult attachment symptoms with their relationship to reading and mathematics achievement growth trajectories among kindergarten to fifth grade students. Therefore, this study will serve to provide counselors, educators, and policy makers ways to improve academic outcomes for early childhood children. These results might be useful in informing training, professional development, and further development of school-wide initiatives. Teachers may be able to receive training on recognizing traumatic stress and attachment difficulty symptomology, thereby, allowing them to make appropriate referrals to mental health professionals. As well as allow teachers to be trained in

early childhood educational interventions that will remedy the effects of traumatic stress and attachment difficulties within the classroom environment. To conclude this research will be advocating for school counselors and other mental health professionals working in educational settings to provide trainings to teachers, further develop programs, and directly intervene with early childhood children individually and in group counseling settings.

Limitations

This study will use a nationally norm referenced data set collected by the National Center for Education Statistics (NCES). There are limitations to generalizability and construct validity because this study will use pre-collected data for post hoc analyses. Concerns surround construct underrepresentation and construct irrelevant variance. These validity concerns and the items that will be selected will be done in relation to a literature review and discussion with experts in order to ensure their appropriateness (American Educational Research Association, 1999).

Definition of Terms

Following are definitions of terms used in the study.

ACADEMIC ACHIEVEMENT**.** Students' stage of accomplishment as measured by the benchmarks within their school system (Robinson & Biran, 2006), including standardized test scores, grades, and level of school completion.

ACADEMIC UNDERACHIEVEMENT**.** Educational performance that is not corresponding to a student's ability (Goodman & West-Olatunji, 2010) that includes lower grades, behavior problems, placement in special education courses, retention, high retention, and failing to graduate are indicators.

AFRICAN AMERICAN**.** An individual who self-identifies as belonging to a cultural or ethnic group from the U.S. who has African ancestry (Paniagua, 2001).

AROUSAL**.** An indicator of traumatic stress characterized by any of the following: (1) disturbance in sleeping patterns, (2) difficulty with concentration, (3) hypervigilance or augmented startle response, and (4) irritability and anger (4th ed., text rev.; DSM-IV-TR; American Psychiatric Association, 2000).

AVOIDANCE**.** An indicator of traumatic stress characterized by numbing as demonstrated by any of the following: (a) avoidance of thoughts, feeling, behaviors, or activities that are related to a traumatic event, (b) memory loss to a traumatic event, (c) detachment behaviors and attitudes toward others, (d) sense of a foreshortened future, and (e) flat affect or reduced interest in prior interests (4th ed., text rev.; DSM-IV-TR; American Psychiatric Association, 2000).

CULTURALLY DIVERSE**.** An individual who self-identifies as a member of a cultural group other than European American, such as African American, Latina/o, Asian American/Pacific Islander, Native American (Sue & Sue, 2013).

CULTURE**.** Group identity founded on shared worldviews and values (West-Olatunji, 2012).

EXTERNALIZING BEHAVIORS**.** An indicator of traumatic stress, characterized by problematic behaviors as demonstrated by aggression and delinquency (Graham-Bermann & Levendosky, 1998).

HEGEMONY**.** Domination or privilege of one individual or group over another (Goodman & West-Olatunji, 2010).

INTERNALIZING BEHAVIORS**.** An indicator of traumatic stress characterized by problematic behaviors as demonstrated by anxiety/depression, withdrawal, and somatic complaints (Graham-Bermann & Levendosky, 1998).

LATINA/O**.** An individual who self-identifies as a member of a cultural group from the U.S. with ancestry from a Latin country (Paniagua, 2005).

MULTICULTURAL COUNSELING COMPETENCIES (MCC). Benchmarks for clinical competence that include (1) self-awareness of biases and worldview, (2) knowledge regarding the worldviews of others, and (3) skills appropriate to engaging with culturally different individuals (Sue & Sue, 2013).

NATIVE AMERICAN. An individual who self-identifies as belonging to a cultural group from the U.S. with indigenous ancestry (Paniagua, 2005).

PEDIATRIC COUNSELING. An understanding and application of the intersection of various developmental issues when conceptualizing assessing, and intervening with young children from birth to five years of age (Wolfgang, Frazier, West-Olatunji, & Barrett, 2012).

REEXPERIENCING. An indicator of traumatic stress characterized by any of the following (a) frequent and troublesome thoughts or nightmares about a traumatic event, (b) belief that a traumatic event is reoccurring, and (c) phsycological reactivity or psychological distress triggered by cues (internal and external) that resemble a traumatic event (4th ed., text rev.; DSM-IV-TR; American Psychiatric Association, 2000).

SOCIALLY MARGINALIZED. Individuals who experience oppression or social bias in society due to demographic factors, such as culture, ethnicity, language, religion, sexual orientation, gender, or socio-economic status (Staton, Evans, & Lucey, 2012).

SOCIOECONOMIC STATUS (SES). A measure of social standing based on household income, education level, and occupation of the adult(s) in the home (Tourangeau, Lê, & Nord, 2005).

SYSTEMIC OPPRESSION. Differential treatment and systematic marginalization of groups and individuals based on characteristics including culture, gender, class, sexual identity, religion, and more (Burstow, 2003).

TRANSGENERATIONAL TRAUMA. Trauma that is passed down from one generation to another (Dass-Brailsford, 2007).

TRAUMA/TRAUMATIC EVENT/EXPERIENCE. An event that is perceived by an individual to be negative, uncontrollable, and sudden that can involve actual or threatened physical pain, injury or death or actual or threatened emotional pain (Carlson, 1997) in which the individual feels no sense of control (Carter, 2007).

TRAUMATIC STRESS. psychological stress that results from a negative event leading to arousal and avoidance of the associated stimuli that triggers experiencing that occurrence in which an individual feels no sense of control (4th ed., text rev.; DSM-IV-TR; American Psychiatric Association, 2000; Rothschild, 2000; Scaer, 2001).

CHAPTER 2
LITERATURE REVIEW

This study explores the relationship between early childhood mental health and development (Brooks-Gunn, Berlin, & Fuligni, 2000; Zeanah & Zeanah, 2009) and explores how this might impact children's academic achievement longitudinally. In the United States the diversity of cultures and linguistic groups continues to grow and it is unfortunate that academic underachievement and high dropout rates persists among certain groups of school children (Chu, 2011; Darney et al., 2013). National legislation has forced schools to be accountable for differences in sociodemographic factors in order to create equity in achievement outcomes. These sociodemographics include (a) race or ethnicity, (b) gender, as well as (c) socioeconomic status (Chatterji, 2006; Crumpton & Gregory, 2011; Moore, Henfield, & Owens, 2008). Failure to sufficiently address this concern has been, in part, due to researchers' lack of consideration for macro-systemic influences or lack of focus on early intervention. Most efforts of dealing with underachievement have been from a deficit orientation which selectively contributes to academic underachievement for students who are culturally diverse and/or from lower socioeconomic backgrounds (Ford et al., 2002; O'Connor & Fernandez, 2006; Robinson & Biran, 2006).

Relatively recently professional counselors and other mental health caregivers have begun to explore the effects of attachment experiences, as well as the prevalence of traumatic stress on early childhood normal development. This has stimulated a need for all service providers working with young children to be able to address these complex issues. Mental health professionals and educators who overlook a child's trauma or attachment history may exacerbate the situation by misconceptualizing children's symptoms as indicators of bad conduct or behavioral disorders (Goodman et al., 2012; Levine & Kline, 2007). This chapter discusses the literature relevant to the study of the following topics: (a) persistent academic underachievement

and sociodemographic factors (b) attachment and academic achievement, (c) traumatic stress, (d) traumatic stress and attachment in early childhood, and (e) traumatic stress and underachievement.

Persistent Academic Underachievement and Sociodemographic Factors

In the U.S. according to the National Assessment of Educational Progress (NAEP), known as the Nation's Report Card, overall fourth grade reading performance shows that only 34% of children were found to be at or above proficient in reading and 40% of children were found to be at or above proficient in mathematics (National Center for Education Statistics, 2011a; 2011b). Looking at differences in race/ethnicity show that the percentage of children of color below basic proficiency in reading (Black 51%, Latino/a 49%, and Native American 53%) are still below their White peers (21%) and the percentage of children of color below basic proficiency in mathematics (Black 48%, Latino/a 48%, and Native 44%) are still below their White peers (39%); however, the gap is closer than in the reading proficiencies. Gender differences persist in reading where females are performing higher than males, however, in mathematics, males were only 1 point higher on average than females. Finally, in both reading and mathematics proficiencies low income children are performing significantly lower than higher income children.

Educational research has portrayed a deficit orientation toward socioeconomic class and culturally diverse persons within the constraints of Western ideologies (Chilisa, 2012; King, 2005; Smith, 1999; West-Olatunji & Gibson, 2012). It has become an important discussion where closing the achievement gap is an ongoing goal of educators, counselors, parents, and politicians (Biles et al., 2012).

Race and Academic Achievement

Studies of educational inequality have revealed the existence of a persistent gap among African Americans, Latino/as, and Native American students (Crumpton & Gregory, 2011; Morris, 2008). Researchers continue to show that many of our teachers still have low expectations formed from inaccurate assumptions based on children's race, academic ability, and intelligence (Chu, 2011). Children seem to get classified as culturally impoverished because their families and communities do not instill values and experiences typical of White, middle class families and communities (Foster, Lewis, & Onafowora, 2003). When comparing students of color to White students, students of color show disproportionate poor performance on high-stakes tests, lower grades, higher school dropout rates, and do not show achievement levels that match with their academic ability (Moore, Ford, & Milner, 2005). Educational researchers discuss how the culture and organization of schools situates children of color as academically and behaviorally deficient and thus places them at risk for special education placement (O'Connor & Fernandez, 2006).The individuals most likely to be placed in special education are African American children, who are male and poor (Moore et al., 2008).

Gender and Academic Achievement

During the past decade, there has been an increasing gender achievement gap with male students lagging behind their female counterparts on a number of important indicators of school success (Clark, Flower, Walton, & Oakley, 2008). Gender and SES differences have been found to be significant for children's reading and mathematics achievement in the first and fifth grades (Chatterji, 2006; Dearing, McCartney, & Taylor, 2009). These studies focus on parenting practices as the way for remediation, this pejorative assumption that parenting style is to blame often results in families in poverty becoming victims to classism or racism when our communities promote strategies of parenting and caring for children that do not align with their

cultural logic of child rearing (Biles et al., 2012; Foss et al., 2011; Sue & Sue, 2013; West-Olatuji & Gibson, 2012). Several studies suggest that socio-political factors such as academic relevance (view that education will lead to better jobs), lack of male role models in schools, and cultural attitudes about gender expectations might contribute to these differences (Clark et al., 2008; Crumpton & Gregory, 2011). However, Morris (2008) provides support that there might be intersectionality with gender, race, and socioeconomic class. He suggests that boys may be more inclined to interests that involve physical and experiential activities.

Class and Academic Achievement

The intense lack of conversation around social class and educational achievement can be summed up by bell hooks's (2000) comment, "nowhere is there a more intense silence about the reality of class difference than in educational settings." Poor children and families often experience marginalization, disenfranchisement, and lack of access to tools that make educational achievement available (Staton, Evans, & Lucey, 2012; Sturm & Slaughter, 2012).The belief that poor people do not value education is far less accurate than the idea that poor people are often not valued in the educational process (Pressley & Sifford, 2012). In fact, researchers have found that it is nearly impossible to identify potentially high-achieving students who are living in poverty based on the current system of identifying students for gifted programs, due to limited access to enrichment programs, after-school activities, and being misidentified for special education (Biles et al., 2012).

Despite parents of color encouraging their children to develop educational goals, racism and poverty continue to create disparities, especially among African American, Latina/o, and Native American children; as well as some of the less known Asian Pacific Islanders, such as the Hmongs, Tongas, Cambodians, and Laotians (Sue, 2010). Native Americans perform well during the first four years of school, but by the end of fourth grade they begin significantly decreasing in

academic performance (Juntunen et al., 2001; Juntunen & Cline, 2010). A main theme in the results was that initial reading gaps in kindergarten tended to be more associated with children's poverty levels than with ethnicity or gender, although African American children showed significant gaps compared with White children even when other background characteristics were controlled (Chatterji, 2006). By fifth grade, poor children are as much as two times more likely to lack proficiency in mathematics and reading skills than children who are not poor (Dearing et al., 2009). Therefore, children living in poverty present a profound challenge to today's educators and counseling professionals as they are significantly more likely to report increased levels of anxiety, depression, greater incidences of behavioral difficulties, and a lower level of positive engagement in school (Amatea & West-Olatunji, 2007; Brennan, Shaw, Dishion, & Wilson, 2012). Without addressing these risks our low-achieving students face the proximal risks of disengagement, greater incidence of school failure, developmental difficulties and delays, low achievement, and the more distal and debilitating risks of grade retention, dropout, restricted job options, and low wages (Amatea & West-Olatunji, 2007; Crumpton & Gregory, 2011).

Most efforts of dealing with the above sociodemographic factors and underachievement have been from a deficit orientation. This selectively contributes to academic underachievement for students who are culturally diverse and/or from lower socioeconomic backgrounds (Ford et al., 2002). A better way to address these concerns may be through a focus on early intervention. Early intervention focuses on ecological factors that influence young children's growth and development. In particular, healthy attachment has been linked to wellness. With the expansion of applications of attachment theory being made beyond just infant-caregiver relationships, studies suggest that this theory has applications in students' school success (Bergin & Bergin, 2009; Metzger et al., 2010; Moss et al., 2011).

Attachment and Academic Achievement

The predictive validity of children's attachment behaviors and their interaction with academic achievement has been found to account for between 17% and 24% of the variance in the Iowa Test of Basic Skills (ITBS) scores in second through fourth grades (Pianta & Harbers, 1996). The connections between attachment, healthy development, and subsequent academic achievement (Bergin & Bergin, 2009; Cutrona et al., 1994; Pianta & Harbers, 1996), provide support that attachment behaviors are strongly related to school outcomes in preschool and elementary (Moss & St-Laurent, 2001; Pianta & Harbers, 1996).

Often, these developmental years involve rapid growth, expansion of skills, and a progression of social-emotional attachment experiences (Squires, 2012). Therefore, it is important to understand that in early childhood the course of development is non-linear and dynamic (Walker & Archibald, 2006), and requires counselors and educators to conceptualize children of diverse cultures across time rather than looking at fixed ages and stages (Peluso, Miranda, Firpo-Jimenez, & Pham, 2010; Siegel, 2003), as well as understanding that culture plays a particularly important role in the formation of attachment quality and how that attachment may be interpreted in relationship with young children's psychological development (Metzger et al., 2010). Attachment quality describes the mental health of young children based on the nature of the attachment relationship. For many young children attachments indicate healthy dependencies that encourage secure development involving interdependence as well as autonomy, and are related to survival in the form of a safe haven or secure base from which to explore both inner and outer worlds (Metzger et al., 2010; Zeanah & Smyke, 2009).

Attachment relationships for early childhood capture the balance of attachment and exploratory behavior as well as distinguish communication and defensive behaviors that underlie attachment (Solomon & George, 2008). Attachment research describes this development through

differential attachment behaviors, along a wellness spectrum, that includes secure and insecure attachment. This is further broken down into 4 styles, 1 secure and 3 insecure: (a) secure, (b) insecure-avoidant, (c) insecure-resistant, and (d) insecure-disorganized-disoriented (Bergin & Bergin, 2009; Delius et al., 2008). Secure attachments are considered the more well and insecure-disorganized-disoriented styles are the more risky to wellness (Solomon & George, 2011a).

Secure Attachments

The secure style is distinguished by a child's relaxed, warm, and positive nature where the child is able to engage in culturally appropriate reciprocal interaction or conversation involving some form of direct expression of feelings, desires, and the ability to negotiate conflict or disagreement (Solomon & George, 2008). This style is fostered by caregiver(s) encouragement, sensitivity, consistency, security, and responsive social-emotional interactions (Andreassen & West, 2007; Lounds, Borkowski, Whitman, Maxwell, & Weed, 2005).

Attachment theory provides a four phase process to organize the rapid changes that take place during secure early childhood development (Sheperis, Renfro-Michel, & Doggett, 2003; Tomlinson, Murray, & Cooper, 2010; Van Ijzendoorn & Sagi-Schwartz, 2008). The four phases of healthy children's development and changes in secure attachment are: Phase I (0 to 3 months) infants reflexively attach, seek out human connection, and respond to familiar smells, sights, and sounds (Lieberman & Van Horn, 2008); using these relationships to help regulate sleeping, feeding, discomfort, and activity (Zeanah & Zeanah, 2009). Phase II (3 to 6 months) infants begin orienting to familiar people, are emotionally expressive, and are attuned and responsive to others' emotional signals (Lieberman, 1993; Marvin & Britner, 2008; Rosenblum, Dayton, & Muzik, 2009; Zeanah & Smyke, 2009). Phase III (6 months on), infants become weary of strangers and actively seek proximity to familiar caregivers using them to learn socialization

behaviors that involve verbal and nonverbal signals (Gauvian & Parke, 2010; Rosenblum et al., 2009), such as displays of happiness, sadness, anger, or fear. Phase IV (from the second to third year on) begins the formation of complex verbal communications, progressively greater walking ability, increased abilities to negotiate with caregivers (Delius et al., 2008; Marvin & Britner, 2008), and a greater ability to coordinate behaviors in terms of the goals of others while responding to them empathically (Rosenblum et al., 2009).

Insecure Attachments

What distinguishes the insecure attachments is that to varying degrees the child loses confidence in the caregiving system to be responsive and available during times of distress and/or trauma (Kobak & Madsen, 2008; Perlman & Doyle, 2012). Avoidant attachment styles are distinguished by caregiver(s) who are unresponsive or diminish the importance of being responsive, are emotionally unavailable and have difficulty with closeness, and utilize parenting strategies that oversee children from afar or assign care to someone else (Bergin & Bergin, 2009; George & Solomon, 2008). This rejection or discouragement of the child's attachment behaviors creates a lack of confidence in caregiver(s) availability that can result in children seeming indifferent to the presence or absence of their caregiver, readily exploring while displaying detached and neutral responses to others, however these children do not avoid interaction altogether, rather the child does subtly minimize opportunities for interaction (Kobak & Madsen, 2008; Solomon & George, 2008).

Resistant attachment styles are characterized by caregiving practices that lead to close physical and emotional protection; however these caregivers tend to wait until children’s upsetness has escalated to high levels before soothing (Solomon & George, 2008). These parents endorse emphasizing positive aspects of the attachment relationship, while having difficulty with unhappiness or disappointment from the child. This resistance to distressing experiences results

in children lacking confidence in caregiver responsiveness causing them to maximize expressions of distress in order to elicit responses from caregivers (Kobak & Madsen, 2008). This often takes the form of exaggerated responses to problems and conflicts, resulting in ambivalent passive aggressive behavior where the child resists exploration and retaliates with temper tantrum like behaviors or becomes coy and tends to regress to more infantile behavior (Solomon & George, 2008). This can make the child difficult to soothe, and results in children who underregulate their emotions while easily feeling threatened, frustrated, anxious, and helpless (Bergin & Bergin, 2009).

Disorganized-disoriented attachment styles are distinguished by caregiving practices that can be hostile or confrontational, submissive or helpless, frightened or out of control, or disengaged with respect to the child, the caregiver(s) own emotions, and with the relationship (Hazen, Jacobvitz, Higgins, Allen, & Jin, 2011; Solomon & George, 2011a). These caregiver(s) have difficulty providing reassurance, and often passively place children at risk, while portraying themselves as helpless to manage or protect the child and can be flooded by powerful, negative feelings (Solomon & George, 2011b).

This attachment style is complex and has a wide variety of possible behaviors and responses that can take various forms of externalizing as well as internalizing behaviors in order to maintain a connection with the caregiver(s) and are conceptualized to be the child's attempt to adapt to the caregivers emotional needs (Hazen et al., 2011; Solomon & George, 2011a). These attempts at gaining caregivers attention are most distinguished by displays of confusion/disorientation, hostility, freezing responses that are followed by rejection or fear of the caregiver, or the child displays caregiving responses such as reassuring, pleasing or cheering up,

or being overly attentive (with hints of apprehension) (Hazen et al., 2011; Moss et al., 2011; Solomon & George, 2008; 2011a; 2011b).

Studies have documented links between attachment support and performance in academic achievement, thus caregiver(s) support can be anticipated to have a significant effect on children's academic performance (Cutrona et al., 1994). In particular the insecure attachment styles, tend to show difficulties self-regulating and processing social-emotional information in the classroom, have the poorest performance in schools, and display the greatest academic risk (Moss et al., 2011; Solomon & George, 2011a).

Attachment and Academic Underachievement

As they enter into schools, children who progress through the four phases of secure attachment behavior are more likely to develop better attitudes and skills with greater curiosity toward academic achievement (Bergin & Bergin, 2009). However, the less supportive attachment relationships, such as avoidant, resistant, and disorganized-disoriented attachment behaviors often lead to less academic success (Bergin & Bergin, 2009; Pianta & Harbers, 1996). In preschool and early school age, insecure attachment behaviors have been associated with disruptive behavior patterns that cause anxieties and fears around school performance (Moss et al., 2011).

There have been observed gender differences in how attachment stressors affect academic achievement as well. Boys and girls can develop different strategies for coping with attachment stressors, a trend that has been observed is that males are more likely to respond to attachment stressors with flight, fight, or freeze responses, and females are more likely to respond with tending (caretaking) and befriending behaviors (Hazen et al., 2011). This is impactful because the children whom teachers identify as being more disruptive and showing

greater underachievement academically, are those viewed as being externalizing (aggressive, whiny, rule breaking), and are more often boys (Hazen et al., 2011).

Insecure attachments, such as, avoidant, resistant, and disorganized-disoriented attachment behaviors tend to lead students to exhibit ADHD like symptoms, show less curiosity, be more dependent, exhibit impaired ability to control attention and memory, while having shorter attention spans, fear of failure, seek less help from teachers, and thus have less academic success (Bergin & Bergin, 2009; Moss & St-Laurent, 2001). One of the areas that have been shown to compromise children's healthy attachment has been traumatic stress. There are multiple factors that relate to the severity and impact of traumatic stress on young children. Additionally, some scholars have suggested that there are multiple layers of traumatic stress within families, due to societal factors (Moss et al., 2011).

Traumatic Stress

Mental health practices have been guided and greatly influenced by the American Psychiatric Association's, Diagnostic and Statistical Manual of Mental Disorders (4th ed., text rev.; DSM-IV-TR; American Psychiatric Association, 2000; Eriksen & Kress, 2006). According to the DSM-IV-TR, a traumatic event is defined as one in which the individual ''experienced, witnessed, or was confronted with an event or events that involved actual or threatened death or serious injury, or a threat to the physical integrity of others'' (4th ed., text rev.; DSM-IV-TR; American Psychiatric Association, 2000, p. 467). Exposure to a traumatic event is a necessary condition that precedes the later development of posttraumatic stress disorder (PTSD) (Friedman, Resick, Bryant, & Brewin, 2011). Additionally, in order to qualify for a diagnosis of PTSD, the DSM-IV-TR requires that individuals report experiencing dominant emotions of fear, helplessness, and horror during the trauma (Brunet, Akerib, & Birmes, 2007; Hathaway, Boals, & Banks, 2010). Followed by symptoms of reexperiencing, avoidance/numbing, and

hyperarousal that cause the person to exhibit clinically significant distress or functional impairment, but only after a one month period of time has elapsed (Friedman et al., 2011).

PTSD in young children is diagnosed using the same three criteria as adults: reexperiencing, avoidance, and hyperarousal (Perlman & Doyle, 2012; Zero to Three, 2005). Although PTSD has been widely reported in children and adolescents, the criteria was developed and tested from adult samples, where no one was younger than 15 years of age (Scheeringa, Zeanah, & Cohen, 2011), which raises concerns regarding its suitability and validity for children (De Young et al., 2011b). Research has indicated that the DSM–IV–TR PTSD criteria is not developmentally sensitive enough to adequately capture the symptoms experienced by early childhood children, particularly infants and preschoolers, and underestimates the number of children experiencing considerable posttraumatic distress and impairment (De Young et al., 2011a; Scheeringa et al., 2011).

The mental health profession has been advocating for an expanded conceptualization of trauma in order to addresses the limitations deep-rooted in the DSM's PTSD criteria (Bryant-Davis & Ocampo, 2005; Burstow, 2003; 2005). Empirical outcomes of individuals experiencing discrimination due to culture have shown that this oppression has harmful effects on both physical and mental health (Harrell, Hall & Taliaferro, 2003; Paradies, 2006; Williams, Mohammed, Leavell, & Collins, 2010; Williams, Neighbors & Jackson, 2003). Research has found that ecological factors, such as racism, harassment, and oppression, may result in traumatic stress (Carter et al., 2011). The DSM's PTSD criteria has developmental concerns, such as it does not take into consideration that for young children, traumatic effects can have immediate negative influences, however these effects are not always apparent immediately following the incidents that caused them and often can remain dormant, accumulating over years

or even decades (Levine, 1997). Some scholars who have evaluated the DSM suggest that it limits our understanding of trauma and minimizes the importance of individual perception (Rothschild, 2000) as well as ignores macro-systemic influences (Lopez et al., 2006; Ivey & Ivey, 1998). This creates important issues for children because the PTSD definition in the DSM criteria are not developmentally sensitive, they require that a traumatic event be identified and physically dangerous, and often excludes macrosystemic influences such as transgenerational influences, as well as experiences of oppression and discrimination (Burstow, 2003; Danieli, 1998; De Young et al., 2011a; Scheeringa et al., 2011; West-Olatunji & Conwill, 2011). Therefore, I propose to utilize traumatic stress theory as it takes into account ecological factors, does not require a known traumatic event, and does not put the older than one month time constraint for the assessment process. By using traumatic stress theory, we can more clearly conceptualize children's needs and formulate more expedient interventions that are grounded in young children’s own familial worldviews.

Traumatic Stress Theory

Traumatic stress theory identifies the effects of events on people that meet the following criteria: (a) perception that an event is negative, (b) the event is perceived to be sudden, (c) and there is a sense of lack of control over the event (Goodman & West-Olatunji, 2008b, 2010). When people perceive of an event as being negative, sudden, and uncontrollable, Carlson (1997) theorized that these type of events are tempered by five factors: (a) individual neurobiological factors, (b) developmental level at time of event, (c) severity of impact of the event(s), (d) the socio-political context of the person (pre and post trauma), and (e) the life events that have occurred before and after the traumatic event. A way that has been proposed to explore the five factor areas has been to use an ecosystemic perspective.

Ecosystemic perspective

An ecosystemic framework views people as integrated beings and feels that exploring child development requires a framework that observes and explores the norms, rules, and systems of our society (Bronfenbrenner,1986; Conyne & Cook, 2004). Counselors and educators need to be aware that children's experiences can be found within several systems such as, (a) the immediate family, preschool, and elementary school experiences, (b) that there are linkages between two or more settings, such as day care and family, (c) that even parent's workplace and extended family have influences, (d) that these experiences are situated in the customs, values, and laws of the surrounding culture as well as the family culture, and (e) the dimension of time and its effects on human development are significant (Cook, Conyne, Savaeau, & Tang, 2004; Dass-Brailsford, 2007). Professional counselors and educators who adopt an ecosystemic perspective assume that mental health issues are influenced by multiple intersecting factors, which include individual characteristics, family, school, community, and other contexts (Dass-Brailsford). Since all of these systems are influenced by the passage of time, we attempt to understand the ever-changing nature of children's contexts by looking at a snapshot of a child's development and looking to see if their experience of change is altered with time (Roysircar & Pignatiello, 2011).

Therefore, the ecosystemic model assumes that we are active participants in our development, that there is continual interaction, mutual influence, and constant change, as well that our prevention efforts must include other systems within the child's life (Chronister, McWhirter, & Kerewsky, 2004).This allows counselors to view young children, their challenges, and resiliencies in a relational and conditional frame of reference (Dollarhide, 2012; Lewis, 2012; Lim et al., 2010; Waller, 2001). The ecosystemic perspective allows for accounting for symptoms and difficulties in historical contexts, as well as accounting for current cultural,

political, and institutional issues that are impacting young children (Goldenberg & Goldenberg, 2008). By addressing these sociopolitical frameworks, counselors are able to conceptualize children, families, and communities in sociocultural contexts when working with culturally diverse families, thereby extending the system of care to incorporate more systemic influences, such as community support systems (Constantine, Myers, Kindaichi, & Moore, 2004; Foss et al., 2011; West-Olatunji et al., 2011) in developmentally and responsive ways.

Individual neurobiological factors

Two biological factors may influence responses to trauma in early childhood (Carlson, 1997). The first is a biological or genetic predisposition to vulnerability or resilience to trauma. In the first three years of life children's neurological growth is centered around nonverbal language signals, such as tone of voice, gestures, facial expressions of affect, perception of emotion, and regulation of these states are often dependent on brain responsiveness in the following areas: (a) relative internal and external safety, (b) support for exploration and acceptance of sensation, and (c) pendulation of expressing the internal and external emotions (Siegel, 2003; Levine, 2010). The second is biological change(s) that may occur in response to traumatic experiences (Carlson). This is often found in stressful events during early development, such as, neglect, physical and sexual abuse, failure of the attachment bond, and traumatic incidents (hospitalization, death of parents, car accidents, etc.) (Rothschild, 2000; Levine). These experiences can cause brain development to be reduced or its activity to become suppressed, limiting children's ability to mediate stress (Masten & Narayan, 2012). This especially happens in the hippocampus, the area of the brain that is involved in emotion and memory organization (Goodman et al., 2012).

Developmental level at time of event

The effects of the developmental level of the child at the time of trauma are complex and are often equated with age; suggesting that age at the time of trauma is expected to be negatively related to severity of symptoms (Carlson, 1997). Studies are now showing that prenatal infants, newborns, and very young children are the most at risk to stress and trauma due to their undeveloped nervous, motor, and perceptual systems (Levine & Kline, 2007). More importantly, current ecosystemic models of child development provide evidence suggesting that neurobiological vulnerability factors may actually be indicators of sensitivity in response to experience, which could be bad in an adverse environment but good in a favorable one; raising the possibility that children who respond poorly to traumatic experiences may also respond well to positive changes in context provided by interventions (Levine & Kline; Masten & Narayan, 2012).

Severity of impact of the event

The intensity, nature, and duration of the trauma can affect symptoms, but it is often the children's perceptions of the controllability and negativity that predicts the impact an event has (Blaustein & Kinniburgh, 2012; Carlson, 1997). Traumas that are more intense are thought to be more likely to provoke overwhelming fear and helplessness which often enhances the perception of negative impact due to the discomfort children have with the sensations and emotions evoked by fearful and out of control situations (Levine & Kline, 2007; Levine, 2010). The severity of symptoms can be made worse if adults do not consider nor move towards attunement with the child's sensations and emotions (reactions); where attunement is the capacity to accurately read children's cues and respond appropriately (behaviorally, cognitively, emotionally, and physiologically) (Blaustein & Kinniburgh; Johnson, 1997).

Socio-political context of the person (pre and post trauma)

Children's social context directly shapes their neural architecture, as interpersonal relationships shape the way genes, personality, and behavior are expressed (Siegel, 2012). The family can be a common source of warmth and safety, but it can also be a source of direct threats to children's health and development; including physical, emotional, and sexual abuse or failing to provide basic needs (neglect) (Seccombe, 2002; Turner et al., 2012; Werner, 2000).

The socioeconomic environment that a child is situated in can influence the rate of traumatic stress. It has been shown that trauma is significantly higher among lower socioeconomic status (SES) children, further suggesting that low SES families experience trauma at a higher rate or have fewer resources with which to relieve the effects of trauma (Goodman et al., 2012). Further, studies show that traumatic stress theory should include the complex ways in which gender, race, ethnicity, and socioeconomic status (SES) combines to affect patterns of disproportionate distribution of mental health issues and disease (Burstow, 2003; 2005; Davis et al., 2011; Cholewa & West-Olatunji, 2008; Howell & McFeeters, 2008; Knitzer & Perry, 2009; Liu & Estrada-Hernández, 2010; West-Olatuji & Gibson, 2012; Williams et al., 2010). In particular, African Americans, Latina/os, Asian Americans, and Native Americans, as marginalized people of color, experience systemic oppression as a form of traumatic stress (Carter & Forsyth, 2009; Harrell et al., 2003; Paradies, 2006; Williams et al., 2003). As well, trauma's impact has been transmitted across generations throughout history, rendering time an important dimension in trauma assessment, particularly to determine if there are long-term intergenerational experiences that affect the family and succeeding generations (Danieli, 1998; 2007).

Life events that have occurred before and after the traumatic event

Prior events that make a trauma seem more controllable and less negative would have a moderating effect, while prior events that make a trauma seem less controllable and more negative would have a sensitizing effect (Carlson, 1997). Likewise, having to cope with negative life experiences after traumatic events, such as living in poverty, single parent households, family instability, stressful work experiences, and living in dangerous community environments would be expected to impair children's recovery from trauma (Amatea & West-Olatunji, 2007; Carlson; Werner & Smith, 1982; West-Olatunji, Sanders, Mehta, & Behar-Horenstein, 2010). It is also important in traumatic stress theory to explore what the individual, family, and community protective factors are that contribute to children's positive adjustment lessening the effects of traumatic stress (West-Olatunji et al., 2010). Findings support a need for an ecosystemic framework when looking at survivors of trauma, especially in areas of vulnerability and resilience, in that it becomes necessary to trace a history of multiple traumata along the time dimension at different stages of development and assessing the transgenerational implications (Danieli, 1998; 2007).

Transgenerational Traumatic Stress

Transgenerational trauma takes an ecosystemic perspective as it explores the impact of trauma, its transmissions, and repeated patterns of behavior, symptoms, roles, and values as adopted by children, their family members, and communities through the generations (Danieli, 1998; Solomon & George, 2011b; West-Olatunji & Conwill, 2011). This transgenerational traumatic stress refers to thoughts, feelings, behaviors, and disrupted conceptualizations or traumatic beliefs and attachment patterns that are passed down from one generation to another (Danieli, 2007; Dass-Brailsford, 2007; Solomon & George). In many cases these parents would normally be sensitive and responsive, however, when in the presence of traumatic experiences

these parents can alarm infants and young children with repeated exhibitions of frightened, dissociative, or overprotective behavior (Hesse, Main, Abrams, & Rifkin, 2003; Schwerdtfeger & Goff, 2007). When looking at internalizing and externalizing behaviors in early childhood, such as unusual levels of aggression, frightened, dissociative, or threatening play in in the presence of otherwise sensitive parenting, it becomes necessary to explore transgenerational histories for traumatic stress (Blaustein & Kinniburgh, 2010; Hesse et al.). Transgenerational trauma are complex and often have at least four components: (a) a parent(s)/caregiver(s) expressions of trauma, (b) the young child's relationship to this trauma, (c) the nature and extent of the conspiracy of silence surrounding the trauma and its aftermath, and (d) the parents' posttrauma adaptational styles (Danieli, 2007).

The conspiracy of silence has been described by children and survivors of trauma as the lack of consideration and experience of neglect, misjudgment, or avoidance of their experience by others, which prevents them from testifying these experiences, thus leading to a fragmented sense of self, amplified feelings, loneliness, isolation, and mistrust (Danieli, 1984, 1998; Fivush, 2010; Henderson & Thompson, 2011; McKinney, 2007). Mental health professionals have pathologized, overgeneralized, and/or stigmatized children of survivors' and their parent(s)/caregiver(s) of the Holocaust, World War II, Vietnam war, Japanese Amerian's internment during World War II, African American holocaust, and collective trauma and systemic oppression experienced by indigenous Native peoples (Danieli, 2007; Dekel & Goldblatt, 2008; Frazier, Goodman, St. Juste, & West-Olatunji, 2009; Goodman & West-Olatunji, 2008a; West-Olatunji & Conwill, 2011).

Violent historical events, discrimination, and intersecting oppressions experienced by prior generations can potentially affect the lives of future generations in the form of unresolved

grief and ongoing trauma (Dass-Brailsford, 2007; Goodman & West-Olatunji, 2008b). Historical racism and modern-day oppression contribute to the pervasive mistrust many peoples of color feel toward the criminal justice system, educational institutions, and other government agencies, which are often viewed with suspicion and cynicism (Dass-Brailsford, 2007; McCubbin & McCubbin, 2005).Within this context, the conspiracy of silence can be used as a defense for trying to prevent total collapse and breakout of intrusive traumatic memories and emotions (Danieli, 2007). However, it often inhibits meaningful dialogue that allows children, their family's, society's, community's, and nation's to integrate trauma into a resilient experience (Danieli, 1998; Goodman & West-Olatunji, 2008a).

Many infants, young children, and school-age children develop disorganized/disoriented attachments as a result of unresolved losses, traumas, and discord within the family that can lead to increased vulnerability to traumatic stress (Hesse et al., 2003; Moss et al., 2011; Solomon & George, 2011b). Parents posttrauma adaptational styles that become inflexible survival strategies tend to render young children, families, and communities vulnerable to further trauma (Danieli, 1998). This trauma affects children's and adult's relationship with time orientation often leading to disorganized experiences of past, present, and future; thus disrupting the totality of one's lifeline: birth, developmental stages, transitions, changes, and death (Danieli, 2007).

Overtime, these effects of silence and inflexibility may become transgenerational thus affecting succeeding generations (Danieli, 2009). The resulting emotional and behavioral effects of transgenerational traumatic stress include high rates of depression, anger, anxiety, hypervigilance, low self-esteem, suicidal ideation and behavior, substance abuse, violence, loss of language, cultural identity, and traditions (Dass-Brailsford, 2007; Duran, Duran, Yellow Horse Brave Heart, & Yellow Horse-Davis, 1998; Felsen, 1998; Raphael, Swan, & Martinek,

1998; Simons & Johnson, 1998). It is important to remember that these infants, toddlers, and preschoolers operate in the present even when they have become carriers of transgenerational trauma (Lieberman &Van Horn, 2008), therefore their temporal perspectives encompass past, present, and future; making historical traumas hold present meaning (Verbos, Gladstone, & Kennedy, 2011).To be healing and even self-actualizing, the articulation and integration of traumatic experiences must be examined from an ecosystemic perspective (Danieli, 2007; McKinney, 2007).

Systemic Oppression and Hegemony

Race, in the United States historically captures not cultural practices and beliefs but societally imposed stigmatizations and marginalization (Williams et al., 2010). These stigmatizations and marginalizations adversely affect health in complex ways in which race, ethnicity, and socioeconomic status (SES) combine to reflect systemic oppression, exploitation, and social inequality (Williams et al.). This translates into race being defined as a social construction in which people are grouped and ranked based on their skin color, language, and physical features (Carter et al., 2011). Whether purposeful or unintentional these dehumanizing acts have led to people of color being reduced to things (Freire, 1970/2000).

These limiting acts of systemic oppression and educational hegemony have been conceptualized as sources of traumatic stress symptoms and potential sources of transgenerational trauma, thereby providing greater understanding of the mechanisms of trauma (Bryant-Davis & Ocampo 2005; Buhin & Vera, 2009; Carter, 2007; Carter & Forsyth, 2009; Carter et al., 2011; Lowe, Okubo, & Reilly, 2012; Turner & Pope, 2009; Sue et al., 2007; Sue & Sue, 2013). In the US, African Americans (West-Olatunji & Conwell, 2011), Latina/os (Guzmán & Carrasco, 2011), Asian Americans (Kim, 2011), Native Americans (Garrett & Portman, 2011), and Arab Americans (Nassar-McMillan, 2011) have been shown to experience disproportionate

amounts of harmful mental and physical health effects due to oppressive experiences (Harrell et al., 2003; Paradies, 2006; Williams et al., 2003).These systemic oppressions are dehumanizing and degrading, however, they are most often experienced as racial microaggressions (Choudhuri, Santiago-Rivera, & Garrett, 2012; Freire, 1970/2000).

Racial Microaggressions have been defined as brief and commonplace daily verbal, behavioral, or environmental indignities, whether intentional or unintentional, that communicate hostile, derogatory, or negative racial slights and insults toward people of color (Sue et al., 2007; Sue, 2010). These microaggressions are often delivered environmentally through the physical surroundings of target groups, where they are made to feel unwelcome, isolated, unsafe, and alienated (Sue & Sue, 2013).

Carter (2007) organized racist events to describe the events in terms of Carlson's (1997) traumatic stress theory criteria needing to be perceived as negative, sudden, and uncontrollable. A qualitative study by Lowe et al. (2012) supported this by asking participants to reflect on racist events, which triggered many to experience strong negative emotions and racism-based traumatic stress. The responses from these participants resulted in symptoms that can be correlated with traumatic stress responses such as hypervigilance, reexperinecing of racist events, physiological arousal, avoidance, memory loss, detachment, estrangement from others, restricted affect, depression, increased aggression, and flashbacks. These authors also found that the participants were further traumatized when attempting to confide in someone about the racist experience where this resulted in their experiences being met by resistance, denial, blame, and minimization; leading the victim to enhance the behaviors of social withdrawal, mistrust of others, lowered self-efficacy, and feelings of powerlessness (Lowe et al.).

Therefore, research shows that one's ability to trust, develop and maintain close relationships, achieve in school, perform at work, and function as a parent can all be impacted by racism-related stressors (Choudhuri et al., 2012). Advocates of traumatic stress theory articulate an association between traumatic stress and systemic oppression, as evidenced in socially marginalized students' disengagement during the education process, acting-out behaviors (internalizing and externalizing) that result in disproportionate special education referrals, depression, and their low levels of self-mastery within schools (West-Olatunji & Conwill, 2011; Carter, 2007). These traumatic stress experiences place children on a trajectory of low education, low job prospects, and low income that often leads to the aggregation of other stressors (Williams et al., 2010). In the presence of high levels of traumatic stress during early childhood, marginalized children's biological processes are negatively affected, there is increased risk of disease, and increased emotional and behavioral disturbances (Williams et al.). Many children from these socially marginalized groups realize that they will likely encounter racially/ethnic based educational discrimination in the future (Buhin & Vera, 2009). Therefore, it is likely that when combined with a lack of economic and social advantages this may lead them to believe that their efforts in school are futile and that academic pursuits will have relatively little payoff (Buhin & Vera).

Scholars believe that prevention of racism is a social justice issue considering the pervasively detrimental effects of racism on all members of our society and especially traumatizing effects for people of color (Buhin & Vera, 2009; Sue & Sue, 2013). Without taking some form of action for our early childhood children of color, studies show this will likely lead to continued wide experiences of transgenerational trauma (Turner & Pope, 2009; West-Olatunji & Conwill, 2011). Alternately, professionals can utilize solutions to presenting problems

grounded in developmentally and culturally-centered approaches in order to aid people of color in enhancing adaptive and positive outcomes from traumatic experiences due to systemic oppression (racism, classism, homophobia, and sexism), while reducing the symptoms of traumatic stress such as anxiety, fear, and depression (Carter et al., 2011; Goodman & West-Olatunji, 2008a; West-Olatunji & Conwill, 2011; Wolfgang, West-Olatunji, Frazier, & Barrett, 2012; Wynn & West-Olatunji, 2008).

Traumatic Stress and Attachment in Early Childhood

Each year more than four million children in the United States are exposed to a traumatic event (Levine & Kline, 2007). This is particularly alarming, because prenatal infants, newborns, and very young children are the most severely affected by stress and trauma due to their undeveloped nervous, motor, and perceptual systems (McCubbin & McCubbin, 2005; Levine & Kline). It is paramount to dispel the figment where many adults presuppose that infants, toddlers, and young children (ages 0 to 8) are the most resilient, rather this stage of development is when they are most vulnerable to the effects of trauma (Blaustein & Kinniburgh, 2010). It becomes important than to assess children looking at both traumatic stress and attachment disturbances (Lieberman, 2004).

An issue that causes young children to be overlooked in assessing for traumatic stress and attachment difficulty is that most mental health professionals still approach children as if they were miniature adults, using scaled-down versions of adult assessment techniques or adult models of normal/abnormal behavior and attempting to extrapolate these upon young children (Straus, 1999; Vernon & Clemente, 2005). There is also a greater need for emphasis on cultural differences in order to avoid clinician, teacher, or day care provider biases; secondarily, this will also assist in culturally sensitive prevention practices, conceptualization, interpretation, and implementation of treatment (Paniagua, 2001; Sue & Sue, 2013).

Effects of Traumatic Stress

The neurological responses that accompany traumatic stress responses in young children include increased levels of adrenaline (activation of sympathetic nervous system), decreased levels of cortisol and serotonin (reduced ability to moderate sympathetic nervous system), and increased levels of endogenous opioids (resulting in pain reduction, emotional blunting, and memory impairment) (Johnson, 1997). This can lead to an entangled experience of acting out and expressing distress in the form not being able to organize material into beginning, middle, and end (Johnson). This often leads to children remembering things out of context from their experiences, having difficulty with emotional acclimation (limbic brain) due to the activation of fight, flight, or freezing responses; and children can have difficulty with transitions and reengaging in relationships (Johnson; Johanson, 2006; Wilkerson et al., 2008).

According to traumatic stress theory, experiences that can overwhelm the four phases of secure attachment described above are separated into five categories: (a) accidents and falls, (b) medical and surgical procedures, (c) violent acts and attacks, (d) grief and loss, and (e) environmental stressors, such as transgenerational trauma (Carlson, 1997; Levine & Kline, 2007). The attachment system is highly responsive to indications of danger; however, when infants, toddlers, and young children experience events that are perceived as negative, sudden, and out of control (Carlson, 1997; Goodman & West-Olatunji, 2008b; Siegel, 2012), the attachment system can be interrupted (Lieberman, 2004). When infants, toddlers, and young children experience traumatic stress, they look to their familiar caregiver(s) for referencing; however, when severe stresses depletes the caregiver(s) resources they can become neglectful or show signs of chronic danger. This alters the young child's perceptual system and they can have difficulty understanding the cues for safety versus risk (Lieberman; Lieberman & Van Horn, 2008). When these types of interruptions occur infants, toddlers, and young children will show

various signs of hyper/hypo arousal, avoidance, or re-experiencing through verbal and nonverbal behaviors (Bailey, Moran, & Pederson, 2007; De Young et al., 2011a, 2011b; Mongillo, Briggs-Gowan, Ford, & Carter, 2009).

Hyper/hypo Arousal

When infants, toddlers, and young children become overwhelmed, they may exhibit fluctuations of hypo- to hyperarousal; displaying frantic distress reactions such as wailing, gasping, and flailing about or expressing emotional numbing such as excessive sleeping, dazed expression, or averting their eye gaze (Frazier e al., 2009; Levine & Kline, 2007; Lieberman &Van Horn, 2008). They can also display inconsolable crying, shallow breathing, vomiting or spitting, arching the back, biting, and pushing away (Levine & Kline; Montirosso, Borgattie, & Tronick, 2010), particularly during feeding and sleeping times (Casanueva et al., 2010). Toddlers and young children can also show arousal by being overly silly, having trouble adjusting to changes, having trouble calming down when upset, being easily bothered by loud noises or bright lights, and have trouble falling asleep or staying asleep, experience recurring nightmares, loss of appetite, vomiting, diarrhea, experience recurrent and intrusive memories, a decline in pre-school and kindergarten performance, learning problems, and difficulties with time and sequencing (Dass-Brailsford, 2007; De Young et al., 2011a, 2011b; Johnson, 1997; Levine, 1997; Modrowski et al., 2013).

Avoidance

Avoidance in infants can take the form of sleeping more than usual, withdrawal from family members and friends by displaying less affection, consistently looking away, or avoiding facial contact (De Young et al., 2011a, 2011b; Klein, Devoe, Miranda-Julian, & Linas, 2009). In older toddlers and young children it can become fear of being separated from caregiver(s), crying

and refusal to follow directions, disorientation, and extreme sadness (Bogat, Levendosky, von Eye, & Davidson, 2011; De Young et al.).

Re-experiencing

Re-experiencing or recollection symptoms in infants do not always appear distressing, thus are harder to detect, and often coincide with experiences, behaviors, and sounds that occurred during the distressing event (Graf, Schiestl, & Landolt, 2011). It can often coincide with avoidance and arousal where distress is shown during sleep, play, or feeding times (Klein et al., 2009). In toddlers and young children it becomes clearer that play or drawings are rigid, repetitive, and reenacting anxious qualities of the traumatic experiences, young children verbalize repeated questions around the event, can be seen to space out, and are able to clarify that they are having a nightmare (De Young et al., 2011a, 2011b; Modrowski et al., 2013; Mongillo et al., 2009).

According to extant research, children who experience traumatic stress inducing events often exhibit the expected symptoms of re-experiencing, avoidance, and arousal (De Young et al., 2011a, 2011b; Klein et al., 2009; Modrowski et al., 2013). However, internalizing behaviors and externalizing behaviors can be common outcomes of traumatic stress (Briggs-Gowan et al., 2010) and are important to include in our assessments when identifying traumatic stress.

Traumatic Stress and Underachievement

This section discusses traumatic stress and its effects on academic achievement, it attempts to summarize the above literature and connects the traumatic experiences children can have with insecure attachments, transgenerational trauma, systemic oppression, as well as the many traumatic events that can cause young children to perceive things as negative, sudden, and out of control, thus affecting their academic achievement. Bergin and Bergin (2009) and Moss and St-Laurent (2001) have shown that insecure attachments can be disruptive as children

express their externalizing behaviors such as, exhibiting ADHD like symptoms, displaying less curiosity, being more dependent on teachers for direction, displaying more aggression, and exhibiting impaired ability to control attention and memory. They also described the internalizing behaviors as causing issues when these children show fears of failure, seek less help from teachers, and display frightened and dissociative behavior during class. Thus, studies show that considerable cognitive and attentional resources are necessary to cope with caregiver(s) who induce fear or feelings of abandonment or threat in children which results in the above behaviors and considerably restricts the mental resources available for learning and exploration as a result of the trauma (Moss et al., 2011).

When looking at the resulting emotional and behavioral effects of transgenerational traumatic stress, these have been shown to include high rates of depression, anger, anxiety, hypervigilance, low self-esteem, suicidal ideation and behavior, substance abuse, violence, loss of language, loss of cultural identity, and loss of cultural traditions (Dass-Brailsford, 2007; Duran et al., 1998; Felsen, 1998; Raphael et al., 1998; Simons & Johnson, 1998). This trauma is complex due to possible intersectionality with other ecosystemic stressors (Morris, 2008). The affects include the above internalizing and externalizing behaviors with added difficulties around time orientation often leading to disorganized experiences (Danieli, 2007), this is especially detrimental in the classroom (Johnson, 1997).

The associations between traumatic stress and systemic oppression, have been shown to have very significant negative outcomes as socially marginalized students disengage during the education process, due to difficulties trusting and maintaining close relationships, and displaying acting-out behaviors (internalizing and externalizing), which lead to disproportionate poor performance, low levels of self-mastery, high dropout rates, and difficulties showing

achievement levels that match with their academic ability (Carter, 2007; Choudhuri et al., 2012; Moore et al., 2005; West-Olatunji & Conwill, 2011). The importance of these trends is that many times teachers are the first to notice trauma symptoms as they manifest in the classroom and on the playground. However, these often get interpreted through a deficit lens leading to misdiagnoses of anxiety, ADHD, depression, and/or conduct disorders (Levine & Kline, 2007).

Interventions for Traumatic Stress With Early Childhood

It is important for counselors to consider developmental capabilities, growth-fostering relationships, transformative acts of love, and cultural empathy when assessing, conceptualizing, and designing age appropriate interventions for infants, toddlers, and young children (Ahmed, Wilson, Henriksen, & Jones, 2011; Comstock et al., 2008; Duran, Firehammer, & Gonzalez, 2008; Seto, Young, Becker, & Kiselica, 2006; Vernon & Clemente, 2005). By conceptualizing the relevant cultural variables, counselors can make more accurate and comprehensive assessments and provide more effective treatments (Crethar, Torres Rivera, & Nash, 2008). This comprehensive approach to cultural and sociopolitical variables is a part of the social justice dialogue of professional counselors.

By incorporating these culturally and developmentally sensitive ecosystemic perspectives the healing of trauma can become a natural process that accesses children's cultural ways of experiencing their bodies, emotions, and thoughts; thereby engaging and balancing the instinctual inner awareness of their body and its health (Levine, 1997; Sapolsky, 2004). Addressing the possible underresponding or overresponding behaviors (Johnson, 1997) requires counselors, teachers, and parents to be aware that traumatic effects are not always apparent immediately following the incidents that caused them and often can remain dormant, accumulating over years or even decades (Levine).

Counselors, educators, and care providers can adjust their basic skills to better work with young children by focusing on three specific areas: (a) setting up a safe and warm environment, (b) establish trust by displaying trust through culturally sensitive gestures, tone of voice, facial expressions, and (c) nurture a non-judgmental understanding of young clients while focusing on exploration, empowerment, and acceptance (Erdman & Lampe, 1996). By engaging in these three practices the care giving professional should be able to help young children (ages 0 to 8) work through a variety of social, emotional, behavioral, and learning challenges (Henderson & Thompson, 2011).

Counselors, educators, and care providers can bring warmth and vitality back to children's experiences by employing mutually relational sociodramatic play experiences (McDevitt & Ormrod, 2010) that create mediated learning so young children can develop the ability to self-define, contextualize, and transform their reality into healthy developmental journeys (Wolfgang et al., 2012). This gentle, non-threating, re-balancing of the energy that was interrupted when the trauma occurred can create restorative opportunities (Levine, 1997).

In summary, underachievement is still an issue of concern for all children in reading and mathematics, but particularly for children of color, male children in reading, and for lower income children in general (National Center for Education Statistics, 2011a; 2011b). Educational research has portrayed a deficit orientation toward socioeconomic class and culturally diverse persons (Chilisa, 2012; King, 2005; Smith, 1999; West-Olatunji & Gibson, 2012) and informs our continued discussions around closing the achievement gap (Biles et al., 2012). Studies show that more support needs to be provided to young children in the area of early intervention that is supportive of culturally sensitive socio-emotional development (Rubin, 1998).

In working with early childhood school aged children the literature suggests that attachment theory might provide enhanced insight into how children engage their teachers during academic exercises. The connections between attachment, children's development, and subsequent academic achievement (Bergin & Bergin, 2009; Cutrona et al., 1994; Pianta & Harbers, 1996), provides support that attachment behaviors are strongly related to school outcomes in preschool and elementary (Moss & St-Laurent, 2001; Pianta & Harbers).

Insecure attachments, such as avoidant, resistant, and disorganized-disoriented attachment tend to lead students to have less academic success (Bergin & Bergin; Moss & St-Laurent). Academic underachievement might be influenced by a compromise in children's healthy attachment. This literature suggests that there might be a relationship between traumatic stress and insecure attachment (Moss et al., 2011). While there have been some significant studies that inform our understanding of the role of traumatic stress in the persistent underachievement of some groups of school children, attachment theory helps to better explain this phenomenon and may prove useful in developing solutions at an early stage in children's schooling experiences.

Early childhood development requires conceptualization to be from an ecosystemic frame so that children's cultural contexts, attachment qualities within these contexts (Metzger et al., 2010), and the extended timeframes can be understood (Peluso et al., 2010; Siegel, 2003). Traumatic stress theory identifies the effects of traumatic events on people as being perceived as negative, sudden, and uncontrollable (Carlson, 1997; Goodman & West-Olatunji, 2008b, 2010). These traumatic events can be unknown due to transgenerational influences (Blaustein & Kinniburgh, 2010; Hesse et al., 2003), the impact of racism-related stressors (Choudhuri et al., 2012), and the extent to which the child is exhibiting reexperiencing, arousal, avoidance,

internalizing behaviors, and externalizing behaviors (Bailey et al., 2007; De Young et al., 2011a, 2011b; Mongillo et al., 2009).

By incorporating these culturally and developmentally sensitive ecosystemic perspectives the healing of trauma can become a natural process (Levine, 1997; Sapolsky, 2004). Counselors, educators, and care providers can adjust their basic skills to better work with young children and the care giving professional should be able to help young children (ages 0 to 8) work through a variety of social, emotional, behavioral, and learning challenges (Erdman & Lampe, 1996; Henderson & Thompson, 2011). Professional counselors therefore can assist educators and care providers in applying these skills and knowledge within early childhood centers, elementary schools, pre-K classrooms, and community mental health agencies.

CHAPTER 3
METHODOLOGY

This study explored the issues of academic underachievement and their relationship with early childhood mental health and development (Brooks-Gunn, Berlin, & Fuligni, 2000; Zeanah & Zeanah, 2009). The relationship between traumatic stress symptoms and difficult attachment symptoms in respect to academic achievement among early childhood school aged children was explored. This study proposed to examine the following five research questions: (1) What is the relationship between the growth trajectory of reading and math achievement and traumatic stress symptoms for children in kindergarten through fifth grade?, (2) What is the relationship between the growth trajectory of reading and math achievement and difficult attachment symptoms for children in kindergarten through fifth grade?, (3) What is the relationship between the growth trajectory of reading and math achievement and traumatic stress symptoms and difficult attachment symptoms for children in kindergarten through fifth grade?, (4) What is the relationship between the growth trajectory of reading and math achievement and traumatic stress symptoms and difficult attachment symptoms for children in kindergarten through fifth grade, while controlling for gender, culture, and socioeconomic status? and finally, (5) What is the relationship of an interaction effect between traumatic stress symptoms and difficult attachment symptoms on the growth trajectory of reading and math achievement for children in kindergarten through fifth grade, while controlling for gender, culture, and socioeconomic status?

The purpose of this chapter is to provide an overview of how the methodology was chosen for examining the above relationships and the proposed ways of using them to examine the US Department of Education's Early Childhood Longitudinal Study, Kindergarten (ECLS-K) post hoc data set. This chapter will cover the development of the model, the setting of the post

hoc data set, the participants, variables, instrumentation, data collection, and proposed data analysis.

Research Constructs and Theoretical Assumptions

This study and its research questions were shaped by my experiences working with young children as a professional counseling intern and through the collaboration and discussions in the Pediatric Counseling Research Group formed at the University of Florida. This team of researchers gathers to discuss, assist, and develop new areas within counseling research. The construct of traumatic stress evolved from the theory development, research, and discussions from Dr. West-Olatunji and Dr. Goodman. Their assumptions and theoretical constructs were used for this study and are a continuation of Dr. Goodman's (2009) dissertation work. Goodman has published many articles in the area of traumatic stress and continues to publish on the constructs surrounding traumatic stress and academic achievement (Frazier et al., 2009; Goodman, 2009; Goodman et al., 2012; Goodman & West-Olatunji, 2008a, 2008b, 2010). Her work took items designed to measures the levels of stress and distress in children and created the latent factor for traumatic stress. This construct was based on common symptoms of traumatic stress among children, as well as the premise that some children with indicators high for traumatic stress may have lower academic achievements (4th ed., text rev.; DSM-IV-TR; American Psychiatric Association, 2000; R. D. Goodman, personal communication, March 7, 2013; Zero to Three, 2005).

My areas of study have centered on early childhood development and attachment. This has been my contribution to the research group's discussion, exploring how the addition of attachment relationships affects traumatic stress and academic achievement. As was informed through the literature review, a longitudinal design was important in order to understand the effects on early childhood development and academic achievement. This literature review

suggested that attachment is important in young children's development. I hypothesized that attachment behaviors might be an important aspect of the relationship between traumatic stress and academic achievement. Therefore, I included indicators that the literature suggested might make up the latent variable difficult attachment symptoms, in order to explore this relationship.

Setting

This study used data extracted from the ECLS-K, which was characterized by a dual-frame multistage complex stratified cluster sampling design that included a series of design weights in order to provide acceptable estimates about minority and poor children which were oversampled (Dawson & Williams, 2008; DiPerna, Lei, & Reid, 2007; Jyoti, Frongillo, & Jones, 2005; Ready, LoGerfo, Burkam, & Lee, 2005; Tourangeau, Lê, & Nord, 2005). In the baseline year, this nationally representative and longitudinal study of 21,409 children who entered kindergarten are situated within a primary sampling unit made up of four identified geographic areas, the second-stage units were randomly sampled from 934 public schools and 346 private schools within these geographic counties, and the third-stage units were the students, 24 kindergarteners within each public school and 12 within each private school (Carlson et al., 2008; Dawson & Williams; Tourangeau et al.; Tourangeau, Nord, Lê, Pollack, & Atkins-Burnett, 2006). The ECLS-K base data was collected during the 1998–1999 academic school year and continued until the children's eighth grade 2007 academic school year over the following intervals: fall and the spring of kindergarten (1998-99), fall and spring of 1st grade (1999-2000), spring of 3rd grade (2002), spring of 5th grade (2004), and spring of 8th grade (2007) (National Center for Education Statistics [NCES], 2001).

Participants

The target sample of this longitudinal study included the children, their parent(s)/guardian(s), and teachers from the ECLS-K data collection base year respondents

(kindergarten, Fall 1998), all of whom were followed to their fifth grade year (Spring 2004). Therefore, the repeated measures will include the direct cognitive assessments for reading and mathematics data for children in the kindergarten year through 5th grade.

The complex stratified cluster sampling design was addressed using the software program M*plus* v.6.12 (Muthén & Muthén, 2010). The estimation method utilized for all models was the robust maximum likelihood (MLR) method of estimation, which provided Satorra-Bentler corrected standard errors and test statistics (Jackman, Leite, & Cochrane, 2011). The MLR method also has the ability to obtain unbiased parameter estimates using the stratification (C16FPSTR=regional strata), cluster (C16FPPSU=the county primary sampling unit), and weights (C1_6FP0=sampling weight) information made available in the ECLS-K data set. This method used Taylor series design based methods in order to adjust the data allowing for corrected-standard errors (DiPerna et al., 2007).

Because some of the files in this data set included cases that have exclusions all the way through, they would not have K–5 longitudinal weights. For example, exclusions will include base-year respondents who did not participate in spring of first grade, spring of third grade, and/or spring of fifth grade. Other exclusions from the total sample are based on the following circumstances: (a) if the children died or moved out of the country, (b) if the children moved during the study, and (c) children for whom there are neither first grade, third-grade, nor fifth-grade data. These exclusions caused participants to not have any K–5 longitudinal weights and therefore were not included in the final data that was extracted (Tourangeau et al., 2006).

The children selected in this study were chosen for various criteria, such as (a) they participated in various measures on their abilities and skills around academic achievement in reading and mathematics, (b) exhibited behaviors as reported by parent(s)/guardian(s) and/or

teachers based on evaluations from a number of social-emotional dimensions that might suggest they potentially could be experiencing symptoms of traumatic stress at entry into the kindergarten year (Fall & Spring, 1998-1999), and (c) the parent(s)/guardian(s) provided perceptions of their own behaviors and/or reported perceptions about the child based on evaluations of the social-emotional relationship of the child and the parent(s)/guardian(s) which may provide symptoms of potential difficult attachment relationships at entry into the kindergarten year (Spring, 1999).

Therefore, this was a longitudinal study of the relationship of children's reading and academic progress during the kindergarten and early elementary school years and its relationship to the child's symptoms of traumatic stress and the parent(s)/guardian(s) perception of symptoms of difficult attachment relationships at school entry into kindergarten (Tourangeau et al., 2006).

Researcher Subjectivity

The purpose of this researcher subjectivity statement in a quantitative study is based on an emancipatory methodological position. In an emancipatory research framework the researcher is explicit in describing their own subjectivity and in operationalizing the values and beliefs that underpin how the researcher conceptualizes and interprets the data in the analyses (West-Olatunji et al., 2012, May). This is done to make the researchers cultural, historical, and contemporary experiences known so that their complexities, power relations, and life experiences can be contextualized within the findings (Ponterotto, 2005; Rose & Glass, 2008; Tillman, 2002, 2006). This is important to make explicit as it informs how decisions were made in sampling, theory, and methodology.

As a European American male who has lived and worked with multicultural populations from around the world, I see our theories and methodologies as being culturally situated; the meanings and assumptions rely heavily on our values and beliefs. Having had lived experiences

with marginalizing early childhood events of complex traumatic stress, both these lived experiences and my professional training shape my choice in theory, methodology, how I conceptualize, and the questions that I bring to this study.

As a professional counselor I work from an ecosystemic perspective, addressing client needs from a developmental, culturally sensitive, strength-based, and preventive fashion. I make a conscious effort to be aware of my biases and attempt to ground my personal perspective and professional practice in empirically supported models of practice so that my contributions to clinical work and the research conversation are supported by best practices within the profession of multicultural counseling with early childhood populations.

Operational Definition of Variables

The variables I used for this study included: (a) the latent variable traumatic stress symptoms, (b) the latent variable difficult attachment symptoms, (c) the direct cognitive assessments for reading and mathematics academic achievement, (d) gender, (e) gender of parent/guardian present during in person at home assessments, (f) culture/ethnicity, and (g) socioeconomic status (Marsh et al., 2009).

The latent variable traumatic stress included a confirmatory factor analysis model that constitutes the observed composite variables: (a) attention qualities of children (P1ATTENI) from the Fall parent questionnaire, and the following from the Spring of kindergarten Teacher Social Rating Scale (SRS) data: (b) self-control (T2CONTRO), (c) interpersonal skills (T2INTERP), (d) externalizing behaviors (T2EXTERN), and (e) internalizing behaviors (T2INTERN). The latent variable traumatic stress symptoms, was determined to be present through identification of the following symptoms of traumatic stress: (a) reexperiencing, (b) avoidance, (c) arousal, (d) externalizing, and (e) internalizing behaviors. Re-experiencing was indicated by the variable Self-control, indicating whether the child’s ability to control behavior is

observed sometimes to never. The avoidance measure was indicated by the variable Interpersonal Skills, which looks at whether the child's skills in forming and maintaining friendships, comforting other children, expressing feelings and opinions in positive ways, and showing sensitivity is observed sometimes to never. Arousal was indicated by attention qualities of children (P1ATTENI). Attention measures whether a child's ability to pay attention is perceived to be less well than other children. Externalizing behaviors involved observing very often to often acting out behaviors such as arguing, fighting, getting angry, acting impulsive, and disturbing activities. Internalizing behaviors involved observing very often to often anxiety, loneliness, low self-esteem, and sadness.

The latent variable attachment difficulties, includes a confirmatory factor analysis model that includes the following ordinal categorical observed variables from the Spring kindergarten parent data: (a) by the end of a long day, hard to be warm and loving toward child (P2HRDWRM), (b) child does things that bother me (P2CHDOES), (b) feel trapped as a parent (P2FLTRAP), (c) often feel angry with child (P2FEELAN), and (d) child is harder to care for (P2CHHARD). These variables are used to approximate the attachment relationship between parent and child.

The repeated measures reading and mathematics academic achievement included five measures of student's performance on these direct cognitive assessments. Therefore reading academic achievement time variables included assessments from: (1) Fall 1998 kindergarten (C1R4RSCL), (2) Spring 1999 kindergarten (C2R4RSCL), (3) Spring 2001 first grade (C4R4RSCL), (5) Spring 2002 third grade (C5R4RSCL), and (6) Spring 2004 fifth grade (C6R4RSCL). Mathematics academic achievement time variables included assessments from: (1) Fall 1998 kindergarten (C1R4MSCL), (2) Spring 1999 kindergarten (C2R4MSCL), (3)

Spring 2001 first grade (C4R4MSCL), (5) Spring 2002 third grade (C5R4MSCL), and (6) Spring 2004 fifth grade (C6R4MSCL).

The variable gender was dummy coded indicating male (0) or female (1). The variable responding parent/guardian's gender was dummy coded indicating male (0) or female (1). The variable ethnicity was dummy coded into four variables so that White will be the reference group (0), while Asian, Black, Latino/a, and Other People of Color will make up the four variables. The variable socioeconomic status is a continuous composite measure of parent's occupation, education level, and household income.

This study theorized that the time-variant dependent variables reading and mathematics academic achievement might have been impacted by the time-invariant covariates (TICs) traumatic stress symptoms and difficult attachment symptoms. The TICs gender, parent/guardian's gender, culture, and SES were included to measure reading and mathematics academic achievements relationship with the sociodemographic factors as well as controlling for unknown variables that impact the possible relationship between academic achievement and traumatic stress symptoms and difficult attachment symptoms.

Instrumentation

This study used direct cognitive assessments, interviews with parents, and teacher questionnaires. Socioeconomic status (SES) was calculated by the NCES through a composite of parent responses to the following questions: father/male guardian's education; mother/female guardian's education; father/male guardian's occupation; mother/female guardian's occupation; and household income (Tourangeau et al., 2006).The direct cognitive assessment battery covered three content areas, but only reading and mathematics was constantly measured longitudinally from kindergarten to fifth grade. The questions for the cognitive assessments were developed by consulting with experts in the field of education to ensure that they developmentally reflected

content areas and content validity (Pollack, Atkins-Burnett, Najarian & Rock, 2005; Tourangeau et al., 2006). The questions that passed screening for construct validity evidence and sensitivity, were then field tested, allowing the creation of the cognitive assessments provided in either number-right scores or raw score count (Item Response Theory (IRT) scale scores or standardized scores [T-scores]). In this study, I used the IRT scale scores, which have reliabilities for the reading and mathematics of .93 and .94, respectively (Tourangeau et al., 2006). The direct child assessments also provided the information on the student's gender and culture.

There were four composite continuous variables from the Spring of kindergarten Teacher Social Rating Scale (SRS) data that were used for the traumatic stress symptoms variable. They included: (a) T2CONTRO, (b) T2INTERP, (c) T2EXTERN, and (d) T2INTERN. Teacher's rated the frequency with the child exhibited the social skill or behavior on the following scale: (1) never, (2) sometimes, (3) often, or (4) very often. The scale for T2CONTRO and T2INTERP were reverse scored so that when regressed on reading and mathematics achievement their factor loadings and traumatic stress symptoms factor coefficients would be more inline and interpretable with scores of children weak in these areas.

The parent interview consisted of approximately 330 questions and covered topics such as child health, parent and family characteristics, child care, and school experiences. For the purpose of this study, I used P1ATTENI from the Child Health and Wellbeing questionnaire for the traumatic stress latent variable. This question asks parents to rate how the child pays attention in comparison to other children his or her age. The parent had the following response choices: "better than other children his/her age," "as well as other children," slightly less well than other children," or "much less well than other children." The last two categories were parceled into

one category “slightly less well/ much less well than other children”. This resulted in three aggregated ordinal categories for P1ATTENI: (1) better than other children, (2) as well as other children, and (3) slightly less well/much less well than other children.

I initially selected eleven variables from the Parent Interview Questionnaire that were used as indicators for the difficult attachment symptoms latent variable during the exploratory factor analysis (EFA). Five of these come from the Discipline, Warmth, and Emotional Supportiveness questionnaire (DWQ). These were chosen based on the literature and from a personal communication by email with Dr. Gail Mulligan, the project officer for the Early Childhood Longitudinal Studies National Center for Education Statistics (Mulligan, personal communication, October, 15 2012). She stated that there were no direct measures of attachment included in the ECLS-K, however there are questions located in the Discipline, Warmth, and Emotional Supportiveness questionnaire (DWQ) section of the Spring kindergarten parent interview questionnaire that are related to the parent/child relationship and that these have been of interest to attachment researchers. The five included the following: P2HRDWRM, P2CHDOES, P2FLTRAP, P2FEELAN, and P2CHHARD).

These five questions asked the parent to rate the following: (a) at the end of a long day, did parent/guardian find it hard to be warm and loving toward child (P2HRDWRM), (b) if the child does things that really bothers the parent/guardian (P2CHDOES), (c) parent/guardian feels trapped by their responsibilities as a parent (P2FLTRAP), (d) parent/guardian often feels angry with the child (P2FEELAN), and (e) child seems harder to care for than most (P2CHHARD). The parent had the following choices for these five questions: “completely true,” “mostly true,” “somewhat true,” or “not at all true.” Completely true and mostly true were parceled into one category, thus creating three ordinal categories.

Four indicators were taken from the CFQ: Critical Family Processes questionaire (P2ARGCHD, P2ARGAFF, P2ARGHEA, P2HITCHR) and two indicators were taken from the PPQ: Parent Psychological Well-being and Health questionnaire (P2DEPRES and P2FEARFL). The four indicators from the CFQ asked the parent to rate the following: (a) do you and your partner have arguments about the child (P2ARGCHD), (b) do you and your partner ague about showing love and affection (P2ARGAFF), (c) when you have a serious disagreement with your partner do you argue heatedly or shout at each other (P2ARGHEA), (d) when you have a serious disagreement with your partner how often do you end up hitting or throwing things at each other (P2HITCHR). The parent had the following choices for these four questions: "often," "sometimes," "hardly ever," or "never." Thus, (P2ARGCHD, P2ARGAFF, P2ARGHEA, P2HITCHR) had 4 ordinal categories each.

The two indicators from the PPQ asked the parent to rate the following: (a) how often during the past week have you felt depressed (P2DEPRES), and (b) how often in past week have you felt fearful (P2FEARFL). The parent had the following choices for these two questions: "most of the time", "a moderate amount of time", "some of the time", "never". Thus, (P2DEPRES and P2FEARFL) had 4 ordinal categories each.

In order to obtain validation of the parent interviews, 10% of each assessor's cases were called for a follow-up phone interview lasting approximately 5 minutes. Of those re-interviewed, 94% reported the same answers as in the original interview (Tourangeau et al., 2006). Providing a relative sense that parents were answering the questions with consistency.

The teacher assessments were taken from the Teacher Social Rating Scale (SRS) which was an adaptation, used with permission, of the Social Skills Rating Scale: Elementary Scale A (SSRS) by Gresham and Elliott (Tourangeau et al., 2006). From the SRS, the Self-Control scale,

Interpersonal Skills scale, Externalizing Problem Behaviors, and Internalizing Problem Behaviors scale had split-half reliabilities of .80, 0.89, .90, and .78 respectively (U. S. Department of Education (NCES), 2006).

Data Analysis

Informed by the Pediatric Counseling Research group's prior work with the ECLS-K data set around these proposed variables and personal communications with R. D. Goodman (Goodman, 2009, personal communication, March 7, 2013; Goodman et al., 2012), and the literature review from chapter two, I used a latent growth curve model (LGCM) with five repeated measures and nine TICs (Duncan, Duncan, & Strycker, 2009). I utilized M*plus*'s v.6.12's (Muthén & Muthén, 2010) ability to model continuous, ordinal, and dichotomous items when analyzing latent variable multi-level longitudinal data where subjects are followed over time with repeated measures of each variable of interest. This data analyses used a methodological-substantive process that explored relationships using exploratory factor analyses (EFA; Marsh et al., 2009), declared these relationships with confirmatory factor analyses (CFA; Asparouhov & Muthén, 2009), and analyzed the causal nature of these relationships using structural equation modeling (SEM) so that it could be applied to the LGCM (Bollen & Curren, 2006; Marsh et al., 2009). This analysis was conducted systematically, looking at the LGCM from simple structures to more complex structures, allowing the trends in the analysis to be seen in a step-wise manner so that misspecifications can be determined from the simplest model.

In this study, model estimation used full information maximum likelihood (FIML), as this approach handles both missing completely at random (MCAR) and missing at random (MAR) data, and is utilized by default in M*plus* (Muthén & Muthén, 2010). FIML uses all the information of the observed data and maximizes the likelihood of the model given the observed data (Wang & Wang, 2012).

There were several robust estimators available in M*plus* for dealing with nonnormality, I used the MLR estimator (Muthén & Muthén, 2010). According to Muthén and Muthén (2009, March 23), MLR provides maximum likelihood parameter estimates using a sandwich estimator that allows for robust χ^2 test statistic and standard errors. Since this study is using a complex survey data set, I ran the TYPE=COMPLEX estimator, which allows MLR to be robust to non-normality and non-independence of observations. The MLR χ^2 statistic is asymptotically equivalent to the Yuan-Bentler T_2^* test statistic, which does not make a specific distributional assumption (Muthén & Muthén, 2009, March 23; Yuan & Bentler, 2000).

Specification of Measurement Model

The first step began with the specification of the two linear LGCM measurement models, one for reading achievement and the second for mathematics achievement. The goal was to determine if these two models fit adequately (Figure 3-1 and Figure 3-2) (Hoyle, 1995; Kaplan, 2009; Kline, 2011). Adequacy of fit has predominantly focused on assessments of goodness of fit (GOF) using the χ^2 GOF test statistic and the likelihood ratio difference test (LRT) (Leite & Stapleton, 2011). However, because this study used the MLR estimator the LRT was calculated by using procedures suggested by Bryant and Satorra (2012).

Adequacy of fit. The adequacy of fit was determined using the following GOF indices: (a) the comparative fit index (CFI), (b) the Tucker-Lewis Index (TLI), (c) the standardized root mean residual (SRMR), and (d) the root mean squared error of approximation (RMSEA) (Grimm & Ram, 2009; Kline, 2011; Leite & Stapleton, 2011; Marsh et al., 2009; Wu & West, 2010). The recommended level of acceptance for CFI & TLI was anything greater than .95, SRMR was anything less than 0.09, while RMSEA was anything less than 0.06 (Jackson, Gillaspy, & Purc-Stephenson, 2009). Due to some models needing numerical integration the AIC and BIC will be

used to determine adequacy of fit, because the χ^2 and regular fit indices (CFI, TLI, SRMR, and RMSEA) are not able to be estimated (Grimm & Ram, 2009; 2011; Grimm, Ram, & Hamagami, 2011).

However, Leite and Stapleton (2011) found that CFI, TLI, and SRMR are affected by growth shape, while SRMR was shown to be affected by sample size and performed worse as the sample size increased. RMSEA was found to be the best of the above at distinguishing misspecifications of growth shape in LGCM, and so the RMSEA is of most importance in the measurement model for the linear growth curve model. The traditional structural equation modeling (SEM) programs have been shown to use the wrong baseline model for the CFI and TLI, therefore these were corrected using procedures described by Wu and West (2010).

If either/both models were found to have inadequate fit to the growth trends of the data, as was anticipated, due to missing data or possible nonlinear trends in the data that might be potential causes to convergence issues, the model was modified using the following methods: (1) modification indices, (2) nonlinear trajectories using nonlinear freed-loading LGCM (Bollen & Curren, 2006), (3) nonlinear modeling in the form of orthogonal polynomial functions estimating quadratic and cubic trends (Kelley & Maxwell, 2008; Kim, Cicchetti, Rogosch, & Manly, 2009; Mayer, Steyer, & Mueller, 2012; Shin, Davison, Long, Chan, & Heistad, 2013; Wang & Wang, 2012), and finally (4) moving to a hierarchical multivariate linear model (HMLM; Raudenbush, Brennan, & Barnett, 1995; Raudenbush & Byrk, 2002; Thum, 1997; Usami, 2009).

Modification indexes. The modification indexes used estimated the amount the overall model χ^2 statistic that would decrease if a particular fixed-to-zero parameter were to be freely estimated and the greater the value of a modification index the better the predicted improvement in overall fit (Kline, 2011). The modification indexes that make theoretical sense and were

predicted to make a substantive change to the models were added one at a time. The additional parameters that were added were chosen based on the literature review and attempted through respecifications to improve the model's adequacy of fit.

In this study the linear LGCM proved inadequate, I attempted a non-linear freed-loading model. The freed-loading model consisted of fixing the first loading on the slope factor to 0, the second loading to 1, and freely estimating the remaining three loadings from the data (DiPerna et al., 2007). The freed-loading model gives flexibility in fitting non-linear forms and is less demanding than the more involved use of polynomial trajectories (Figure 3-3 and Figure 3-4) (Bollen & Curren, 2006). In this way, the model was allowed to let the data inform the growth curve trajectory.

These two LGCMs for reading and mathematics achievement required the utilization of general orthogonal polynomial functions for unequal time intervals; this was in order to fix the loadings to specific a priori values that are not correlated (Hedeker & Gibbons, 2006). Orthogonal polynomials were used in order to allow the model to estimate possible nonlinear quadratic and cubic trends in the trajectories without the typical multicollinearity issues (Kelley & Maxwell, 2008; Kim et al., 2009; Mayer et al., 2012; Shin et al., 2013; Wang & Wang, 2012). Table 3-1 provides the unequal time intervals and the subsequent orthogonal polynomials that were used for these models; these orthogonal polynomials were created with the R statistical software v. 3.0.1 using the contr.poly command.

The advantage of the nonlinear quadratic (change in the rate of change over time in the linear growth) and cubic growth (change in the change in the rate of change over time in the linear growth) is it offers more complex explanations within the linear trend (Bollen & Curren, 2006; Muthén & Muthén, 2010). The other advantage to orthogonal polynomial curves are as

follows: (a) they allow for more accurate estimates of developmental curves, (b) can be estimated for unequal time intervals, and (c) allow for a possible saturated model to be estimated if needed (Hox, 2010; Snijders & Bosker, 2012).

Final measurement model. The final model used in this study combined the use of the general orthogonal polynomial model with the use of the hierarchical multivariate linear model (HMLM), which was developed for multilevel hierarchical linear modeling (HLM) by Raudenbush and Bryk (2002). Multilevel and SEM approaches have been seen as practical implementations of the same growth curve approach, differing on data structure and model approach, however, identical models can be constructed using both approaches (Grimm & Ram, 2012). M*plus* is able to estimate an HMLM model by (a) setting the variances of all trend latent variables (intercept, slope, and higher level polynomials) equal to zero, and (b) allowing the residuals for all observed reading and mathematics achievement variables to correlate (Raudenbush & Bryk). The HMLM had an unrestricted covariance matrix (Raudenbush et al., 1995; Raudenbush & Byrk; Thum, 1997; Usami, 2009), in the sense that the variances and covariances were no longer a within-person covariance; rather, it captured all variation and covariation among the five repeated observations regardless of missing data. This addressed the convergence issues and biases in the estimates due to the missing data (Raudenbush, Bryk, Cheong, Congdon, & du Toit, 2011).

HMLM models have the ability to be tailored to handle a variety of covariance structures (Hox, 2010; Raudenbush et al., 1995; Raudenbush & Byrk, 2002; Thum, 1997; Usami, 2009) and they were developed as a way of estimating multivariate normal models from incomplete data (Raudenbush & Byrk). By capturing all variation and covariation among repeated

observations regardless of missing data, the HMLM addressed the convergence issues and biases in the estimates due to missing data (Figure 3-5 and Figure 3-6) (Raudenbush et al., 2011).

Confirmatory Factor Analyses

The process of developing the confirmatory factor analysis for the two TIC latent variables was different. For traumatic stress symptoms, it followed the traditional latent variable measurement specification that is based on prior developed theory and previous research that used logit and multiple regression analyses (Asparouhov & Muthén, 2009; Goodman, 2009; Goodman et al., 2012; R. D. Goodman, personal communication, March 7, 2013). The indicators for traumatic stress symptoms were adapted for a structural equation model analysis utilizing measurement model confirmatory practices (CFA; Appleyard, Yang, & Runyan, 2010).

The latent variable difficult attachment symptoms, however, had not been developed in previous work. Therefore, this proxy variable was developed through exploratory techniques that utilized usual SEM based standard errors and overall tests of model fit (Asparouhov & Muthén, 2009). This data analyses used a methodological-substantive process that explores relationships using exploratory factor analyses (EFA), declaring these relationships with confirmatory factor analyses (CFA), and analyzing the causal nature of these relationships using structural equation modeling (SEM) so that it could be applied to the LGCM (Bollen & Curren, 2006; Marsh et al., 2009).

Development of the Proxy Latent Variable

The latent variable difficult attachment symptoms was estimated using M*plus* v.6.12. This involved a series of EFA's that used an oblique geomin rotation and constrained the EFA models to extract 1 to 4 factors from the eleven selected indicators that were covered in the instrumentation section (Muthén & Muthén, 2010). This provided insight into which items were: (a) most adequately loading, (b) providing conceptual clarity, (c) interpretable, and (d)

theoretical salience with the hypothesized factors (Kline, 2011). The goal was to have an adequate number of indicators and for these to load on only the difficult attachment symptoms latent factor. The items of importance loaded greater than .40 on the relevant factor and less than .40 on the other possible factors (Ang, 2005). I discarded those that were loading less than .40 and the model was reconstructed using the high loading indicators.

Measurement Confirmatory Factor Analyses

The next step utilized measurement model confirmatory factor analyses (CFA; Appleyard et al., 2010) to provide evidence that these two latent factors had adequacy of fit (Hoyle, 1995; Kaplan, 2009; Kline, 2011). Due to the presence of categorical indicators, the CFA models were run with the indicators specified as continuous in order to get a reference AIC & BIC, as well as the chi-square (χ^2) test statistic, loglikelihood ratio test (LRT), CFI, TLI, SRMR, and RMSEA to provide an idea of the models fit (Kline). I then compared those AIC & BIC to an estimation run with the indicators specified as ordinal categorical, so that a logit model (which does not provide a fit test or fit indices) would run. Again the modification indexes were consulted as well as looking at the reliability of the indicators (Leite & Zuo, 2011).

Structural Model of LGCM

The next stage of the analysis involved developing the structural model for the latent growth curve. This included a repeated measure of reading and mathematics achievement nested within individuals as the level one dependent variable. The level two variables were the following time-invariant covariates (TICs) or co-varying independent variables that do not change over time (Wang & Wang, 2012): (a) the latent variable traumatic stress symptoms, (b) the latent variable difficult attachment symptoms, (c) gender, (d) gender of parent/guardian present during assessments (interviewee gender), (e) culture/ethnicity, and (f) socioeconomic status.

The structural model was a HMLM cubic orthogonal polynomial LGCM which was used to answer the first four research questions. Therefore, four different structural models were implemented and each of these four models included an estimate for reading achievement and an estimate for mathematics achievement (Figure 3-5 and Figure 3-6).

The Interaction

In order to look at the interactions between the latent variables traumatic stress and difficult attachment symptoms, I utilized M*plus*'s latent moderated structural equation (LMS) approach for the interaction modeling (Dimitruk, Schermelleh-Engel, Kelava, & Moosbrugger, 2007; Kelava & Brandt, 2009; Klein & Schermelleh-Engel, 2010). The LMS method was especially developed for the analysis of nonlinear structural equation models, such as when exploring interaction effects of latent variables, which explicitly take heteroskedasticity into account and do not require the formation of product variables (Kelava et al., 2011; Klein & Moosbrugger, 2000; Marsh et al., 2004; Dimitruk et al., 2007). Simulation studies have shown that LMS provides consistent, asymptotically unbiased, asymptotically efficient, and asymptotically normally distributed estimates which help the analysis to not be affected by problems resulting from low reliability of latent interactions (Dimitruk et al.).

LMS was established by Schermelleh-Engel, Klein, and Moosbrugger (1998) and Klein and Moosbrugger (2000) to better solve the non-normality problems experienced by latent interaction effects, as these effects are not distributed normally even when indicators of first-order factors are normally distributed (Marsh, Wen, & Hau, 2006). LMS was derived under the assumption of multivariate normality based on the concepts of mixture and conditional distributions, allowing the observed non-normal distributions to be partitioned into aggregates of normal distributions while holding one or more other variables constant, each at a particular value (Cham, West, Ma, & Aiken, 2012; Jackman et al., 2011; Kelava et al., 2011). This allows

for asymptotically correct standard errors for nonlinear effects by applying the expectation maximization (EM) algorithm which results in maximum likelihood (ML) parameter estimates (Jackman et al., 2011; Lyhagen, 2007). This is important for applied researchers using inferential statistics, as having biased estimated standard errors can critically affect modeling performance around significance testing (Dimitruk et al, 2007).

SEM often incorporates linear relationships among latent variables and uses the model chi-square and GOF indices in order to compare the fitted covariance matrix of a target model to an unstructured covariance matrix to assess global and adequacy of fit, however, when nonlinear terms are included (polynomial functions and interaction terms) this becomes problematic (Klein & Schermelleh-Engel, 2010). The problem is that these models are not nested within the saturated model that is represented by the unstructured covariance matrix, thus not allowing the use of the χ^2 GOF test nor any of the GOF indices as these tests require specification of a saturated model (Kelava et al., 2011; Little, Bovaird, & Widaman, 2006). The restrictions on the mean and covariance structures therefore, only allow for comparisons of nonnested models using the Akaike Information Criteria (AIC) and Bayesian Information Criteria (BIC); when using the AIC and BIC indexes smaller values indicate better models both in terms of model fit and model parsimony (Kelava et al.; Little et al.).

Final Structural Model.

The final structural model for the fifth research question used a HMLM cubic orthogonal latent growth curve model with nine TICs and an interaction between traumatic stress symptoms and difficult attachment symptoms using the LMS method. This included an estimate for reading achievement and an estimate for mathematics achievement (Figure 3-7 and Figure 3-8).

Table 3-1. Orthogonal polynomial coefficients for unequal time points 0, 4, 16, 40, 64 months.

Trend	Time 1	Time 2	Time 3	Time 4	Time 5
Intercept	0.4472136	0.4472136	0.4472136	0.4472136	0.4472136
Linear	-0.4610972	-0.3867267	-0.1636151	0.2826080	0.7288310
Quadratic	0.4149989	0.1496717	-0.4305151	-0.6198129	0.4856573
Cubic	-0.4128476	0.1300984	0.6735047	-0.5713284	0.1805729

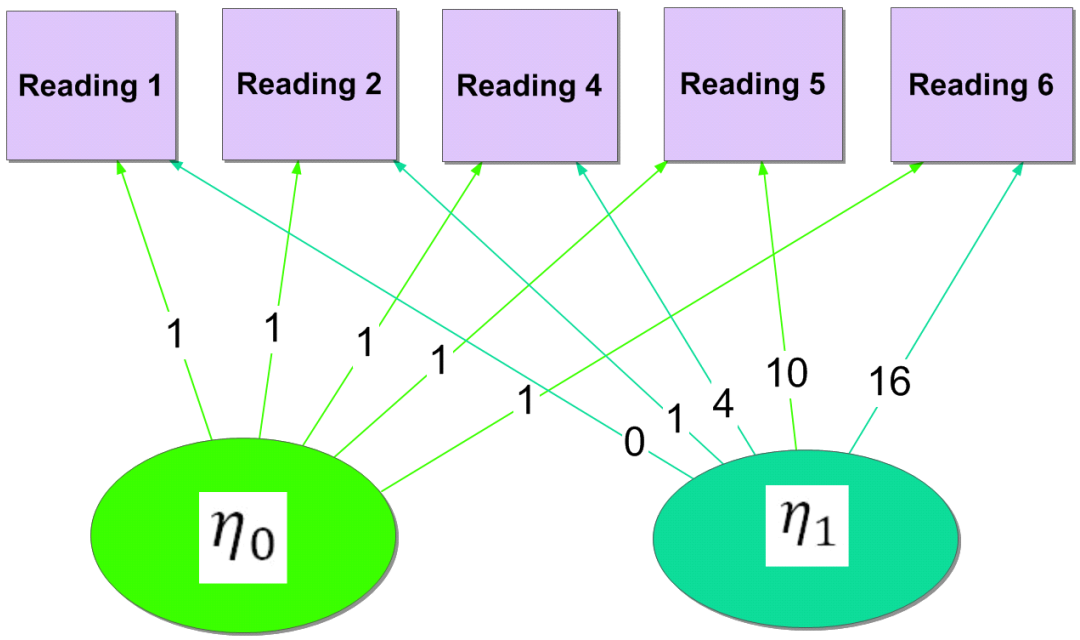

Figure 3-1. Linear latent growth curve measurement model of reading achievement.

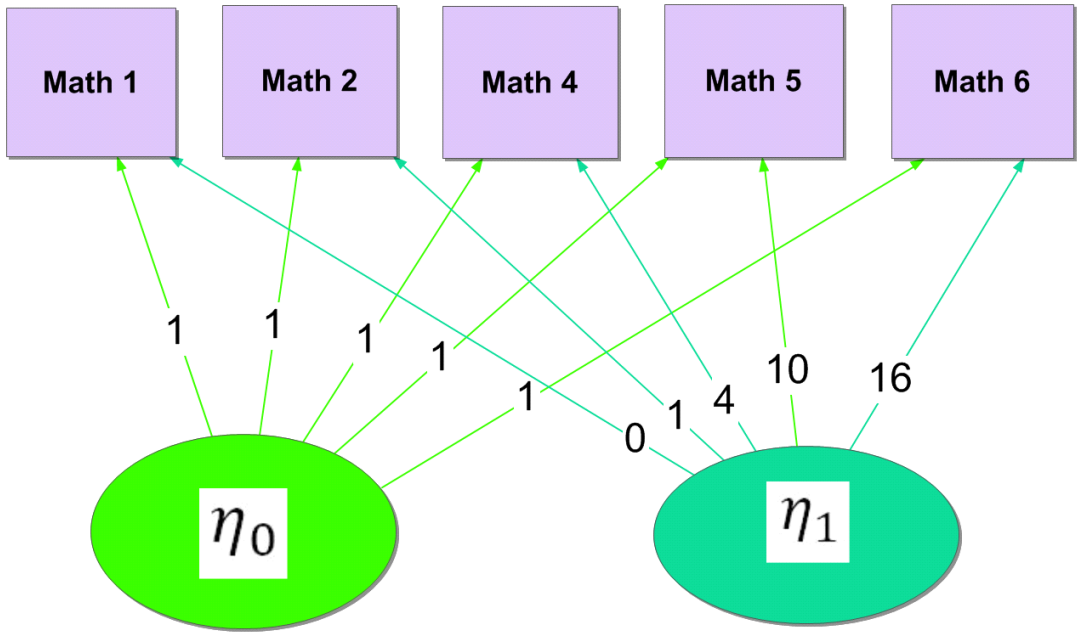

Figure 3-2. Linear latent growth curve measurement model of mathematics achievement.

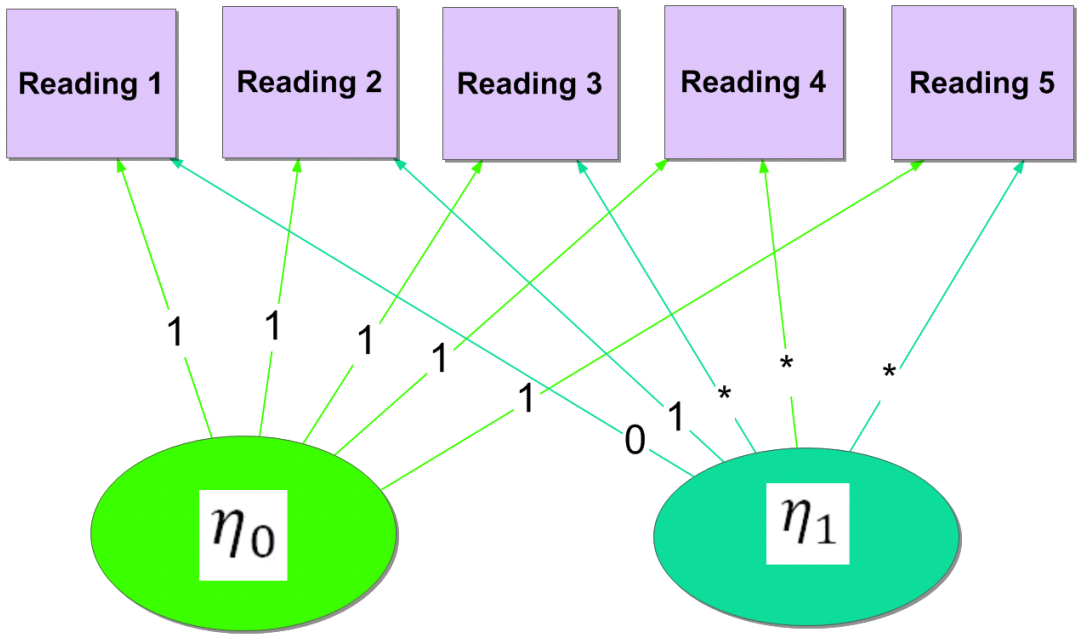

Figure 3-3. Freed-loading latent growth curve measurement model for reading achievement.

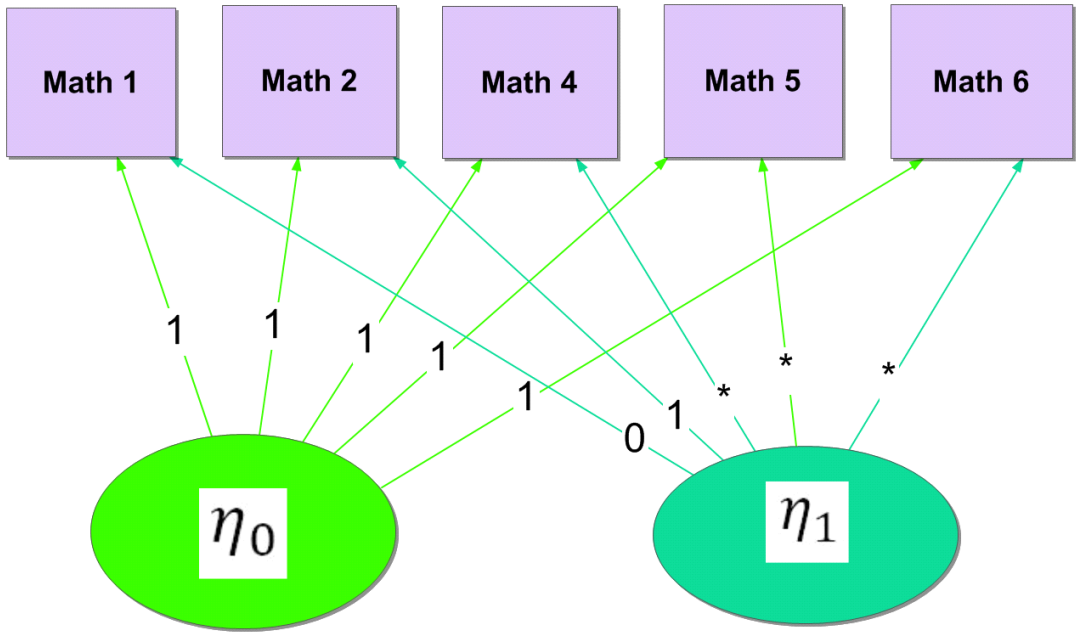

Figure 3-4. Freed-loading latent growth curve measurement model for mathematics achievement.

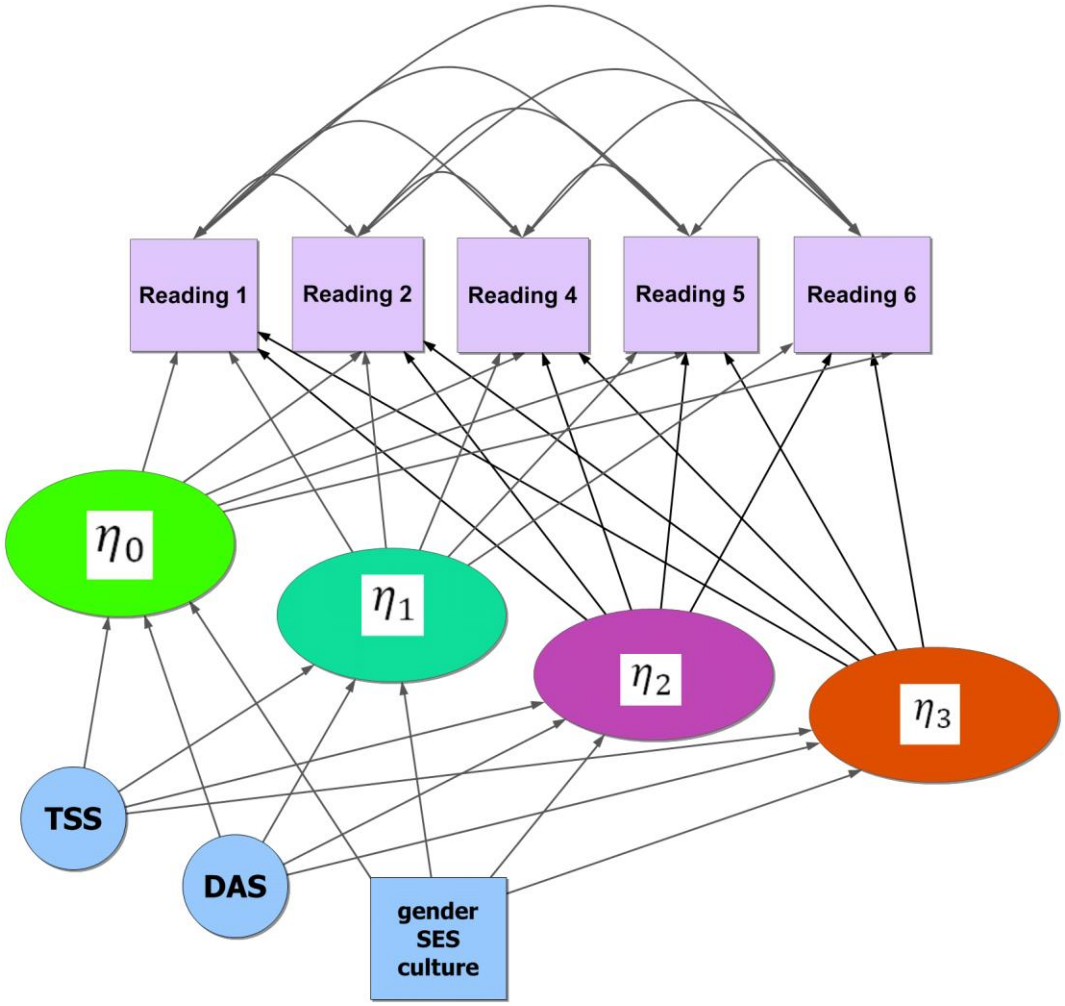

Figure 3-5. HMLM cubic polynomial latent growth curve structural model with nine time-invariant covariates for reading achievement.

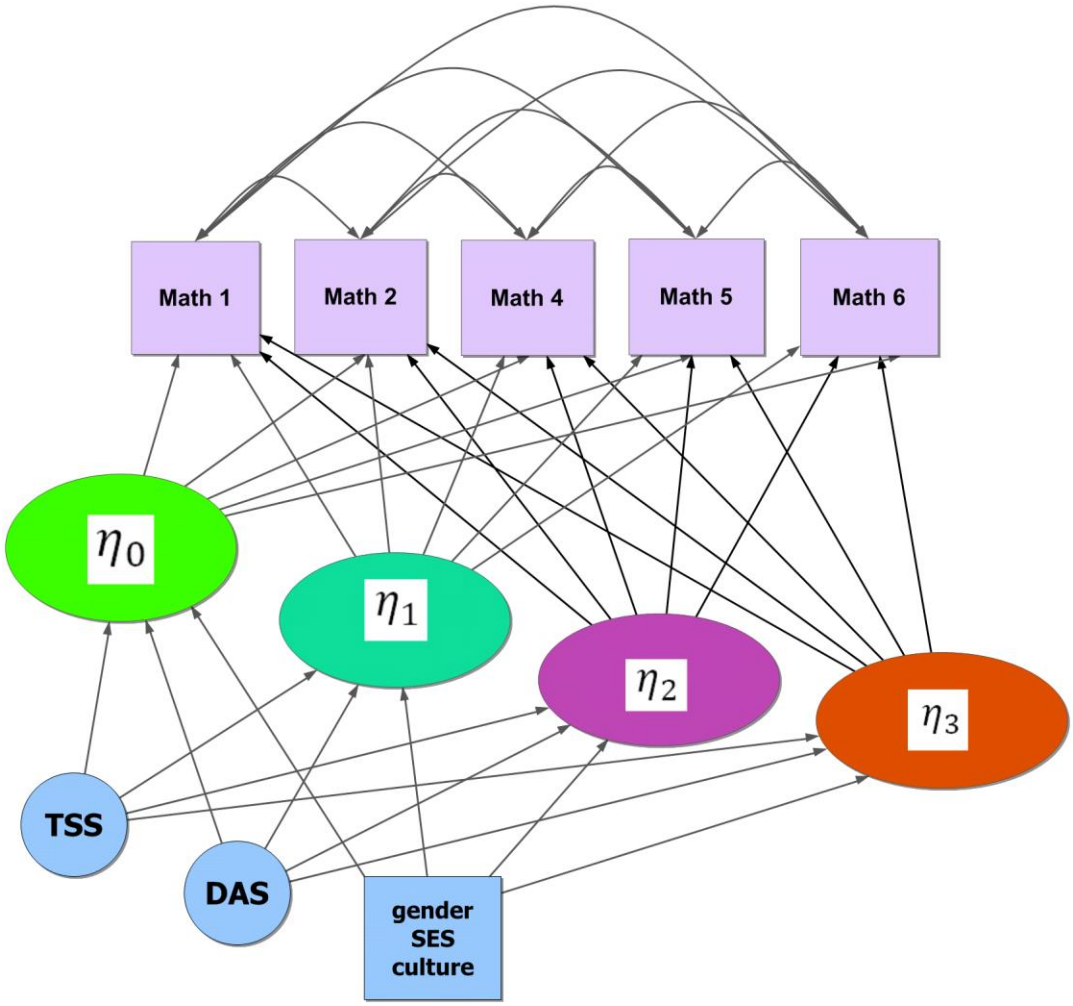

Figure 3-6. HMLM cubic polynomial latent growth curve structural model with nine time-invariant covariates for mathematics achievement.

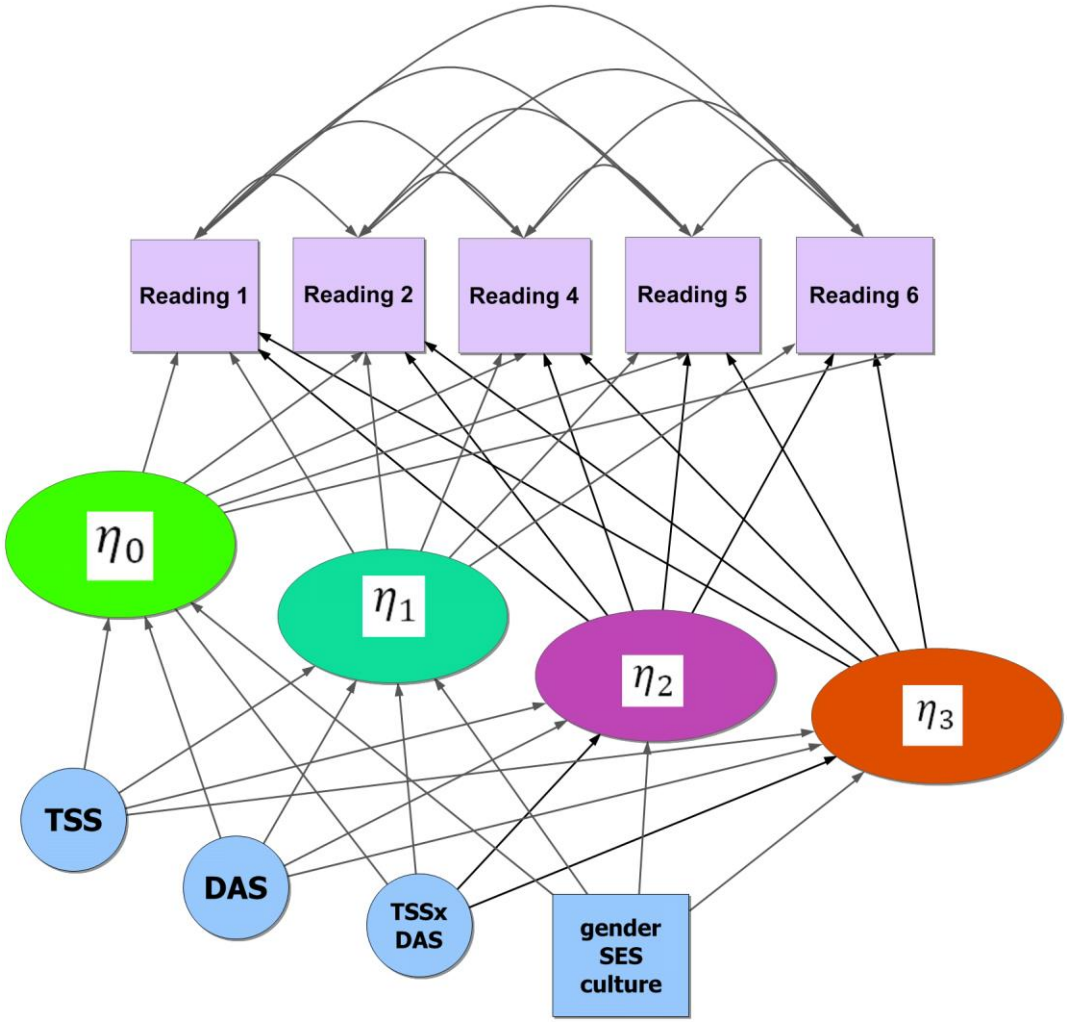

Figure 3-7. HMLM cubic polynomial latent growth curve structural model with nine time-invariant covariates and the interaction between traumatic stress symptoms and difficult attachment symptoms for reading achievement.

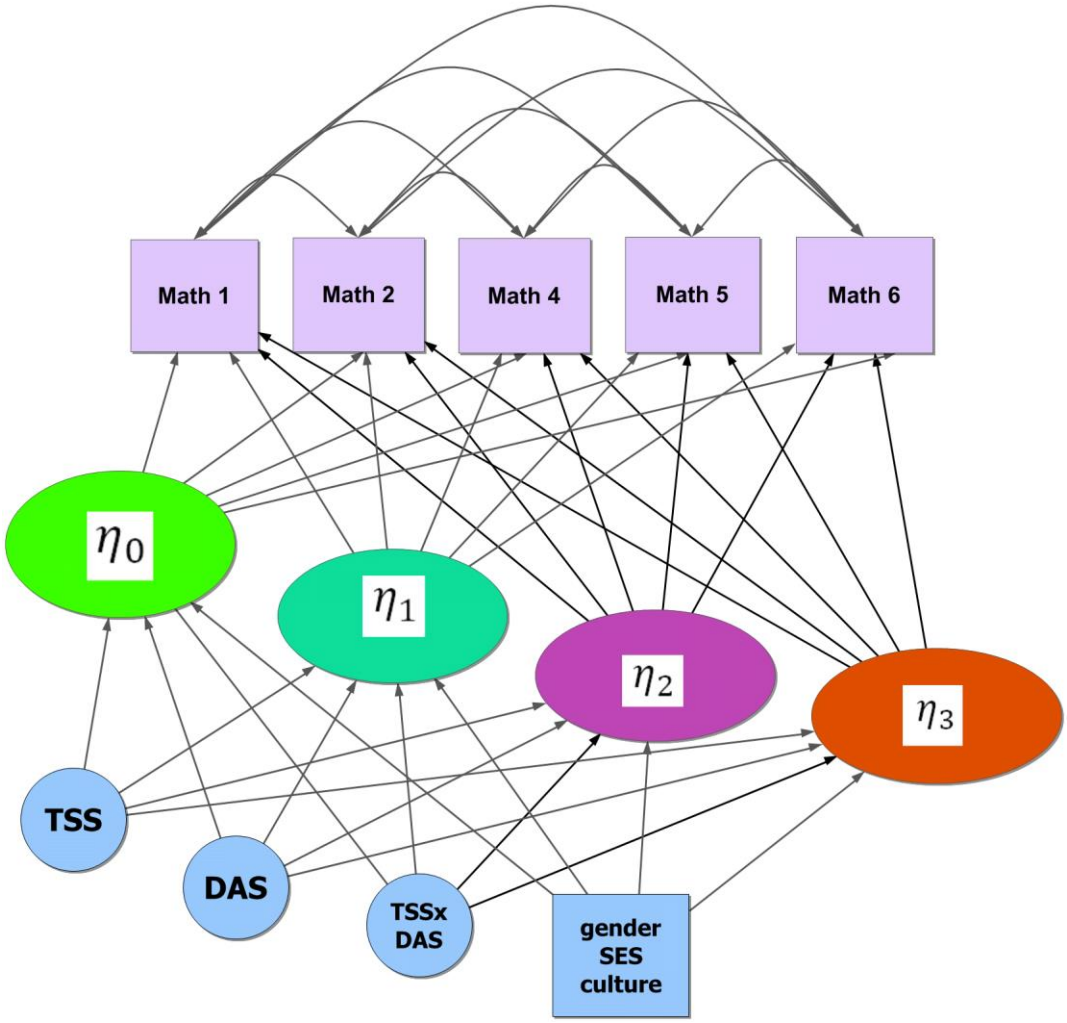

Figure 3-8. HMLM cubic polynomial latent growth curve structural model with nine time-invariant covariates and the interaction between traumatic stress symptoms and difficult attachment symptoms for mathematics achievement.

CHAPTER 4
RESULTS

The issue of persistent underachievement for certain segments of the student population has been of interest to educational researchers; however, environmental factors have not been sufficiently explored. This study examined the impact of the relationship between children's traumatic stress symptoms and negative attachment symptoms with their effect on the outcome trajectory of reading and mathematics academic achievement from kindergarten to fifth grade. The study controlled for the effects of gender, culture, and socioeconomic status (SES) on these relationships. My research questions were: (1) What is the relationship between the growth trajectory of reading and mathematics achievement and traumatic stress symptoms for children in kindergarten through fifth grade?, (2) What is the relationship between the growth trajectory of reading and mathematics achievement and difficult attachment symptoms for children in kindergarten through fifth grade?, (3) What is the relationship between the growth trajectory of reading and mathematics achievement and traumatic stress symptoms and difficult attachment symptoms for children in kindergarten through fifth grade?, (4) What is the relationship between the growth trajectory of reading and mathematics achievement and traumatic stress symptoms and difficult attachment symptoms for children in kindergarten through fifth grade, while controlling for gender, culture, and socioeconomic status? and finally, (5) What is the relationship of an interaction effect between traumatic stress symptoms and difficult attachment symptoms on the growth trajectory of reading and mathematics achievement for children in kindergarten through fifth grade, while controlling for gender, culture, and socioeconomic status? This quantitative study used the national database Early Childhood Longitudinal Study-Kindergarten 1998 cohort (ECLS-K) collected by the National Center for Education Statistics (NCES) in order to design a latent growth curve model that incorporated traumatic stress

symptoms and difficult attachment symptoms and their effects on the growth trajectory. The purpose of this chapter is to present the results from analyzing the research questions using the methods described previously.

Participant Multivariate Descriptive Information

This study's sample consisted of 8,368 participants after missing data was addressed using full information maximum likelihood (FIML) estimation. The covariance coverage of the proportion of data present in the reading achievement model ranged from 88.2% to 100% present (Table 4-1). The covariance coverage of the proportion of data present in the mathematics achievement model ranged from 91.6% to 100% present (Table 4-2).

This weighted longitudinal sample consisted of 51.5% males ($n = 4{,}310$) and 48.5% females ($n = 4{,}059$). The distribution of the responding parent/guardian's gender in this sample was 6.2% male ($n = 519$) and 93.8% female ($n = 7{,}849$). The distribution of the cultural groups in this sample was 57.7% European American ($n = 4{,}828$), 18.8% Latina/o ($n = 1{,}573$), 16% African American ($n = 1{,}339$), 2.7% Asian ($n = 226$), and 4.8% other people of color (Native American, Alaska Native, Native Hawaiian, Other Pacific Islander, and Multi-Racial) ($n = 402$).

Due to low percentage of the sample number the cultural group other people of color's means were for the most part found to be not significantly different from the reference group, European American, when answering research questions four and five for the reading and mathematics LGCM. Therefore it was not included in the discussion of the results, but was allowed to remain in the model as a controlled for dummy coded variable. However, just to note the cultural group other people of color did significantly differ from the mean quadratic slope factor when answering research questions four and five for the mathematics LGCM, suggesting

that children from this cultural group show lower negative quadratic trends in their mathematics achievement trajectory than European American children (Table 4-3). Likewise, children whose responding parent/guardian were male were found to be not significantly different from the reference sample of children whose responding parent/guardian was female for research questions four and five for the reading and mathematics LGCM. Therefore it was also not included in the discussion of the results, but was allowed to remain in the model as a controlled for dummy coded variable (Table 4-4).

In review of the academic achievement measures for the students in the sample, the observed and estimated means for reading achievement, their standard deviations, and correlation matrix are shown in Table 4-5. The observed and estimated means for mathematics achievement, their standard deviations, and correlation matrix are shown in Table 4-6. These two correlation matrix tables show that these items are significantly correlated and therefore measure similar constructs over time. By looking at the histogram/density plots of the reading (Figure 4-1) and mathematics (Figure 4-2) achievement variables and the plot of individuals observed longitudinal trajectories for reading (Figure 4-3) and mathematics (Figure 4-4) data (Grimm & Ram, 2012), these figures provide support for the data to be following nonlinear trends (Grimm, Steele, Mashburn, Burchinal, & Pianta, 2010). This can be seen as the distribution started out positively skewed in time periods one and two. The trend in the data from third grade to fifth grade showed possible platykurtic or flattening of the distribution and some potential multimodal aspects (Huck, 2008). This distribution reflected the need for using MLR estimation methods in M*plus* as it has been shown to deal well with nonnormal distribution of the data (Muthén & Muthén, 2009, March 23; 2010; Yuan & Bentler, 2000).

Specification of Measurement Model

In order to ensure that estimates of the latent growth curve model (LGCM) were accurate, it was necessary to determine which measurement model was the best fit. I began with the linear and its quadratic LGCM, then the freed-loading and its quadratic LGCM, next looked at the quadratic orthogonal polynomial model, and followed by the quadratic and cubic orthogonal polynomial of the hierarchical multivariate linear model (HMLM) model. The cubic orthogonal polynomial HMLM model was finally chosen as providing the most accurate estimates for the reading and mathematics achievement data.

The Latent Growth Curve Model

I began this process by analyzing the fit of the unconditional LGCM. Time was centered at initial assessment and the following Equation 4-1 was used for the linear model:

$$y_i = \Lambda \eta_i + \varepsilon_i \tag{4-1}$$

$$y_i = \begin{bmatrix} y_{i1} \\ y_{i2} \\ y_{i3} \\ y_{i4} \\ y_{i5} \end{bmatrix} \quad \Lambda = \begin{bmatrix} 1 & 0 \\ 1 & 1 \\ 1 & 4 \\ 1 & 10 \\ 1 & 16 \end{bmatrix} \quad \eta_i = \begin{bmatrix} \eta_{00} \\ \eta_{10} \end{bmatrix} \quad \varepsilon_i = \begin{bmatrix} \varepsilon_{i1} \\ \varepsilon_{i2} \\ \varepsilon_{i3} \\ \varepsilon_{i4} \\ \varepsilon_{i5} \end{bmatrix}$$

The linear model

I began with the linear model to the reading achievement and mathematics data. The results for the reading data showed that it did not fit the data well ($\chi^2(10) = 4957.87$ ($\rho < .05$), $RMSEA = 0.243$ ($\pm .006$), $corrected\ CFI = 0.664$, $corrected\ TLI = 0.529$, $SRMR = 0.255$, $AIC = 379446.01$, $BIC = 379488.18$). The mathematics data showed similarly poor fit to the linear model ($\chi^2(10) = 49164.63$ ($\rho < .05$), $RMSEA = 0.223$ ($\pm .006$), $corrected\ CFI = 0.700$, $corrected\ TLI = 0.580$, $SRMR = 0.235$, $AIC = 305791.21$,

$BIC = 305861.51$). The quadratic trend to this model did not converge due to a not positive definite residual covariance matrix for both the reading and mathematics data. Given the poor fit of the linear model, I then examined the utility of the free loading model.

The free loading model

The free loading LGCM was examined next for the reading and mathematics data, with the following Equation 4-2:

$$y_i = \Lambda \eta_i + \varepsilon_i \tag{4-2}$$

$$y_i = \begin{bmatrix} y_{i1} \\ y_{i2} \\ y_{i3} \\ y_{i4} \\ y_{i5} \end{bmatrix} \quad \Lambda = \begin{bmatrix} 1 & 0 \\ 1 & 1 \\ 1 & \lambda_{32} \\ 1 & \lambda_{42} \\ 1 & \lambda_{52} \end{bmatrix} \quad \eta_i = \begin{bmatrix} \eta_{00} \\ \eta_{10} \end{bmatrix} \quad \varepsilon_i = \begin{bmatrix} \varepsilon_{i1} \\ \varepsilon_{i2} \\ \varepsilon_{i3} \\ \varepsilon_{i4} \\ \varepsilon_{i5} \end{bmatrix}$$

The free loading for reading ($\chi^2(7) = 939.33$ ($\rho < .05$), $LRT(7) = 9982.28$ ($\rho < .05$), $RMSEA = 0.127$ ($\pm .007$), $corrected\ CFI = 0.937$, $corrected\ TLI = 0.873$, $SRMR = 0.188$, $AIC = 301869.17$, $BIC = 301960.55$) and mathematics ($\chi^2(7) = 469.87$ ($\rho < .05$), $LRT(7) = 11453.69$ ($\rho < .05$), $RMSEA = 0.089$ ($\pm .007$), $corrected\ CFI = 0.972$, $corrected\ TLI = 0.944$, $SRMR = 0.126$, $AIC = 292320.54$, $BIC = 292411.93$), showed a large improvement in fit, but still showed problems adequately estimating the data. The largely significant LRT showed the free loading model was significantly different and its lower AIC and BIC values suggested better fit, however, the fit indices suggested a need for model improvement. The poor fit of the freed-loading model required that the utility of the quadratic free loading model be looked at next.

The quadratic free loading model

The estimated factor scores from the non-polynomial model were specified and the quadratic factor was added. The following specifications are shown for the reading free loading model with quadratic factor, in Equation 4-3:

$$y_i = \Lambda \eta_i + \varepsilon_i$$

$$y_i = \begin{bmatrix} y_{i1} \\ y_{i2} \\ y_{i3} \\ y_{i4} \\ y_{i5} \end{bmatrix} \quad \Lambda = \begin{bmatrix} 1 & 0 & 0 \\ 1 & 1 & 1 \\ 1 & 3.799 & 14.432 \\ 1 & 8.111 & 65.788 \\ 1 & 10.069 & 101.385 \end{bmatrix} \quad \eta_i = \begin{bmatrix} \eta_{00} \\ \eta_{10} \\ \eta_{20} \end{bmatrix} \quad \varepsilon_i = \begin{bmatrix} \varepsilon_{i1} \\ \varepsilon_{i2} \\ \varepsilon_{i3} \\ \varepsilon_{i4} \\ \varepsilon_{i5} \end{bmatrix} \tag{4-3}$$

which did not converge because it did not have a positive definite residual covariance matrix.

The mathematics free loading model with quadratic factor had the following specifications in its Equation 4-4:

$$y_i = \Lambda \eta_i + \varepsilon_i$$

$$y_i = \begin{bmatrix} y_{i1} \\ y_{i2} \\ y_{i3} \\ y_{i4} \\ y_{i5} \end{bmatrix} \quad \Lambda = \begin{bmatrix} 1 & 0 & 0 \\ 1 & 1 & 1 \\ 1 & 3.422 & 11.710 \\ 1 & 7.021 & 49.294 \\ 1 & 9.259 & 85.729 \end{bmatrix} \quad \eta_i = \begin{bmatrix} \eta_{00} \\ \eta_{10} \\ \eta_{20} \end{bmatrix} \quad \varepsilon_i = \begin{bmatrix} \varepsilon_{i1} \\ \varepsilon_{i2} \\ \varepsilon_{i3} \\ \varepsilon_{i4} \\ \varepsilon_{i5} \end{bmatrix} \tag{4-4}$$

and this did converge, showing large improvement on the model that estimates an adequate fit ($\chi^2(6) = 43.06$ ($\rho < .05$), $LRT(8) = 13372.84$ ($\rho < .05$), $RMSEA = 0.027$ ($\pm .008$), $corrected\ CFI = 0.998$, $corrected\ TLI = 0.995$, $SRMR = 0.039$, $AIC = 291080.15$, $BIC = 291178.57$), however when the TICs were added it was not able to converge and so was not used for further analysis. Given the troubles converging the quadratic freed-loading model was rejected, I then examined the utility of the quadratic orthogonal polynomial model.

The quadratic orthogonal polynomial model

A quadratic orthogonal polynomial model for the reading and mathematics data was analyzed next using the following Equation 4-5:

$$y_i = \Lambda \eta_i + \varepsilon_i \tag{4-5}$$

$$y_i = \begin{bmatrix} y_{i1} \\ y_{i2} \\ y_{i3} \\ y_{i4} \\ y_{i5} \end{bmatrix} \quad \Lambda = \begin{bmatrix} 0.447 & -0.461 & 0.415 \\ 0.447 & -0.387 & 0.150 \\ 0.447 & -0.164 & -0.431 \\ 0.447 & 0.283 & -0.620 \\ 0.447 & 0.729 & 0.486 \end{bmatrix} \quad \eta_i = \begin{bmatrix} \eta_{00} \\ \eta_{10} \\ \eta_{20} \end{bmatrix} \quad \varepsilon_i = \begin{bmatrix} \varepsilon_{i1} \\ \varepsilon_{i2} \\ \varepsilon_{i3} \\ \varepsilon_{i4} \\ \varepsilon_{i5} \end{bmatrix}$$

This did not converge because it had a not positive definite residual covariance matrix. This led to the conclusion that the issues of convergence were due to the amount of missing data and thus the HMLM model by Raudenbush and Byrk (2002) was examined as it was designed to deal with missing data issues specifically.

The HMLM quadratic orthogonal polynomial model

This model is accomplished in M*plus* by (a) setting the variances of all trend latent factors equal to zero, and (b) allowing the residuals for all observed reading and mathematics variables to correlate (Raudenbush & Bryk, 2002). The following Equation 4-6 was used for this model:

$$y_i = \Lambda \eta_i + \varepsilon_i \tag{4-6}$$

$$y_i = \begin{bmatrix} y_{i1} \\ y_{i2} \\ y_{i3} \\ y_{i4} \\ y_{i5} \end{bmatrix} \quad \Lambda = \begin{bmatrix} 0.447 & -0.461 & 0.415 \\ 0.447 & -0.387 & 0.150 \\ 0.447 & -0.164 & -0.431 \\ 0.447 & 0.283 & -0.620 \\ 0.447 & 0.729 & 0.486 \end{bmatrix} \quad \eta_i = \begin{bmatrix} \eta_{00} \\ \eta_{10} \\ \eta_{20} \end{bmatrix} \quad \varepsilon_i = \begin{bmatrix} \varepsilon_{i1} \\ \varepsilon_{i2} \\ \varepsilon_{i3} \\ \varepsilon_{i4} \\ \varepsilon_{i5} \end{bmatrix}$$

In the HMLM quadratic orthogonal polynomial the trend changed as this model was able to converge, suggesting that this model is able to address the missing data issue. The HMLM

quadratic orthogonal polynomial model fit the data better than previous models for reading data ($\chi^2(2) = 41.42$ ($\rho < .05$), $LRT(12) = 981.59$ ($\rho < .05$) when compared to the free loading model, $RMSEA = 0.049$ ($\pm .008$), $corrected\ CFI = 0.997$, $corrected\ TLI = 0.981$, $SRMR = 0.021$, $AIC = 299059.65$, $BIC = 299186.18$). The mathematics HMLM quadratic orthogonal polynomial model approximated the parameters better than previous models for the mathematics data ($\chi^2(2) = 74.39$ ($\rho < .05$), $LRT(12) = 15860.15$ ($\rho < .05$) when compared to the free loading model, $RMSEA = 0.067$ ($\pm .013$), $corrected\ CFI = 0.996$, $corrected\ TLI = 0.969$, $SRMR = 0.022$, $AIC = 291233.15$, $BIC = 291359.70$). However, RMSEA was slightly above the .06 cutoff when the confidence interval is accounted for and it being the more important fit index, the HMLM cubic orthogonal polynomial model was explored.

The HMLM cubic orthogonal polynomial model

The Equation 4-7 for the HMLM cubic orthogonal polynomial model is as follows:

$$y_i = \Lambda \eta_i + \varepsilon_i \tag{4-7}$$

$$y_i = \begin{bmatrix} y_{i1} \\ y_{i2} \\ y_{i3} \\ y_{i4} \\ y_{i5} \end{bmatrix} \quad \Lambda = \begin{bmatrix} 0.447 & -0.461 & 0.415 & -0.413 \\ 0.447 & -0.387 & 0.150 & 0.130 \\ 0.447 & -0.164 & -0.431 & 0.674 \\ 0.447 & 0.283 & -0.620 & -0.571 \\ 0.447 & 0.729 & 0.486 & 0.181 \end{bmatrix} \quad \eta_i = \begin{bmatrix} \eta_{00} \\ \eta_{10} \\ \eta_{20} \\ \eta_{30} \end{bmatrix} \quad \varepsilon_i = \begin{bmatrix} \varepsilon_{i1} \\ \varepsilon_{i2} \\ \varepsilon_{i3} \\ \varepsilon_{i4} \\ \varepsilon_{i5} \end{bmatrix}$$

The HMLM cubic orthogonal polynomial model had the best fit to the data for both the reading LGCM ($\chi^2(1) = 0.433$ ($\rho > .05$), $LRT(12) = 41.31$ ($\rho < .05$), $RMSEA = 0.00$ ($\pm .03$), $corrected\ CFI = 1.000$, $corrected\ TLI = 1.001$, $SRMR = 0.002$, $AIC = 298900.53$, $BIC = 299034.09$) and the mathematics LGCM ($\chi^2(1) = 10.56$ ($\rho < .05$), $LRT(12) = 69.19$ ($\rho < .05$), $RMSEA = 0.034$ ($\pm .02$), $corrected\ CFI = 0.999$, $corrected\ TLI =$

$0.992,\ SRMR\ =\ 0.008,\ AIC\ =\ 290984.82,\ BIC\ =\ 291118.40$). This was determined by looking at the fit indices, the LRT, and the AIC and BIC values of all models tried. The LRT showed that the HMLM cubic orthogonal polynomial model contributed additional information that causes a significant difference with the HMLM quadratic polynomial model [reading: $LRT(12) =\ 41.31\ (\rho < .05)$ and mathematics: $LRT(12) = 69.19\ (\rho < .05)$]. The AIC and BIC values were lowest suggesting that the HMLM cubic orthogonal polynomial had the best fit of all models for reading and mathematics data. Thus, the HMLM cubic orthogonal polynomial model was selected to test the research questions and hypothesis.

The correlation matrix for the reading achievement endogenous variables, their estimated means by the model, and the observed means with standard deviations are presented in Table 4-5. The correlation matrix for the mathematics achievement endogenous variables, their estimated means by the model, and the observed means with standard deviations are presented in Table 4-6. A comparison of the different model estimated means for reading (Table 4-7) and mathematics (Table 4-8) achievement were compared and it was verified that the HMLM cubic polynomial model had the more stable estimates.

Confirmatory Factor Analysis

The process of developing the measurement specifications necessary to proceed with structural analysis was developed in two phases. The first phase consisted of applying EFA procedures with SEM based tests of model fit to the difficult attachment symptoms indicators. No EFA procedures were conducted with traumatic stress symptoms because the factor structure had already been theoretically developed and prior research supported its structure. For difficult attachment symptoms a selection of the appropriate items was made and then they were specified to the single factor without any cross-loadings, known as confirmatory factor analysis (CFA). The second phase consisted of analyzing the measurement model for the latent variables,

traumatic stress symptoms and difficult attachment symptoms, fitness to the cubic orthogonal polynomial LGCM. The following are the results of these phases.

Difficult Attachment Symptoms EFA and CFA Development

I included 11 items based on the literature and the personal communication with Dr. Gail Mulligan (Mulligan, personal communication, October, 15 2012) for an exploratory factor analysis (EFA). The oblique geomin rotation was used and the estimations were constrained to 1 to 4 factors. A 3 factor model was chosen as the best fitting result. Its $\chi^2(25) = 274.85$ ($\rho < .05$) showed that this was not an exact fitting model, however the fit indices did show that it was adequate enough not to reject ($RMSEA = 0.023$ ($\pm .003$), $CFI = 0.987$, $TLI = 0.971$, $SRMR = 0.027$). Of the 11 items, I dropped 6 items from subsequent analyses due to low loading (< 0.40) on the factor of interest and high loading on 2 other factors (Table 4-9).

The resulting indicators (P2HRDWRM, P2CHDOES, P2FLTRAP, P2FELAN, and P2CHHARD) were fit to a CFA analysis. The model was run without specifying the indicators as categorical, causing M*plus* to assume them as continuous, thus providing a baseline comparison, since logit regression does not provide indices of fit. This resulted in the following fit test and indices, ($\chi^2(5) = 1.974$ ($\rho > .05$), $RMSEA = 0$, $CFI = 1$, $TLI = 1$, $SRMR = 0.01$, $AIC = 32128.20$, $BIC = 32233.52$). The model was then rerun using logit regression by specifying its indicators as ordinal categorical, providing the following results ($\chi^2_{LI}(226) = 258.63$ ($\rho > .05$), $AIC = 25749.75$, $BIC = 25855.07$). As can be seen by the non-significant likelihood chi-square test for ordered categorical outcomes and the improved lower AIC and BIC values these indicators appear to fit the latent factor adequately. The descriptive statistics for parents' difficult attachment symptoms indicate that the majority of caregivers reported "not at all true" for the five symptoms: P2HARDWRM ("hard to be warm"), P2CHDOES (“child does

things that really bother me"), P2FLTRAP ("feel trapped as a parent"), P2FEELAN ("feel angry with the child"), and P2CHHARD ("child is harder to care for than most"). See Table 4-10 for the descriptive statistics for difficult attachment symptoms. When looking at the plots of the total information and characteristics curves for the indicators of difficult attachment symptoms four out of the five indicators are stable and one of the indicators P2HRDWRM is not as stable (Figure 4-5 and Figure 4-6).

Traumatic Stress Symptoms CFA Development

The model of indicators developed from prior research on traumatic stress with this data set led to the following indicators to be specified (T2CONTRO, T2INTERP, T2EXTERN, T2INTERN, and P1ATTENI) to load on the latent variable traumatic stress symptoms. Again the model was run first without specifying the indicator P1ATTENI as categorical to provide a baseline comparison. The resulting fit test and indices ($\chi^2(5) = 150.84$ ($\rho < .05$), $RMSEA = .059$ (± 0.008), $CFI = 0.967$, $TLI = 0.934$, $SRMR = 0.027$, $AIC = 57807.91$, $BIC = 57913.39$) show that the model is a good fit. The fact that TLI is below the current standard of 0.95 can be attributed to P1ATTENI not being specified as categorical. This model was rerun specifying P1ATTENI as an ordinal categorical indicator which provided an $AIC = 57291.99$ and $BIC = 57404.51$, showing a relatively large increase in model fit. Thus, these indicators were accepted as fitting this factor adequately. The descriptive statistics of traumatic stress symptoms suggested that teachers rated most children as showing average behaviors, and a small proportion showed signs of difficulty (Table 4-11). Given the shape of the total information curve of traumatic stress symptoms, it is hypothesized that it is a bimodal distribution (Figure 4-7). The plot of the characteristic curve for the P1ATTENI indicator as a

function of traumatic stress symptoms suggests that this indicator is not as stable in its distribution (Figure 4-8).

The final step in the latent variables measurement model involved estimating how they fit together. Again I ran traumatic stress symptoms and difficult attachment symptoms together as continuous variables to estimate a baseline comparison. The fit test and indices were as follows ($\chi^2(33) = 69.39$ ($\rho < .05$), $RMSEA = .01$ (± 0.004), $CFI = 0.99$, $TLI = 0.986$, $SRMR = 0.022$, $AIC = 89310.05$, $BIC = 89535.08$), showing the combined model was a great fit. When specified to include the ordinal categorical indicators it resulted in these values ($\chi^2_{LI}(707) = 683.77$ ($\rho = .7281$), $AIC = 83135.35$ $BIC = 83353.35$). The likelihood chi-square test for the binary and ordered categorical outcomes was non-significant and the AIC and BIC showed a considerable model improvement providing support that this model is sufficient. The factor loadings for the measurement model that includes traumatic stress symptoms and difficult attachment symptoms shows discrepancies in teacher's ability to identify internalizing behaviors (T2INTERN), parents had trouble discriminating children's attention qualities (P1ATTENI), and parents possibly showed trouble disclosing when they were having trouble being warm with their children (P2HRDWRM) (Table 4-12, for the factor loadings, standard errors, factor correlations, and R^2 estimates). Andreassen and West (2007) and Chapin (2006) have found that both teacher and parent self-report data has been skewed toward socially desirable answers. This suggests that some of the troubles with the indicators could be pointing to social desirability biases or even cultural differences in interpreting the meaning of socially desirable questions.

The Structural LGCM

The unconditional cubic orthogonal polynomial model for reading and mathematics provided the best description for the growth model. This model estimated the values for the mean intercept, mean linear factor, mean quadratic factor, and the mean cubic factor for the trajectory for all children in the sample from kindergarten to fifth grade. However, because the general orthogonal polynomial coefficients are rescaled measures of the time scores, both will be provided.

Mean Values for Structural LGCM

The non-orthogonalized values outside of the parenthesis and the orthogonalized values are presented inside the parentheses. The reading achievement data observed the initial value of mean reading achievement to be 34.73 with a $s.e. = 0.236$ ($\bar{x}_{ETA0} = 192.80, s.e. = 1.10$) which increased linearly at a mean rate of 11.20 with a $s.e. = 0.163$ units per four months increase in time (Figure 4-9; $\bar{x}_{ETA1} = 97.27,\ s.e. = 0.57$). This increase in slope on average was decelerating at a rate of 0.142 unit per units per four months increase in time with a $s.e. = 0.025$ (Figure 4-10; $\bar{x}_{ETA2} = -17.50,\ s.e. = 0.32$). However, looking at this plot one can see a huge acceleration from Fall of kindergarten to Spring of kindergarten, which then results in a continuing deceleration till fifth grade. This average quadratic deceleration is also decelerating (attenuated) or reduced over time at an average rate of 0.007 with a $s.e. = 0.001$ (Figure 4-11; $\bar{x}_{ETA3} = -1.52,\ s.e. = 0.23$). Thus, the mean intercept, mean slope, mean quadratic slope, and mean cubic slope differed significantly from zero ($\rho < .05$). These trends were graphed to give a visual perspective of these nonlinear trends.

Looking at the mathematics achievement data, the mean initial value of mathematics achievement was equal to 25.77 with a $s.e. = 0.213$ ($\bar{x}_{ETA0} = 152.92, s.e. = 1.01$) which

increased linearly at a mean rate of 10.23 units per four months increase in time with a $s.e. = 0.130$ (Figure 4-12; $\bar{x}_{ETA1} = 80.61,\ s.e. = 0.57$). This increase in slope was decelerating at an average rate of 0.371 unit per units per four months increase in time with a $s.e. = 0.025$ (Figure 4-13; $\bar{x}_{ETA2} = -11.73,\ s.e. = 0.20$). Looking at this plot, one can see the huge acceleration from Fall kindergarten to Spring kindergarten, which results in a continuing deceleration until fifth grade. This average quadratic deceleration is also decelerating (attenuated) or reduced over time at an average rate of 0.007 with a $s.e. = 0.001$ (Figure 4-14; $\bar{x}_{ETA3} = 1.41,\ s.e. = 0.19$). The mean intercept, mean slope, mean quadratic slope, and mean cubic slope of mathematics achievement differed significantly from zero ($\rho < 0.05$). These trends in mathematics were graphed to give a visual perspective of these nonlinear trends.

Because variance of the intercept, slope, quadratic, and cubic factors were set equal to zero, individual differences were not estimated for this model. This was acceptable, because the purpose of this study was to look at how traumatic stress symptoms and difficult attachment symptoms affected children's mean reading and mathematics achievement from Fall of kindergarten to Spring of fifth grade. Therefore, it was not important to estimate the individual differences, particularly since the missing data made models that estimated these parameters not possible.

The Conditional LGCM

The values of the intercept slope factor, linear slope factor, quadratic slope factor, and cubic slope factor will be based on the rescaled time scale for the results pertaining to the conditional LGCM and the research questions. In this next part of the analysis the conditional LGCM was examined using Equation 4-8 and Equation 4-9. The amount of time-invariant

covariates (TICs) included in the models differed for each research question. The full model is described by Equation 4-10.

The level 1 equation is:

$$y_i = \Lambda \eta_i + \varepsilon_i \tag{4-8}$$

$$y_i = \begin{bmatrix} y_{i1} \\ y_{i2} \\ y_{i3} \\ y_{i4} \\ y_{i5} \end{bmatrix} \quad \Lambda = \begin{bmatrix} 0.447 & -0.461 & 0.415 & -0.413 \\ 0.447 & -0.387 & 0.150 & 0.130 \\ 0.447 & -0.164 & -0.431 & 0.674 \\ 0.447 & 0.283 & -0.620 & -0.571 \\ 0.447 & 0.729 & 0.486 & 0.181 \end{bmatrix} \quad \eta_i = \begin{bmatrix} \eta_{00} \\ \eta_{10} \\ \eta_{20} \\ \eta_{30} \end{bmatrix} \quad \varepsilon_i = \begin{bmatrix} \varepsilon_{i1} \\ \varepsilon_{i2} \\ \varepsilon_{i3} \\ \varepsilon_{i4} \\ \varepsilon_{i5} \end{bmatrix}$$

The level two equation in its full form is:

$$\eta_i = \mu_\eta + \Gamma x_i + \zeta_i \tag{4-9}$$

$$\eta_i = \begin{bmatrix} \eta_{00} \\ \eta_{10} \\ \eta_{20} \\ \eta_{30} \end{bmatrix} \quad \mu_\eta = \begin{bmatrix} \mu_{\eta_{00}} \\ \mu_{\eta_{10}} \\ \mu_{\eta_{20}} \\ \mu_{\eta_{30}} \end{bmatrix} \quad \Gamma = \begin{bmatrix} \gamma_{\eta_{01}} & \gamma_{\eta_{02}} & \cdots & \gamma_{\eta_{06}} \\ \gamma_{\eta_{11}} & \gamma_{\eta_{12}} & \cdots & \gamma_{\eta_{16}} \\ \gamma_{\eta_{21}} & \gamma_{\eta_{22}} & \cdots & \gamma_{\eta_{26}} \\ \gamma_{\eta_{31}} & \gamma_{\eta_{32}} & \cdots & \gamma_{\eta_{36}} \end{bmatrix} \quad x_i = \begin{bmatrix} x_{1i} \\ x_{2i} \\ \vdots \\ x_{9i} \end{bmatrix} \quad \zeta_i = \begin{bmatrix} \zeta_{\eta_{0i}} \\ \zeta_{\eta_{1i}} \\ \zeta_{\eta_{2i}} \\ \zeta_{\eta_{3i}} \end{bmatrix}$$

The combined model is:

$$y_i = \Lambda\left(\mu_\eta + \Gamma x_i\right) + \Lambda \zeta_i + \varepsilon_i \tag{4-10}$$

Reading and Mathematics Growth Trajectory and TSS

The first research question asked: What is the relationship between the growth trajectory of reading and mathematics achievement and traumatic stress symptoms for children in kindergarten through fifth grade? This question was examined with this nested level 2 model using Equation 4-11:

$$\eta_i = \mu_\eta + \Gamma x_i + \zeta_i \tag{4-11}$$

$$\eta_i = \begin{bmatrix} \eta_{00} \\ \eta_{10} \\ \eta_{20} \\ \eta_{30} \end{bmatrix} \quad \mu_\eta = \begin{bmatrix} \mu_{\eta_{00}} \\ \mu_{\eta_{10}} \\ \mu_{\eta_{20}} \\ \mu_{\eta_{30}} \end{bmatrix} \quad \Gamma = \begin{bmatrix} \gamma_{\eta_{01}} \\ \gamma_{\eta_{11}} \\ \gamma_{\eta_{21}} \\ \gamma_{\eta_{31}} \end{bmatrix} \quad x_i = \begin{bmatrix} x_{1i} \end{bmatrix} \quad \zeta_i = \begin{bmatrix} \zeta_{\eta_{0i}} \\ \zeta_{\eta_{1i}} \\ \zeta_{\eta_{2i}} \\ \zeta_{\eta_{3i}} \end{bmatrix}$$

where x_{1i} represents the time-invariant covariate (TIC): *traumatic stress symptoms* (TSS). The following are the mean estimates for reading achievement for children who are low on TSS: mean intercept = 192.73 ($s.e = 1.10$), mean linear slope = 97.22 ($s.e. = 0.59$), mean quadratic slope = -17.47 ($s.e. = 0.32$), and the mean cubic slope = -1.50 ($s.e. = 0.22$). The following are the mean estimates for mathematics achievement for children who are low on TSS: mean intercept slope factor = 152.92 ($s.e = 1.01$), mean linear slope = 80.61 ($s.e. = 0.57$), mean quadratic slope = -11.73 ($s.e. = 0.19$), and the mean cubic slope = 1.39 ($s.e. = 0.19$).

The latent variable TSS has both continuous and ordinal categorical data, which requires numerical integration, so the normal χ^2 test and fit indices are not available. Thus, likelihood-based indexes were used to make model comparisons (Grimm & Ram, 2009).These included the loglikelihood ratio test (LRT), the Akaike's Information Criterion (AIC), and the Bayesian Information Certerion (BIC). Since the cubic orthogonal polynomial LGCM's fitness has already been estimated, its loglikelihood, AIC, and BIC values were used as a comparison due to this model being nested within the models being examined for the research questions.

The path model for the structural equation of reading achievement with the TIC TSS can be seen in Figure 4-15 and mathematics achievement in Figure 4-16. The reading data results of the LRT, AIC, and BIC ($LRT\ (19) = 13319.93$ ($\rho < .05$), $AIC = 355574.86, BIC = 355842.09$) suggest that the addition of TSS to the model contributed additional information that causes a significant difference, however this causes an increase in complexity such that the

AIC and BIC are quite a bit larger. This is also the case for the mathematics data ($LRT\ (19) = 13329.98\ (\rho < .05),\ AIC\ = 347941.83,\ BIC\ = 348209.06$) where the addition of TSS causes a significant difference, yet increases the complexity with larger AIC and BIC values. The AIC and BIC suggest that the addition of TSS does not fit as well, however, there is not a measure to determine if the fit is still adequate. Therefore, the stability of the model was also checked by examining the estimated means, residual variances, and the R^2 estimates from standardized output in M*plus* for both reading and mathematics data. The estimated means showed little difference to the cubic orthogonal polynomial model estimated means for reading and mathematics, the residual variances were significant and positive for both, and the R^2 showed no change from Table 4-12 that is based on the CFA for TSS and DAS; thus supporting the models fit adequately.

Reading Achievement LGCM With One TIC

In the reading LGCM, TSS significantly predicted a negative intercept factor ($\hat{\gamma}_{ETA0} = -19.95,\ s.e. = 1.29,\ \rho < 0.05$), negative linear slope factor ($\hat{\gamma}_{ETA1} = -7.31,\ s.e. = 0.69,\ \rho < 0.05$), and a positive quadratic slope factor ($\hat{\gamma}_{ETA2} = 4.66, s.e. = 0.49,\ \rho < 0.05$) (Figure 4-15). The estimates for TSS did not show a significant difference from the mean cubic slope ($\hat{\gamma}_{ETA3} = -0.25, s.e. = 0.32,\ \rho > 0.05$). Indicating that, on average, children high in TSS are observed to have lower initial reading achievement scores with a lower rate of change over time suggesting that a one-unit increase in TSS is associated with a 7.31 decrease in the slope of the trajectory of reading achievement. TSS also predicted a slower deceleration for children high in TSS as compared to children low in TSS.

Mathematics Achievement LGCM With One TIC

TSS for the mathematics achievement, significantly predicted a negative intercept factor ($\hat{\gamma}_{ETA0} = -16.29,\ s.e. = 1.11,\ \rho < 0.05$), a negative linear slope factor ($\hat{\gamma}_{ETA1} = -5.58,$ $s.e. = 0.66,\ \rho < 0.05$), a positive quadratic slope factor ($\hat{\gamma}_{ETA2} = 1.66, s.e. = 0.38,\ \rho < 0.05$), and a negative cubic slope factor ($\hat{\gamma}_{ETA3} = -1.03,\ s.e. = 0.28,\ \rho < 0.05$) (Figure 4-16). This suggest that, on average, children high in TSS are observed to have lower initial mathematics achievement scores with lower rates of change that indicate a one-unit increase in TSS is associated with a 5.58 decrease in the slope of the trajectory of mathematics achievement over time. The positive quadratic slope factor attenuates the mean quadratic cup down trend, thus slowing the plateau effect for children high in TSS. The negative cubic slope factor is reducing the mean cubic slopes amplification of the quadratics decelerating effect on the growth rate over time.

Based on the results of the first statistical analysis, there is a significant relationship between traumatic stress symptoms and reading and mathematics achievement. Children who are reported as having higher levels of traumatic stress also have lower levels of initial performance and performance over time. These findings support prior research in this area (Goodman et al., 2012) and go further to suggest that these lower levels of achievement can persist across grade levels and developmental trajectories.

Reading and Mathematics Growth Trajectory and DAS

The second research question explored: What is the relationship between the growth trajectory of reading and mathematics achievement and difficult attachment symptoms for children in kindergarten through fifth grade? This question was examined with the nested level 2 model in Equation 4-12:

$$\eta_i = \mu_\eta + \Gamma x_i + \zeta_i \tag{4-12}$$

$$\eta_i = \begin{bmatrix} \eta_{00} \\ \eta_{10} \\ \eta_{20} \\ \eta_{30} \end{bmatrix} \quad \mu_\eta = \begin{bmatrix} \mu_{\eta_{00}} \\ \mu_{\eta_{10}} \\ \mu_{\eta_{20}} \\ \mu_{\eta_{30}} \end{bmatrix} \quad \Gamma = \begin{bmatrix} \gamma_{\eta_{01}} \\ \gamma_{\eta_{11}} \\ \gamma_{\eta_{21}} \\ \gamma_{\eta_{31}} \end{bmatrix} \quad x_i = \begin{bmatrix} x_{2i} \end{bmatrix} \quad \zeta_i = \begin{bmatrix} \zeta_{\eta_{0i}} \\ \zeta_{\eta_{1i}} \\ \zeta_{\eta_{2i}} \\ \zeta_{\eta_{3i}} \end{bmatrix}$$

where x_{2i} represents the time-invariant covariate (TIC): *difficult attachment symptoms* (DAS). The following are the mean estimates for reading achievement for children who are low on DAS: mean intercept slope factor = 192.78 ($s.e = 1.10$), mean linear slope = 97.28 ($s.e. = 0.58$), mean quadratic slope = -17.50 ($s.e. = 0.33$), and the mean cubic slope = -1.53 ($s.e. = 0.23$). The following are the mean estimates for mathematics achievement for children who are low on DAS: mean intercept slope factor = 152.92 ($s.e = 1.01$), mean linear slope = 80.62 ($s.e. = 0.57$), mean quadratic slope = -11.73 ($s.e. = 0.20$), and the mean cubic slope = 1.40 ($s.e. = 0.19$).

The path model for the structural equation of reading achievement with the TIC DAS can be seen in Figure 4-17 and mathematics achievement in Figure 4-18. The reading data results of the LRT, AIC, and BIC ($LRT\ (19) = 5441.76 (\rho < .05)$, $AIC = 324150.22$, $BIC = 324417.45$) show again that the addition of a TIC, in this case DAS, to the model contributed additional information that caused a significant difference. More complexity resulted and the AIC and BIC values were larger. The mathematics data ($LRT\ (19) = 5498.55\ (\rho < .05)$, $AIC = 316497.59$, $BIC = 316764.83$) also showed that the addition of DAS caused a significant difference, with the expected increase in the AIC and BIC values. The estimated means maintained accuracy for both reading and mathematics, the residual variances were

significant and positive for both, and the R^2 showed no change from Table 4-12, thus supporting the models adequacy of fit.

Reading Achievement LGCM With One TIC

In the reading LGCM, DAS significantly predicted a negative intercept factor ($\hat{\gamma}_{ETA0} = -8.75,\ s.e. = 1.95,\ \rho < 0.05$), a negative linear slope factor ($\hat{\gamma}_{ETA1} = -4.34,\ s.e. = 0.93,\ \rho < 0.05$), and a positive quadratic slope factor ($\hat{\gamma}_{ETA2} = 1.93, s.e. = 0.53,\ \rho < 0.05$) (Figure 4-17). The cubic slope factor was not found to be significantly different from the mean cubic slope ($\hat{\gamma}_{ETA3} = -0.06, s.e. = 0.44,\ \rho > 0.05$). Thus, on average, children high in DAS are observed to have lower initial reading achievement scores and lower rates of change over time suggesting that a one-unit increase in DAS is associated with a 4.34 decrease in the slope of the trajectory of reading achievement. The concave upward trend of the quadratic slope factor suggests a slowing of the decelerating trend of the quadratic slope for children high in DAS.

Mathematics Achievement LGCM With One TIC

DAS for the mathematics achievement significantly predicted a negative intercept factor ($\hat{\gamma}_{ETA0} = -7.94,\ s.e. = 1.73,\ \rho < 0.05$), negative linear slope factor ($\hat{\gamma}_{ETA1} = -2.64,\ s.e. = 0.78,\ \rho < 0.05$), and a positive quadratic slope factor ($\hat{\gamma}_{ETA2} = 1.20, s.e. = 0.36,\ \rho < 0.05$) (Figure 4-18). DAS did not estimate a significantly different cubic slope factor from the mean cubic slope ($\hat{\gamma}_{ETA3} = -0.22,\ s.e. = 0.26,\ \rho > 0.05$). Indicating that, on average, children high in DAS are observed to have lower initial mathematics achievement scores and a lower growth trend over time that for a one-unit increase in DAS is associated with a 2.64 decrease in the slope of the trajectory of mathematics achievement. The positive quadratic slope factor indicated an attenuation of the decelerating effects of the mean quadratic slope, thus slowing the plateau effect for children high in DAS.

Based on the results of the second statistical analysis, there is a significant relationship between difficult attachment symptoms and reading and mathematics achievement initially and over time. Children whose parents reported as having higher levels of difficult attachment symptoms also have lower levels of initial performance and lower performance over time. These findings support prior research in this area (Bergin & Bergin, 2009; Pianta & Harbers, 1996) and goes further to suggest that these higher levels of difficult attachment symptoms start before second grade, rather in this study that they at least begin in kindergarten, and lead to lower levels of achievement that can persist at least until fifth grade.

Reading and Mathematics Growth Trajectory and TSS and DAS

The third research question explores: What is the relationship between the growth trajectory of reading and mathematics achievement and traumatic stress symptoms and difficult attachment symptoms for children in kindergarten through fifth grade? This question was examined with the nested level 2 model using Equation 4-13:

$$\eta_i = \mu_\eta + \Gamma x_i + \zeta_i \tag{4-13}$$

$$\eta_i = \begin{bmatrix} \eta_{00} \\ \eta_{10} \\ \eta_{20} \\ \eta_{30} \end{bmatrix} \quad \mu_\eta = \begin{bmatrix} \mu_{\eta_{00}} \\ \mu_{\eta_{10}} \\ \mu_{\eta_{20}} \\ \mu_{\eta_{30}} \end{bmatrix} \quad \Gamma = \begin{bmatrix} \gamma_{\eta_{01}} & \gamma_{\eta_{02}} \\ \gamma_{\eta_{11}} & \gamma_{\eta_{12}} \\ \gamma_{\eta_{21}} & \gamma_{\eta_{22}} \\ \gamma_{\eta_{31}} & \gamma_{\eta_{32}} \end{bmatrix} \quad x_i = \begin{bmatrix} x_{1i} \\ x_{2i} \end{bmatrix} \quad \zeta_i = \begin{bmatrix} \zeta_{\eta_{0i}} \\ \zeta_{\eta_{1i}} \\ \zeta_{\eta_{2i}} \\ \zeta_{\eta_{3i}} \end{bmatrix}$$

where x_{1i} represents the time-invariant covariate (TIC): *traumatic stress symptoms* (TSS) and x_{2i} represents the time-invariant covariate (TIC): *difficult attachment symptoms* (DAS). The following are the mean estimates for children who are low on TSS and DAS: mean intercept slope factor = 192.74 ($s.e = 1.10$), mean linear slope = 97.22 ($s.e. = 0.58$), mean quadratic slope = -17.47 ($s.e. = 0.33$), and the mean cubic slope = -1.51 ($s.e. = 0.22$). The following are the mean estimates for mathematics achievement for children who are low on TSS and DAS:

mean intercept slope factor = 152.92 ($s.e\ =\ 1.01$), mean linear slope = 80.61 ($s.e. = 0.57$), mean quadratic slope = -11.73 ($s.e. = 0.20$), and the mean cubic slope = 1.39 ($s.e. = 0.19$).

The path model for the structural equation of reading achievement with the TICs TSS and DAS can be seen in Figure 4-19 and mathematics achievement in Figure 4-20. For the reading data, results of the LRT, AIC, and BIC when compared to the cubic LGCM ($LRT\ (39) = 17703.80\ (\rho < .05),\ AIC\ = 381000.23,\ BIC = 381408.11$) showed again that the addition of the TICs TSS and DAS together contributed significant additional information, with expected complexity resulting in larger AIC and BIC values. The mathematics data ($LRT\ (39) = 17768.87(\rho < .05),\ AIC\ = 373385.98,\ BIC = 373793.86$) also showed this same trend. The estimated means maintained accuracy for both reading and mathematics, the residual variances were significant and positive for both, and the R^2 stayed the same for both TSS and DAS, all together supporting model fit.

Reading Achievement LGCM With Two TICs

TIC1: TSS and DAS. In the reading LGCM when controlling for DAS, TSS significantly predicted a negative intercept factor ($\hat{\gamma}_{ETA0} = -17.47,\ s.e. = 1.44,\ \rho < 0.05$), a negative linear slope factor ($\hat{\gamma}_{ETA1} = -5.90,\ s.e. = 0.72,\ \rho < 0.05$), and a positive quadratic slope factor ($\hat{\gamma}_{ETA2} = 4.12, s.e. = 0.52,\ \rho < 0.05$) (Figure 4-19). TSS's cubic slope factor was not found to be significantly different from the mean cubic slope ($\hat{\gamma}_{ETA3} = -0.24, s.e. = 0.38,\ \rho > 0.05$). Indicating that children high in TSS have a lower initial reading score and a lower rate of growth over time that suggested a one-unit increase in TSS was associated with a 5.90 decrease in the slope of the trajectory of reading achievement. The positive quadratic slope factor attenuates the mean negative quadratic slope.

TIC2: DAS and TSS. When controlling for TSS, DAS had a significant negative intercept factor ($\hat{\gamma}_{ETA0} = -6.37,\ s.e. = 1.75,\ \rho < 0.05$), negative linear slope factor ($\hat{\gamma}_{ETA1} = -3.62,\ s.e. = .87,\ \rho < 0.05$), and positive quadratic slope factor ($\hat{\gamma}_{ETA2} = 1.37,\ s.e. = .50,\ \rho < 0.05$) (Figure 4-19). DAS did not significantly predict a cubic slope factor that was different from the mean cubic slope ($\hat{\gamma}_{ETA3} = -0.07,\ s.e. = .48,\ \rho > 0.05$). These results indicate that when controlling for TSS, DAS predicted a lower initial reading achievement score with a lower rate of growth over time showing that for every one-unit increase in DAS resulted in a decrease of 3.62 units in the slope of the trajectory. The quadratic slope factor is also estimated to be reducing the effects of the mean negative quadratic slope, which results in children high in DAS not leveling off in the growth trend as fast as children low in DAS.

Mathematics Achievement LGCM With Two TICs

TIC1: TSS and DAS. When controlling for DAS for the mathematics data, TSS significantly predicted a negative intercept factor ($\hat{\gamma}_{ETA0} = -13.91,\ s.e. = 1.25,\ \rho < 0.05$), negative linear slope factor ($\hat{\gamma}_{ETA1} = -4.80,\ s.e. = 0.67,\ \rho < 0.05$), positive quadratic slope factor ($\hat{\gamma}_{ETA2} = 1.24, s.e. = 0.41,\ \rho < 0.05$), and a negative cubic slope factor ($\hat{\gamma}_{ETA3} = -1.00,\ s.e. = 0.30,\ \rho < 0.05$) (Figure 4-20). Indicating that, on average, children high in TSS are observed to have lower initial mathematics achievement scores and lower rates of change over time such that a one-unit increase in TSS was associated with a 4.80 decrease in the slope of the trajectory of mathematics achievement. The positive quadratic slope factor showed an attenuation of the mean quadratic slope thus resulting in children high in TSS not having their growth rate slowed down as fast. The negative cubic slope factor is also slowing the mean cubic slopes trend of speeding up of this slowing down of the mathematics achievement growth rate.

TIC2: DAS and TSS. DAS for the mathematics data significantly predicted a negative intercept factor ($\hat{\gamma}_{ETA0} = -6.02,\ s.e. = 1.60,\ \rho < 0.05$), negative linear slope factor ($\hat{\gamma}_{ETA1} = -1.99,\ s.e. = 0.75,\ \rho < 0.05$), positive quadratic slope factor ($\hat{\gamma}_{ETA2} = 1.03, s.e. = 0.38,\ \rho < 0.05$), while controlling for TSS (Figure 4-20). DAS did not predict a significant difference from the mean cubic slope ($\hat{\gamma}_{ETA3} = -0.10,\ s.e. = 0.27,\ \rho > 0.05$). This suggests that while controlling for TSS, children high in DAS have a lower initial mathematics score with a downward trajectory over time that for every one-unit increase in DAS is associated with a 1.99 decrease in the slope of mathematics achievement trajectory. The positive quadratic slope factor is attenuating the mean quadratic slope, resulting in a flatter growth trajectory.

Based on the results of the third statistical analysis, there is a significant relationship between traumatic stress symptoms and difficult attachment symptoms with reading and mathematics achievement. Children who are reported as having higher levels of traumatic stress and difficult attachment symptoms also have lower levels of initial performance and performance over time. These findings support prior research that has looked at both traumatic stress and attachment behaviors (Bailey et al., 2007; De Young et al., 2011a, 2011b; Lieberman, 2004; Lieberman & Van Horn, 2008; Mongillo et al., 2009) suggesting difficulties, but not specifically looking at academic achievement. Only Goodman et al.'s (2012) study connected the effects of traumatic stress to reading and mathematics achievement at the cross-sectional fifth grade level. The findings of this study go further to suggest that traumatic stress symptoms and difficult attachment symptoms together predict lower levels of achievement and that these lower levels can persist across grade levels as well as developmental trajectories.

Reading and Mathematics Growth Trajectory and TSS, DAS, Gender, SES, and Culture

The fourth research question explores: What is the relationship between the growth trajectory of reading and mathematics achievement and traumatic stress symptoms and difficult attachment symptoms for children in kindergarten through fifth grade, while controlling for gender, culture, and socioeconomic status? This question was examined with the level 2 model in Equation 4-14:

$$\eta_i = \mu_\eta + \Gamma x_i + \zeta_i \tag{4-14}$$

$$\eta_i = \begin{bmatrix} \eta_{00} \\ \eta_{10} \\ \eta_{20} \\ \eta_{30} \end{bmatrix} \quad \mu_\eta = \begin{bmatrix} \mu_{\eta_{00}} \\ \mu_{\eta_{10}} \\ \mu_{\eta_{20}} \\ \mu_{\eta_{30}} \end{bmatrix} \quad \Gamma = \begin{bmatrix} \gamma_{\eta_{01}} & \gamma_{\eta_{02}} & \cdots & \gamma_{\eta_{06}} \\ \gamma_{\eta_{11}} & \gamma_{\eta_{12}} & \cdots & \gamma_{\eta_{16}} \\ \gamma_{\eta_{21}} & \gamma_{\eta_{22}} & \cdots & \gamma_{\eta_{26}} \\ \gamma_{\eta_{31}} & \gamma_{\eta_{32}} & \cdots & \gamma_{\eta_{36}} \end{bmatrix} \quad x_i = \begin{bmatrix} x_{1i} \\ x_{2i} \\ \vdots \\ x_{9i} \end{bmatrix} \quad \zeta_i = \begin{bmatrix} \zeta_{\eta_{0i}} \\ \zeta_{\eta_{1i}} \\ \zeta_{\eta_{2i}} \\ \zeta_{\eta_{3i}} \end{bmatrix}$$

where x_{1i} is the time-invariant covariate (TIC): *traumatic stress symptoms* (TSS), x_{2i} is the TIC: *difficult attachment symptoms* (DAS), x_{3i} is the TIC gender, x_{4i} represents the TIC gender of interviewed parent/caregiver, x_{5i} represents the TIC SES, the next four variables represent dummy codes of the variable culture: x_{6i} represents the TIC Asian American culture, x_{7i} represents the TIC African American culture, x_{8i} represents the TIC Latina/o culture, x_{9i} represents the TIC other people of color culture. However, as mentioned earlier, TIC x_{4i} and x_{9i} were found to be insignificant in the model and are not discussed in the results.

The following are the mean estimates for children from average SES families, whose interviewed caregiver was female, the child is male, European American, and the children are low on TSS and DAS: mean intercept slope factor = 193.52 ($s.e = 1.38$), mean linear slope = 98.73 ($s.e. = 0.75$), mean quadratic slope = -17.11 ($s.e. = 0.44$), and the mean cubic slope = -2.00 ($s.e. = 0.34$). The following are the mean estimates for mathematics achievement for children from average SES, whose interviewed caregiver was female, the child is male, European

American, and the children are low on TSS and DAS: mean intercept slope factor = 161.43 ($s.e\ =\ 1.09$), mean linear slope = 85.12 ($s.e. = 0.63$), mean quadratic slope = -12.99 ($s.e. = 0.30$), and the mean cubic slope = 1.15 ($s.e. = 0.39$).

For the reading data, results of the LRT, AIC, and BIC when compared to the cubic LGCM with TSS and DAS as TICs ($LRT\ (28) =\ 783.44\ (\rho < .05),\ AIC\ = 378523.09,$ $BIC = 379127.85$) showed that the addition of the TICs gender, SES, and culture to the reading HMLM cubic orthogonal polynomial model with the TICs TSS and DAS contributed significant additional information. Interestingly the addition of these four TICs resulted in a reduction in the AIC and BIC values. This suggests that gender, SES, and culture have significant information that they add to this model causing it to fit the data better than TSS and DAS alone.

The results for the mathematics data ($LRT\ (26) =\ 931.09\ (\rho < .05),\ AIC\ =$ $370708.24,\ BIC = 371313.00$) showed similar results to the trends displayed by the reading data. The addition of the TICs gender, SES, and culture to the mathematics HMLM cubic orthogonal polynomial model with the TICs TSS and DAS contributed significant additional information. Again there was a reduction in the AIC and BIC values. This suggests that gender, SES, and culture have significant information for the mathematics model as well. The estimated means maintained accuracy for both reading and mathematics, the residual variances were significant and positive for both, and the R^2 stayed similar for both TSS and DAS, all together supporting model fit.

Reading Achievement LGCM With Seven TICs

TIC1: TSS and DAS, Gender, SES, Culture. For the reading achievement trajectory data, TSS was examined first while controlling for DAS, gender, SES, and culture. TSS significantly predicted a negative intercept factor ($\hat{\gamma}_{ETA0} = -12.92,\ s.e. = 1.31,\ \rho < 0.05$), a

negative linear slope factor ($\hat{\gamma}_{ETA1} = -4.01,\ s.e. = 0.70,\ \rho < 0.05$), and a positive quadratic slope factor ($\hat{\gamma}_{ETA2} = 3.25,\ s.e. = 0.51,\ \rho < 0.05$). The cubic slope factor was found not be significantly different from the mean cubic slope ($\hat{\gamma}_{ETA3} = -0.29,\ s.e. = 0.38,\ \rho > 0.05$). Indicating that, on average, children high in TSS are observed to have lower initial reading achievement scores with a downward rate of change that reflects with a one-unit increase in TSS this was associated with a 4.01 decrease in the slope of the trajectory of reading achievement. The concave up quadratic slope factor acts against the mean concave down quadratic slope, resulting in a flattening of the growth rate over time.

TIC2: DAS and TSS, Gender, SES, Culture. DAS was examined next controlling for TSS, gender, SES, and culture. DAS significantly predicted a negative intercept factor ($\hat{\gamma}_{ETA0} = -3.37,\ s.e. = 1.40, \rho < 0.05$) and a negative linear slope factor ($\hat{\gamma}_{ETA1} = -2.44,\ s.e. = 0.80,\ \rho < 0.05$). It showed that the quadratic slope factor ($\hat{\gamma}_{ETA2} = 0.77,\ s.e. = 0.46,\ \rho > 0.05$) and the cubic slope factor ($\hat{\gamma}_{ETA3} = -0.20, s.e. = 0.46, \rho > 0.05$) are not estimated to be significantly different from the mean quadratic and cubic slopes. This suggests that when all other TICs are controlled for, on average, children high in DAS have lower initial reading achievement scores and show a downward rate of change over time. Thus, with a one-unit change in DAS there is an associated 2.44 decrease in the slope trajectory of reading achievement.

TIC3: Gender and TSS, DAS, SES, Culture. The results of the analysis for gender controlling for TSS, DAS, SES, and culture were looked at next. Gender showed a significant positive intercept factor ($\hat{\gamma}_{ETA0} = 5.42,\ s.e. = 1.40,\ \rho < 0.05$), a positive linear slope factor ($\hat{\gamma}_{ETA1} = 1.58,\ s.e. = 0.72,\ \rho < 0.05$), and a negative quadratic slope factor ($\hat{\gamma}_{ETA2} = -1.84,\ s.e. = 0.55,\ \rho < 0.05$). However, gender did not show a significant difference from the mean

cubic slope ($\hat{\gamma}_{ETA3} = -0.05,\ s.e. = 0.37,\ \rho > 0.05$). This indicates that females, on average, show higher reading achievement scores at initial assessment and have an increasing rate of change in reading achievement over time. The concave downward quadratic slope factor accentuates the already negative quadratic slope, resulting in females have a faster reduction in the rate of growth over time. So even though females start out higher in scores and have a higher rate of growth over time, their growth rate is decelerating at a faster rate. Where males start out lower in reading achievement, have lower rates of change, but their growth rate does not decelerate as fast.

TIC4: SES and TSS, DAS, Gender, Culture. Examining Socioeconomic status (SES) while controlling for TSS, DAS, gender, and culture significantly predicted a positive intercept factor ($\hat{\gamma}_{ETA0} = 20.41,\ s.e. = 1.02,\ \rho < 0.05$), a positive linear slope factor ($\hat{\gamma}_{ETA1} = 7.33,\ s.e. = 0.53,\ \rho < 0.05$), and a negative quadratic slope factor ($\hat{\gamma}_{ETA2} = -3.63,\ s.e. = 0.33,\ \rho < 0.05$). SES did not predict a significantly different cubic slope factor from the mean cubic slope ($\hat{\gamma}_{ETA3} = -0.24,\ s.e. = 0.30,\ \rho > 0.05$). This estimation predicts that on average, children whose families are high in SES are observed to have the highest initial reading achievement scores with a large positive rate of change over time respectively. This predicts that a one-unit increase in SES is associated with a 7.33 unit increase in the slope of the trajectory of reading achievement. Those high in SES also show a larger concave down quadratic trend resulting in a greater decelerating growth rate over time. This suggests that reading achievement plateaus for high SES children as they head toward third and fifth grade.

TIC5: Asian American Culture and TSS, DAS, Gender, SES, AA, Latina/o culture. The relationship of Asian American culture on reading achievement while controlling for TSS, DAS, gender, SES, AA, and Latina/o culture showed significant predictions for a negative linear

slope factor ($\hat{\gamma}_{ETA1} = -3.90,\ s.e. = 1.69,\ \rho < 0.05$) and cubic slope factor ($\hat{\gamma}_{ETA3} = 3.04,$ $s.e. = 0.96,\ \rho < 0.05$). The intercept factor ($\hat{\gamma}_{ETA0} = 5.53,\ s.e. = 3.66,\ \rho > 0.05$) and the quadratic slope factor ($\hat{\gamma}_{ETA2} = -0.20,\ s.e. = 1.26,\ \rho > 0.05$) were found to not be significantly different from their respective mean slopes. These results show that children of Asian American culture, on average, for reading achievement show a lower growth rate over time as compared to children of European American and Latina/o cultures and that their cubic factor is maintaining the quadratics deceleration.

TIC6: AA Culture and TSS, DAS, Gender, SES, Asian American, Latina/o culture. The relationship of African American culture on reading achievement while controlling for TSS, DAS, gender, SES, Asian American, and Latina/o culture showed significant predictions for a negative intercept factor ($\hat{\gamma}_{ETA0} = -10.35,\ s.e. = 2.06,\ \rho < 0.05$) and negative linear slope factor ($\hat{\gamma}_{ETA1} = -8.92,\ s.e. = 1.31,\ \rho < 0.05$), however, the quadratic slope factor ($\hat{\gamma}_{ETA2} =$ $0.93,\ s.e. = 0.89,\ \rho > 0.05$) and cubic slope factor ($\hat{\gamma}_{ETA3} = 0.77,\ s.e. = 0.82,\ \rho > 0.05$) were found to not be different from their respective mean slopes. Importantly, African American cultures negative intercept slope factor was almost as large as children who were high on TSS. These results suggest that children of African American culture, on average, begin kindergarten with lower initial mean reading achievement scores while showing a lower growth rate over time as compared to children of European American, Asian American, and Latina/o cultures.

TIC7: Latina/o culture and TSS, DAS, Gender, SES, AA culture. The relationship of Latina/o culture on reading achievement while controlling for TSS, DAS, gender, SES, Asian American, and African American culture showed a significant negative intercept factor ($\hat{\gamma}_{ETA0} =$ $-6.80,\ s.e. = 2.12, \rho < 0.05$), but was found to not have significant differences in the mean linear slope ($\hat{\gamma}_{ETA1} = -1.63,\ s.e. = 1.02,\ \rho > 0.05$), mean quadratic slope ($\hat{\gamma}_{ETA2} = 0.86,$

$s.e. = 0.81,\ \rho > 0.05$), or the mean cubic slope ($\hat{\gamma}_{ETA3} = 0.97,\ s.e. = 0.68,\ \rho > 0.05$). Therefore these estimates suggest that, on average, children from Latina/o cultures only show differences in their initial reading achievement scores, which are lower as compared to European American children.

Based on the results of the fourth statistical analysis, there is a significant relationship between traumatic stress symptoms, difficult attachment symptoms, gender, SES, Asian American culture, AA culture, and Latina/o culture with reading achievement. Children who are reported as having higher levels of traumatic stress, difficult attachment symptoms, are male, low in SES, and Asian American, African American, or Latina/o also have lower levels of initial performance and/or performance over time. These findings support prior research that has looked at traumatic stress (Goodman et al., 2012), difficult attachment symptoms (Lieberman, 2004; Pianta & Harbers, 1996), gender (Clark et al., 2008; Dearing et al., 2009), low in SES (Chatterji, 2006), and are either African American or Latina/o (Crumpton & Gregory, 2011; Morris, 2008) as indicators for lower reading achievement. The findings of this study go further to suggest that all seven covariates predict lower levels of reading achievement and that these lower levels can persist across grade levels from kindergarten through at least fifth grade as well as developmental trajectories.

Mathematics Achievement LGCM With Seven TICs

TIC1: TSS and DAS, Gender, SES, Culture. For the mathematics achievement trajectory data, TSS was examined while controlling for DAS, gender, SES, and culture. TSS significantly predicted a negative intercept factor ($\hat{\gamma}_{ETA0} = -11.86,\ s.e. = 1.17,\ \rho < 0.05$), a negative linear slope factor ($\hat{\gamma}_{ETA1} = -4.13,\ s.e. = 0.66,\ \rho < 0.05$), a positive quadratic slope factor ($\hat{\gamma}_{ETA2} = 1.09,\ s.e. = 0.38,\ \rho < 0.05$), and a negative cubic slope factor ($\hat{\gamma}_{ETA3} =$

$-0.93,\ s.e. = 0.29,\ \rho < 0.05$). Indicating that, on average, children high in TSS are observed to have lower initial mathematics achievement scores and a lower rate of change over time that suggested with a one-unit increase in TSS there is an associated 4.13 decrease in the slope of the trajectory of mathematics achievement. The positive quadratic slope factor attenuates the effects of the negative mean quadratic slope thus reducing the deceleration of the growth trajectory over time. While the negative cubic slope factor also is working against the mean positive cubic slopes effects, thus reducing its amplification of the cup down quadratic trend.

TIC2: DAS and TSS, Gender, SES, Culture. DAS was examined next controlling for TSS, gender, SES, and culture. DAS significantly predicted a negative intercept factor ($\hat{\gamma}_{ETA0} = -2.81,\ s.e. = 1.32,\ \rho < 0.05$). DAS did not show significantly different results from the mean linear slope ($\hat{\gamma}_{ETA1} = -1.22,\ s.e. = 0.70,\ \rho > 0.05$), mean quadratic slope ($\hat{\gamma}_{ETA2} = 0.55,\ s.e. = 0.38,\ \rho > 0.05$), or the mean cubic slope ($\hat{\gamma}_{ETA3} = 0.16,\ s.e. = 0.28,\ \rho > 0.05$). This suggests that when all other TICs are controlled for, on average, children high in DAS had lower initial mathematics achievement scores, but similar rates of change (linear slope and other polynomial slopes) to children low on DAS.

TIC3: Gender and TSS, DAS, SES, Culture. The results of the analysis for gender controlling for TSS, DAS, SES, and culture were looked at next. Gender showed a significant negative intercept factor ($\hat{\gamma}_{ETA0} = -7.73,\ s.e. = 1.25,\ \rho < 0.05$), a negative linear slope factor ($\hat{\gamma}_{ETA1} = -5.70,\ s.e. = 0.65,\ \rho < 0.05$), and a positive quadratic slope factor ($\hat{\gamma}_{ETA2} = 1.30,\ s.e. = 0.35,\ \rho < 0.05$). However, gender did not show a significant difference from the mean cubic slope ($\hat{\gamma}_{ETA3} = 0.55,\ s.e. = 0.35,\ \rho > 0.05$). This indicates that females, on average, show lower mathematics achievement scores at initial assessment and have a lower rate of change in mathematics achievement over time. The concave upward quadratic slope factor works

against the negative mean quadratic slope, resulting in a slight reduction in the deceleration trend over time.

TIC4: SES and TSS, DAS, Gender, Culture. Examining Socioeconomic status (SES) while controlling for TSS, DAS, gender, and culture significantly predicted a positive intercept factor ($\hat{\gamma}_{ETA0} = 16.59,\ s.e. = 0.87,\ \rho < 0.05$), a positive linear slope factor ($\hat{\gamma}_{ETA1} = 6.20,\ s.e. = 0.42,\ \rho < 0.05$), and a negative quadratic slope factor ($\hat{\gamma}_{ETA2} = -2.00,\ s.e. = 0.24,\ \rho < 0.05$). SES did not predict a significant difference from the mean cubic slope ($\hat{\gamma}_{ETA3} = -0.29,\ s.e. = 0.19,\ \rho > 0.05$). This estimation predicted that on average, children whose families are high in SES are observed to have higher initial mathematics achievement scores with higher rate of change over time. This suggests that a one-unit increase in SES is associated with a 6.20 increase in the slope of the trajectory of mathematics achievement. Those high in SES also show a concave down quadratic slope factor that accentuates the mean cup down quadratic slope, causing children high in SES to have a greater decelerating rate of change over time. This suggests that mathematics achievement may have a plateau or ceiling effect as well.

TIC5: Asian American Culture and TSS, DAS, Gender, SES, AA, Latina/o culture. The relationship of Asian American culture on mathematics achievement while controlling for TSS, DAS, gender, SES, AA, and Latina/o culture showed significant predictions for a positive linear slope factor ($\hat{\gamma}_{ETA1} = 4.48,\ s.e. = 1.54,\ \rho < 0.05$), a positive quadratic slope factor ($\hat{\gamma}_{ETA2} = 2.60,\ s.e. = 1.05,\ \rho < 0.05$) and a negative cubic slope factor ($\hat{\gamma}_{ETA3} = -1.22,\ s.e. = 0.61,\ \rho < 0.05$). The intercept factor ($\hat{\gamma}_{ETA0} = 4.90,\ s.e. = 3.74,\ \rho > 0.05$) was found to not be significantly different from its respective mean slopes. These results show that children of Asian American culture, on average, for mathematics achievement show a higher growth rate over time as compared to children of European American, African American, and Latina/o

cultures. The positive or cup up quadratic slope factor suggests that this higher growth rate is accelerating and the negative cubic slope factor shows this acceleration is reducing over time.

TIC6: AA Culture and TSS, DAS, Gender, SES, Latina/o culture. The relationship of African American culture on mathematics achievement while controlling for TSS, DAS, gender, SES, Asian American, and Latina/o culture showed significant predictions for a negative intercept factor ($\hat{\gamma}_{ETA0} = -15.84,\ s.e. = 1.97,\ \rho < 0.05$), negative linear slope factor ($\hat{\gamma}_{ETA1} = -8.81,\ s.e. = 1.13,\ \rho < 0.05$), and a positive quadratic slope factor ($\hat{\gamma}_{ETA2} = 1.85,\ s.e. = 0.68,\ \rho < 0.05$). The cubic slope factor ($\hat{\gamma}_{ETA3} = -0.41,\ s.e. = 0.60,\ \rho > 0.05$) was found not to be significantly different from the mean cubic slope. In mathematics achievement an even larger negative mean intercept slope factor is estimated than children who were high on TSS. These results suggest that children of African American culture, on average, begin kindergarten with lower initial mean mathematics achievement scores while showing a lower rate of change in mathematics achievement over time and this trend is attenuating the mean quadratic trend of cup down or decelerating rate of change over time.

TIC7: Latina/o culture and TSS, DAS, Gender, SES, AA culture. The relationship of Latina/o culture on mathematics achievement while controlling for TSS, DAS, gender, SES, Asian American, and African American culture showed a significant negative intercept factor ($\hat{\gamma}_{ETA0} = -6.91,\ s.e. = 1.61,\ \rho < 0.05$) and positive quadratic slope factor ($\hat{\gamma}_{ETA2} = 1.36,\ s.e. = 0.51,\ \rho < 0.05$). The linear slope factor ($\hat{\gamma}_{ETA1} = 1.36,\ s.e. = 0.88,\ \rho > 0.05$) and cubic slope factor ($\hat{\gamma}_{ETA3} = 0.04,\ s.e. = 0.45,\ \rho > 0.05$) was found to not be significantly different from the respective mean slope factors. Therefore these estimates suggest that, on average, children from Latina/o cultures begin school with a lower initial mathematics achievement score as compared to European American children and due to a cup up quadratic

slope factor have less of a deceleration in growth over time. Latina/o children do not differ on the other trajectories of mathematics achievement over time.

Based on the results of the fourth statistical analysis, there is a significant relationship between traumatic stress symptoms, difficult attachment symptoms, gender, SES, Asian American, AA culture, and Latina/o culture with mathematics achievement. Children who are reported as having higher levels of traumatic stress, difficult attachment symptoms, are female, low in SES, and are either African American or Latina/o also have lower levels of initial performance and performance over time. These findings support prior research that has looked at traumatic stress (Goodman et al., 2012), difficult attachment symptoms (Lieberman, 2004; Pianta & Harbers, 1996), gender (Clark et al., 2008; Dearing et al., 2009), low in SES (Chatterji, 2006), and are either African American or Latina/o (Crumpton & Gregory, 2011; Morris, 2008) as indicators for lower mathematics achievement. The findings of this study go further to suggest that six of the covariates predict lower levels of mathematics achievement and that these lower levels can persist across grade levels from kindergarten through at least fifth grade as well as through developmental trajectories; with the exception of Asian American culture which actually shows larger growth rates than their European American peers.

Reading and Mathematics Growth Trajectory and TSS, DAS, Gender, SES, Culture, and the Interaction Between TSS and DAS

The fifth research question explores: What is the relationship of an interaction effect between traumatic stress symptoms and difficult attachment symptoms on the growth trajectory of reading and mathematics achievement for children in kindergarten through fifth grade, while controlling for gender, culture, and socioeconomic status? This question was examined with the level 2 model in Equation 4-15:

$$\eta_i = \mu_\eta + \Gamma x_i + \zeta_i \tag{4-15}$$

$$\eta_i = \begin{bmatrix} \eta_{00} \\ \eta_{10} \\ \eta_{20} \\ \eta_{30} \end{bmatrix} \quad \mu_\eta = \begin{bmatrix} \mu_{\eta_{00}} \\ \mu_{\eta_{10}} \\ \mu_{\eta_{20}} \\ \mu_{\eta_{30}} \end{bmatrix} \quad \Gamma = \begin{bmatrix} \gamma_{\eta_{01}} & \gamma_{\eta_{02}} & \cdots & \gamma_{\eta_{07}} \\ \gamma_{\eta_{11}} & \gamma_{\eta_{12}} & \cdots & \gamma_{\eta_{17}} \\ \gamma_{\eta_{21}} & \gamma_{\eta_{22}} & \cdots & \gamma_{\eta_{27}} \\ \gamma_{\eta_{31}} & \gamma_{\eta_{32}} & \cdots & \gamma_{\eta_{37}} \end{bmatrix} \quad x_i = \begin{bmatrix} x_{1i} \\ x_{2i} \\ \vdots \\ x_{10i} \end{bmatrix} \quad \zeta_i = \begin{bmatrix} \zeta_{\eta_{0i}} \\ \zeta_{\eta_{1i}} \\ \zeta_{\eta_{2i}} \\ \zeta_{\eta_{3i}} \end{bmatrix}$$

where x_{1i} is the time-invariant covariate (TIC): *traumatic stress symptoms* (TSS), x_{2i} is the TIC: *difficult attachment symptoms* (DAS), x_{3i} is the TIC gender, x_{4i} represents the TIC gender of interviewed parent/caregiver, x_{5i} represents the TIC SES, the next four variables represent dummy codes of the variable culture: x_{6i} represents the TIC Asian American culture, x_{7i} represents the TIC African American culture, x_{8i} represents the TIC Latina/o culture, x_{9i} represents the TIC other people of color culture. The final TIC x_{10i} represents TSSχDAS (interaction between TSS and DAS). However, as mentioned earlier, TIC x_{4i} and x_{9i} were found to be insignificant in the model and are not discussed in the results.

The following are the mean estimates for reading achievement for higher SES, male, European American children who are low on TSS and DAS: mean intercept slope factor = 193.95 ($s.e\ =\ 1.41$), mean linear slope = 99.23 ($s.e. = 0.71$), mean quadratic slope = -17.06 ($s.e. = 0.46$), and the mean cubic slope = -2.15 ($s.e. = 0.37$). The following are the mean estimates for mathematics achievement for higher SES, male, European American children who are low on TSS and DAS: mean intercept slope factor = 161.43 ($s.e\ =\ 1.09$), mean linear slope = 85.12 ($s.e. = 0.63$), mean quadratic slope = -12.99 ($s.e. = 0.30$), and the mean cubic slope = 1.15 ($s.e. = 0.39$).

For the reading data, results of the LRT, AIC, and BIC when compared to the cubic LGCM with seven TICs ($LRT\ (4) =\ 17.44\ (\rho < .05)$, $AIC\ = 378489.59$, $BIC =$

379122.47) showed that the addition of the TIC interaction between TSS and DAS had significantly changed the model. It also showed that the addition of the interaction resulted in smaller AIC and BIC values showing it provided a better fitting model. The mathematics data ($LRT\ (4) = 11.89\ (\rho < .05),\ AIC = 370666.40,\ BIC = 371299.29$) showed similar results to this trend. The estimated means maintained accuracy for both reading and mathematics, the residual variances were significant and positive for both, and the R^2 stayed similar for both TSS and DAS, thus, still supporting the model fit.

Reading Achievement LGCM With Eight TICs

TIC1: TSS and DAS, TSS$^{\chi}$DAS, Gender, SES, Culture. For the reading achievement trajectory data, TSS was examined first while controlling for DAS, TSS$^{\chi}$DAS, gender, SES, and culture. TSS significantly predicted a negative intercept factor ($\hat{\gamma}_{ETA0} = -12.42,\ s.e. = 1.35,\ \rho < 0.05$), a negative linear slope factor ($\hat{\gamma}_{ETA1} = -3.61,\ s.e. = 0.71,\ \rho < 0.05$), and a positive quadratic slope factor ($\hat{\gamma}_{ETA2} = 3.20,\ s.e. = 0.53,\ \rho < 0.05$). Indicating that, on average, children high in TSS are observed to have lower initial reading achievement scores with a downward rate of change that reflects with a one-unit increase in TSS that there is an association with a 3.61 decrease in the mean slope of the trajectory of reading achievement. The concave up quadratic slope for children high in TSS suggests that they are plateauing slower than children low in TSS. The cubic slope factor was found to be non-significantly different from the mean cubic slope factor ($\hat{\gamma}_{ETA3} = -0.32,\ s.e. = 0.38,\ \rho > 0.05$).

TIC2: DAS and TSS, TSS$^{\chi}$DAS, Gender, SES, Culture. DAS was examined next controlling for TSS, TSS$^{\chi}$DAS, gender, SES, and culture. DAS significantly predicted a negative intercept factor ($\hat{\gamma}_{ETA0} = -3.76,\ s.e. = 1.68,\ \rho < 0.05$) and a negative linear slope factor ($\hat{\gamma}_{ETA1} = -2.51,\ s.e. = 0.76,\ \rho < 0.05$). It showed no significant differences from the mean

quadratic slope ($\hat{\gamma}_{ETA2} = 0.94,\ s.e. = 0.50,\ \rho > 0.05$) nor from the mean cubic slope ($\hat{\gamma}_{ETA3} = -0.40,\ s.e. = 0.51,\ \rho > 0.05$). This suggests that when all other TICs are controlled for, on average, children high in DAS show a lower mean initial reading achievement score with a lower linear trend that has a downward rate of change over time indicating that with a one-unit change in DAS there is an associated 2.51 decrease in the slope trajectory of reading achievement.

TIC3: TSSχDAS and TSS, DAS, Gender, SES, Culture. The interaction TSSχDAS was next to be examined controlling for TSS alone, DAS alone, gender, SES, and culture. The TSSχDAS variable did not show significantly different results from the mean intercept factor ($\hat{\gamma}_{ETA0} = -2.51,\ s.e. = 1.56,\ \rho > 0.05$), quadratic slope factor ($\hat{\gamma}_{ETA2} = -0.27,\ s.e. = 0.59,\ \rho > 0.05$) or cubic slope factor ($\hat{\gamma}_{ETA3} = 0.91,\ s.e. = 0.49,\ \rho > 0.05$). TSSχDAS did show a significantly lower linear slope factor ($\hat{\gamma}_{ETA1} = -2.95,\ s.e. = 0.94,\ \rho < 0.05$). These results suggest that the interaction between TSS and DAS causes a lower rate of growth over time for children high in TSS and in DAS and that one-unit of change in TSSχDAS is associated with a 2.95 decrease in the slope trajectory of reading achievement over time. A further implication of these results is that TSS is dependent on the effects of DAS and DAS is dependent on the effects of TSS towards their overall effect on reading achievement.

TIC4: Gender and TSS, DAS, TSSχDAS, SES, Culture. The results of the analysis for gender controlling for TSS, DAS, TSSχDAS, SES, and culture were looked at next. Gender showed a significant positive intercept factor ($\hat{\gamma}_{ETA0} = 5.35,\ s.e. = 1.40,\ \rho < 0.05$), a positive linear slope factor ($\hat{\gamma}_{ETA1} = 1.49,\ s.e. = 0.72,\ \rho < 0.05$), and a negative quadratic slope factor ($\hat{\gamma}_{ETA2} = -1.86,\ s.e. = 0.55,\ \rho < 0.05$). Gender did not show significantly different results than the mean cubic slope factor ($\hat{\gamma}_{ETA3} = -0.03,\ s.e. = 0.37,\ \rho > 0.05$). This indicated that females, on average, showed higher reading achievement scores at initial assessment and have a

higher rate of change in reading achievement over time. The concave downward nonlinear trend predicted by the quadratic slope factor suggests that females are slowing the rate that their negative (cup down) quadratic growth is decelerating their linear growth; more so than is happening to males over time. Where males start out lower in reading achievement, have lower rates of positive change, but show a slower deceleration in the change trajectory over time.

TIC5: SES and TSS, DAS, TSSχDAS, Gender, Culture. Next socioeconomic status (SES) is examined while controlling for TSS, DAS, TSSχDAS, gender, and culture. SES significantly predicted a positive intercept factor ($\hat{\gamma}_{ETA0} = 20.36,\ s.e. = 1.02,\ \rho < 0.05$), a positive linear slope factor ($\hat{\gamma}_{ETA1} = 7.30,\ s.e. = 0.53,\ \rho < 0.05$), and a negative quadratic slope factor ($\hat{\gamma}_{ETA2} = -3.63,\ s.e. = 0.33,\ \rho < 0.05$). SES did not predict a significantly difference from the mean cubic slope factor ($\hat{\gamma}_{ETA3} = -0.24,\ s.e. = 0.30,\ \rho > 0.05$). This estimation predicts that on average, children whose families are higher in SES are observed to have higher initial reading achievement scores with a larger positive rate of change over time that suggests that a one-unit increase in SES is associated with a 7.30 increase in the slope of the trajectory of reading achievement. Those high in SES also show a larger concave down or greater decelerating quadratic trend. This suggests that reading achievement plateaus faster for higher SES children as they head toward third and fifth grade.

TIC6: Asian Culture and TSS, DAS, TSSχDAS, Gender, SES, AA, Latina/o culture. The relationship of Asian American culture on reading achievement while controlling for TSS, DAS, TSSχDAS, gender, SES, AA, and Latina/o culture showed significant predictions for a negative linear slope factor ($\hat{\gamma}_{ETA1} = -4.04,\ s.e. = 1.68,\ \rho < 0.05$) and cubic slope factor ($\hat{\gamma}_{ETA3} = 3.12,\ s.e. = 0.96,\ \rho < 0.05$). The intercept factor ($\hat{\gamma}_{ETA0} = 5.48,\ s.e. = 3.68,\ \rho > 0.05$) and the quadratic slope factor ($\hat{\gamma}_{ETA2} = -0.24,\ s.e. = 1.27,\ \rho > 0.05$) were found to not

be significantly different from their respective mean slopes. These results show that children of Asian American culture, on average, for reading achievement show a lower growth rate over time as compared to children of European American and Latina/o cultures and that their cubic factor is maintaining the quadratics deceleration.

TIC7: AA Culture and TSS, DAS, TSSχDAS, Gender, SES, Asian, Latina/o culture. The relationship of African American culture on reading achievement while controlling for TSS, DAS, TSSχDAS, gender, SES, and Latina/o culture showed significant predictions for a negative intercept factor ($\hat{\gamma}_{ETA0} = -10.43,\ s.e. = 2.04,\ \rho < 0.05$) and negative linear slope factor ($\hat{\gamma}_{ETA1} = -9.02,\ s.e. = 1.29,\ \rho < 0.05$), however, the quadratic slope factor ($\hat{\gamma}_{ETA2} = 0.93,\ s.e. = 0.90,\ \rho > 0.05$) and cubic slope factor ($\hat{\gamma}_{ETA3} = 0.78,\ s.e. = 0.82,\ \rho > 0.05$) were found to be not significantly different from their respective means. Again, African American cultures negative mean intercept slope factor was close to being as large as children who were high on TSS. These results suggest that children of African American culture, on average, begin kindergarten with lower initial mean reading achievement scores showing a lower rate of change in reading achievement over time as compared to children of European American, Asian American, and Latina/o cultures.

TIC8: Latina/o culture and TSS, DAS, TSSχDAS, Gender, SES, Asian, AA culture. The relationship of Latina/o culture on reading achievement while controlling for TSS, DAS, TSSχDAS, gender, SES, and other cultures showed a significant negative intercept factor ($\hat{\gamma}_{ETA0} = -6.85,\ s.e. = 2.12,\ \rho < 0.05$), but was not found to be significantly different from the mean predicted linear slope factor ($\hat{\gamma}_{ETA1} = -1.74,\ s.e. = 1.01,\ \rho > 0.05$), quadratic slope factor ($\hat{\gamma}_{ETA2} = 0.84,\ s.e. = 0.81,\ \rho > 0.05$), and cubic slope factor ($\hat{\gamma}_{ETA3} = 1.01,\ s.e. = 0.68,\ \rho > 0.05$). Therefore these estimates suggest that, on average, children from Latina/o

cultures begin school with a lower initial reading achievement score as compared to European American children and are similar to the means for the other trajectory trends.

Based on the results of the fifth statistical analysis, there is a significant relationship between traumatic stress symptoms, difficult attachment symptoms, the interaction between TSSχDAS, gender, SES, Asian American, African American, and Latina/o culture with reading achievement. Children who are reported as having higher levels of traumatic stress, difficult attachment symptoms, have an interaction between TSSχDAS, are male, low in SES, and Asian American, African American, or Latina/o also have lower levels of initial performance and/or performance over time. These findings support prior research that has looked at traumatic stress (Goodman et al., 2012), difficult attachment symptoms (Lieberman, 2004; Pianta & Harbers, 1996), gender (Clark et al., 2008; Dearing et al., 2009), low in SES (Chatterji, 2006), and are either African American or Latina/o (Crumpton & Gregory, 2011; Morris, 2008) as indicators for lower reading achievement. The findings of this study go further to suggest that all seven covariates including the interaction between TSSχDAS predict lower levels of reading achievement and that these predictions can persist across grade levels from kindergarten through at least fifth grade as well as through developmental trajectories.

Mathematics Achievement LGCM With Eight TICs

TIC1: TSS and DAS, TSSχDAS, Gender, SES, Culture. For the mathematics achievement trajectory data, TSS was examined first while controlling for DAS, TSSχDAS, gender, SES, and culture. TSS significantly predicted a negative intercept factor ($\hat{\gamma}_{ETA0} = -11.37,\ s.e. = 1.14,\ \rho < 0.05$), a negative linear slope factor ($\hat{\gamma}_{ETA1} = -3.73,\ s.e. = 0.64,\ \rho < 0.05$), a positive quadratic slope factor ($\hat{\gamma}_{ETA2} = 1.11,\ s.e. = 0.39,\ \rho < 0.05$), and negative cubic slope factor ($\hat{\gamma}_{ETA3} = -0.92,\ s.e. = 0.29,\ \rho < 0.05$). Indicating that when all

other TICs are controlled for, on average, children high in TSS are observed to have lower initial mathematics achievement scores with a lower downward rate of change that reflects with a one-unit increase in TSS that there is an associated 3.73 decrease in the mean slope of the trajectory of mathematics achievement over time. The concave up or positive quadratic slope factor for children high in TSS suggests that they are decelerating at a slower rate in their growth trajectory as compared to children low in TSS.

TIC2: DAS and TSS, TSSχDAS, Gender, SES, Culture. DAS was examined next controlling for TSS, TSSχDAS, gender, SES, and culture. DAS significantly predicted a negative intercept factor ($\hat{\gamma}_{ETA0} = -3.63,\ s.e. = 1.46,\ \rho < 0.05$), a negative linear slope factor ($\hat{\gamma}_{ETA1} = -1.36,\ s.e. = 0.66,\ \rho < 0.05$), and a positive quadratic slope factor ($\hat{\gamma}_{ETA2} = 0.76,\ s.e. = 0.36,\ \rho < 0.05$). It showed no significant differences for the mean cubic slope factor ($\hat{\gamma}_{ETA3} = -0.26,\ s.e. = 0.37,\ \rho > 0.05$). This suggests that when all other TICs are controlled for, on average, children high in DAS show a lower initial mathematics achievement score with a lower growth rate over time that reflects with a one-unit increase in DAS that there is an associated 1.36 decrease in the mean slope of the trajectory of mathematics achievement over time. The concave up or positive quadratic slope factor for children high in DAS suggests that they are decelerating at a slower rate in their growth trajectory as compared to children low in DAS.

TIC3: TSSχDAS and TSS, DAS, Gender, SES, Culture. The interaction TSSχDAS was next to be examined controlling for TSS alone, DAS alone, gender, SES, and culture. The TSSχDAS variable did not show significantly different results from the mean intercept factor ($\hat{\gamma}_{ETA0} = -1.63,\ s.e. = 1.59,\ \rho > 0.05$), quadratic slope factor ($\hat{\gamma}_{ETA2} = -0.72,\ s.e. = 0.74,\ \rho > 0.05$) or cubic slope factor ($\hat{\gamma}_{ETA3} = 0.22,\ s.e. = 0.53,\ \rho > 0.05$). TSSχDAS did show a significantly lower linear slope factor ($\hat{\gamma}_{ETA1} = -2.81,\ s.e. = 0.94,\ \rho < 0.05$). These results

suggest that the interaction between TSS and DAS causes a lower rate of growth over time for children high in TSS and in DAS and that one-unit of change in TSSχDAS is associated with a 2.85 decrease in the slope trajectory of mathematics achievement over time. Another implication of these results is TSS is dependent on the effects of DAS and DAS is dependent on the effects of TSS towards their overall effect on mathematics achievement.

TIC4: Gender and TSS, DAS, TSSχDAS, SES, Culture. The results of the analysis for gender controlling for TSS, DAS, TSSχDAS, SES, and culture were looked at next. Gender showed a significant positive intercept factor ($\hat{\gamma}_{ETA0} = -7.75,\ s.e. = 1.24,\ \rho < 0.05$), a negative linear slope factor ($\hat{\gamma}_{ETA1} = -5.77,\ s.e. = 0.65, \rho < 0.05$), and a positive quadratic slope factor ($\hat{\gamma}_{ETA2} = 1.27,\ s.e. = 0.35,\ \rho < 0.05$). Gender did not show significantly different results than the mean cubic slope factor ($\hat{\gamma}_{ETA3} = 0.56,\ s.e. = 0.35,\ \rho > 0.05$). This indicated that females, on average, showed lower mathematics achievement scores at initial assessment and lower rates of change in mathematics achievement over time. The concave upward quadratic slope factor for females is predicting a smaller deceleration of the negative growth trajectory over time than the mean for males. Where males start out higher in mathematics achievement, have higher rates of positive change, but show a higher deceleration in the change trajectory over time.

TIC5: SES and TSS, DAS, TSSχDAS, Gender, Culture. Next socioeconomic status (SES) is examined while controlling for TSS, DAS, TSSχDAS, gender, and culture. SES significantly predicted a positive intercept factor ($\hat{\gamma}_{ETA0} = 16.49,\ s.e. = 0.88,\ \rho < 0.05$), a positive linear slope factor ($\hat{\gamma}_{ETA1} = 6.15,\ s.e. = 0.41,\ \rho < 0.05$), and a negative quadratic slope factor ($\hat{\gamma}_{ETA2} = -2.00,\ s.e. = 0.24,\ \rho < 0.05$). SES did not predict a significant difference from the mean cubic slope factor ($\hat{\gamma}_{ETA3} = -0.30,\ s.e. = 0.19,\ \rho > 0.05$). This

estimation predicts that on average, children whose families are higher in SES are observed to have higher initial mathematics achievement scores with a larger positive rate of change over time that suggests that a one-unit increase in SES is associated with a 6.15 increase in the slope of the trajectory of mathematics achievement. Those high in SES also show a larger concave down or greater deceleration in the growth trend over time. This suggests that mathematics achievement plateaus faster for higher SES children as they head toward third and fifth grade.

TIC6: Asian Culture and TSS, DAS, TSSχDAS, Gender, SES, AA, Latina/o culture. The relationship of Asian American culture on mathematics achievement while controlling for TSS, DAS, TSSχDAS, gender, SES, AA, and Latina/o culture showed significant predictions for a positive linear slope factor ($\hat{\gamma}_{ETA1} = 4.35,\ s.e. = 1.50,\ \rho < 0.05$), quadratic slope factor ($\hat{\gamma}_{ETA2} = 2.54,\ s.e. = 1.06,\ \rho < 0.05$), and a negative cubic slope factor ($\hat{\gamma}_{ETA3} = -1.19,\ s.e. = 0.60,\ \rho < 0.05$). The intercept factor ($\hat{\gamma}_{ETA0} = 4.94,\ s.e. = 3.73,\ \rho > 0.05$) was found to not be significantly different from its mean slope. These results show that children of Asian American culture, on average, for mathematics achievement show a higher growth rate over time as compared to children of European American, African American, and Latina/o cultures. The positive or concave up quadratic slope factor suggests that Asian American children's growth trajectory is decelerating at a slower rate and their cubic slope factor causes the mean cubic slope trajectory to be relatively close to zero. Essentially this mean that Asian American children do not show as much of a plateau effect in mathematics achievement as compared to their peers.

TIC7: AA Culture and TSS, DAS, TSSχDAS, Gender, SES, Asian, Latina/o culture. The relationship of African American culture on mathematics achievement while controlling for TSS, DAS, TSSχDAS, gender, SES, Asian American, and Latina/o culture showed significant predictions for a negative intercept factor ($\hat{\gamma}_{ETA0} = -15.91,\ s.e. = 1.94,\ \rho < 0.05$), a negative

linear slope factor ($\hat{\gamma}_{ETA1} = -8.91,\ s.e. = 1.11,\ \rho < 0.05$), and a positive quadratic slope factor ($\hat{\gamma}_{ETA2} = 1.82,\ s.e. = 0.68,\ \rho < 0.05$). African American culture did not show significant difference from the mean cubic slope ($\hat{\gamma}_{ETA3} = -0.41,\ s.e. = 0.60,\ \rho > 0.05$). African American cultures negative intercept slope factor showed the largest decrease in initial mathematics achievement of any other TIC in this study. These results indicate that children of African American culture, on average, begin kindergarten with lower initial mean mathematics achievement scores showing a lower rate of change in mathematics achievement over time as compared to children of European American, Asian American, and Latina/o cultures. The positive or concave upward quadratic slope factor suggests that African American children have a slower deceleration of the growth trend over time; thus plateauing slower than their peers.

TIC8: Latina/o culture and TSS, DAS, TSSχDAS, Gender, SES, Asian, AA culture. The relationship of Latina/o culture on mathematics achievement while controlling for TSS, DAS, TSSχDAS, gender, SES, and other cultures showed a significant negative intercept factor ($\hat{\gamma}_{ETA0} = -6.93,\ s.e. = 1.60,\ \rho < 0.05$) and positive quadratic slope factor ($\hat{\gamma}_{ETA2} = 1.31,\ s.e. = 0.50,\ \rho < 0.05$), but was not found to be significantly different from the mean predicted linear slope ($\hat{\gamma}_{ETA1} = 1.24,\ s.e. = 0.86,\ \rho > 0.05$) nor the mean cubic slope ($\hat{\gamma}_{ETA3} = 0.05,\ s.e. = 0.45,\ \rho > 0.05$). Therefore these estimates suggest that, on average, children from Latina/o cultures begin school with a lower initial mathematics achievement score and their cup up quadratic slope factor causes the deceleration of the growth rate to be slowed, thus they do not plateau in growth as fast as European American children.

Based on the results of the fifth statistical analysis, there is a significant relationship between traumatic stress symptoms, difficult attachment symptoms, the interaction between TSSχDAS, gender, SES, Asian American culture, AA culture, and Latina/o culture with

mathematics achievement. Children who are reported as having higher levels of traumatic stress, difficult attachment symptoms, have an interaction between TSS^{x}DAS, are female, low in SES, and are either African American or Latina/o also have lower levels of initial performance and performance over time. These findings support prior research that has looked at traumatic stress (Goodman et al., 2012), difficult attachment symptoms (Lieberman, 2004; Pianta & Harbers, 1996), gender (Clark et al., 2008; Dearing et al., 2009), low in SES (Chatterji, 2006), and are either African American or Latina/o (Crumpton & Gregory, 2011; Morris, 2008) as indicators for lower mathematics achievement. The findings of this study go further to suggest that six of the covariates including the interaction between TSS^{x}DAS predict lower levels of mathematics achievement and that these predictions can persist across grade levels from kindergarten through at least fifth grade as well as through developmental trajectories.

Grand Summary of Results

The results of this study provide evidence that there is a significant relationship between traumatic stress symptoms, difficult attachment symptoms, and their interaction on the longitudinal trajectory of reading and mathematics achievement for young children at kindergarten through fifth grade, even after controlling for the effects of gender, SES, and culture. Thus, children high in traumatic stress symptoms consistently had a lower initial reading and mathematics achievement scores while also consistently showing lower growth rates over time. The consistent quadratic trends for reading and quadratic and cubic trends in mathematics provide support for the hypothesis that traumatic stresses effects are not linear, but persist over time and developmental level.

Children high in difficult attachment symptoms also consistently showed lower initial reading and mathematics achievement scores. However, the effects became different when gender, SES, and culture were included. At this time in reading, difficult attachment symptoms

showed lower growth trends over time, but no effects on the mean quadratic or cubic trends. In mathematics, difficult attachment symptoms showed lower initial scores in mathematics, but with the interaction it also showed nonlinear influences, which hint that its effects might be more on development than measured achievement. When looking at gender, the results are consistent that females show lower initial scores in mathematics and persistent lower growth over time while having nonlinear quadratic effects. Likewise, males consistently show lower initial scores in reading and persistent lower growth rates over time while having nonlinear quadratic effects. SES also consistently showed that lower SES children had relatively large lower initial reading and mathematics scores, had lower rates of growth over time, and nonlinear quadratic effects. Cultural effects were more interesting, when the model did not include the interaction, culture showed significantly lower initial scores in reading and mathematics for African American and Latina/o children as well as lower growth rates over time; Asian Americans surprisingly were included in the lower growth rates over time. However, when the interaction between traumatic stress and difficult attachment symptoms was included in the model, culture predicted lower initial scores in reading and mathematics for African American and Latina/o children, while suggesting lower growth rates over time for Asian and African American children. An interesting effect of the interaction was significant cubic slope factor estimation for Asian children. This suggests that there are significant levels of traumatic stress and challenges to the attachment behaviors of culturally different children within the educational system that persist over time and across developmental levels. This consistency within gender, SES, and culture suggests a systemic issue within the education system for these patterns to persist across developmental trajectories and grade levels.

These findings support prior research about young children that has looked at the effects of traumatic stress (Goodman et al., 2012), difficult attachment symptoms (Lieberman, 2004; Pianta & Harbers, 1996), gender (Clark et al., 2008; Dearing et al., 2009), low SES (Chatterji, 2006), and either African American or Latina/o cultures (Crumpton & Gregory, 2011; Morris, 2008) as indicators for lower reading and mathematics achievement.

The findings of this study go further to suggest that all seven covariates including the interaction between TSS$^{\chi}$DAS predict effects earlier than other studies have before. These effects may be larger than previously expected, and persist across grade levels from kindergarten through at least fifth grade as well as showing significant negative trends in developmental trajectories (Figure 4-21).

Table 4-1. Covariance coverage of the proportion of data present in the sample reading achievement data for this study.

	1	2	3	4	5	6	7	8	9	10	11	12
1. P1ATTENI	0.997											
2. P2HRDWRM	0.985	0.988										
3. P2CHDOES	0.984	0.987	0.988									
4. P2FLTRAP	0.984	0.986	0.986	0.987								
5. P2FEELAN	0.985	0.987	0.987	0.986	0.988							
6. P2CHHARD	0.984	0.987	0.987	0.986	0.987	0.988						
7. READ1	0.919	0.912	0.912	0.911	0.912	0.912	0.922					
8. READ2	0.947	0.939	0.939	0.938	0.940	0.939	0.916	0.950				
9. READ4	0.959	0.951	0.951	0.950	0.951	0.951	0.906	0.935	0.962			
10. READ5	0.954	0.946	0.946	0.945	0.947	0.946	0.887	0.914	0.932	0.958		
11. READ6	0.949	0.941	0.941	0.940	0.941	0.941	0.882	0.910	0.927	0.935	0.953	
12. T2CONTRO	0.958	0.950	0.949	0.949	0.950	0.949	0.893	0.920	0.931	0.923	0.919	0.961
13. T2INTERP	0.954	0.946	0.945	0.944	0.946	0.945	0.889	0.916	0.926	0.919	0.915	0.953
14. T2EXTERN	0.959	0.951	0.951	0.950	0.952	0.951	0.894	0.921	0.932	0.924	0.920	0.958
15. T2INTERN	0.955	0.947	0.947	0.946	0.947	0.947	0.892	0.919	0.929	0.921	0.917	0.954
16. GENDER	0.997	0.988	0.988	0.987	0.988	0.988	0.922	0.950	0.962	0.958	0.953	0.961
17. WKSESL	0.997	0.988	0.988	0.987	0.988	0.988	0.922	0.950	0.962	0.958	0.953	0.961
18. R_A1	0.997	0.988	0.988	0.987	0.988	0.988	0.922	0.950	0.962	0.958	0.953	0.961
19. R_B2	0.997	0.988	0.988	0.987	0.988	0.988	0.922	0.950	0.962	0.958	0.953	0.961
20. R_L3	0.997	0.988	0.988	0.987	0.988	0.988	0.922	0.950	0.962	0.958	0.953	0.961
21. R_U4	0.997	0.988	0.988	0.987	0.988	0.988	0.922	0.950	0.962	0.958	0.953	0.961
22. P1SEX_1	0.997	0.988	0.988	0.987	0.988	0.988	0.922	0.950	0.962	0.958	0.953	0.961

	13	14	15	16	17	18	19	20	21	22
13. T2INTERP	0.957									
14. T2EXTERN	0.954	0.963								
15. T2INTERN	0.950	0.955	0.959							
16. GENDER	0.957	0.963	0.959	1.000						
17. WKSESL	0.957	0.963	0.959	1.000	1.000					
18. R_A1	0.957	0.963	0.959	1.000	1.000	1.000				
19. R_B2	0.957	0.963	0.959	1.000	1.000	1.000	1.000			
20. R_L3	0.957	0.963	0.959	1.000	1.000	1.000	1.000	1.000		
21. R_U4	0.957	0.963	0.959	1.000	1.000	1.000	1.000	1.000	1.000	
22. P1SEX_1	0.957	0.963	0.959	1.000	1.000	1.000	1.000	1.000	1.000	1.000

Table 4-2. Covariance coverage of the proportion of data present in the sample mathematics achievement data for this study.

	1	2	3	4	5	6	7	8	9	10	11	12
1. P1ATTENI	0.997											
2. P2HRDWRM	0.985	0.988										
3. P2CHDOES	0.984	0.987	0.988									
4. P2FLTRAP	0.984	0.986	0.986	0.987								
5. P2FEELAN	0.985	0.987	0.987	0.986	0.988							
6. P2CHHARD	0.984	0.987	0.987	0.986	0.987	0.988						
7. READ1	0.971	0.964	0.963	0.962	0.964	0.963	0.974					
8. READ2	0.980	0.972	0.972	0.971	0.973	0.972	0.967	0.984				
9. READ4	0.975	0.967	0.967	0.965	0.967	0.967	0.957	0.968	0.978			
10. READ5	0.958	0.951	0.950	0.949	0.951	0.950	0.940	0.950	0.951	0.962		
11. READ6	0.950	0.942	0.942	0.941	0.942	0.942	0.931	0.941	0.942	0.940	0.954	
12. T2CONTRO	0.958	0.950	0.949	0.949	0.950	0.949	0.941	0.951	0.945	0.927	0.920	0.961
13. T2INTERP	0.954	0.946	0.945	0.944	0.946	0.945	0.937	0.947	0.940	0.923	0.916	0.953
14. T2EXTERN	0.959	0.951	0.951	0.950	0.952	0.951	0.941	0.952	0.946	0.928	0.921	0.958
15. T2INTERN	0.955	0.947	0.947	0.946	0.947	0.947	0.938	0.949	0.942	0.925	0.917	0.954
16. GENDER	0.997	0.988	0.988	0.987	0.988	0.988	0.974	0.984	0.978	0.962	0.954	0.961
17. WKSESL	0.997	0.988	0.988	0.987	0.988	0.988	0.974	0.984	0.978	0.962	0.954	0.961
18. R_A1	0.997	0.988	0.988	0.987	0.988	0.988	0.974	0.984	0.978	0.962	0.954	0.961
19. R_B2	0.997	0.988	0.988	0.987	0.988	0.988	0.974	0.984	0.978	0.962	0.954	0.961
20. R_L3	0.997	0.988	0.988	0.987	0.988	0.988	0.974	0.984	0.978	0.962	0.954	0.961
21. R_U4	0.997	0.988	0.988	0.987	0.988	0.988	0.974	0.984	0.978	0.962	0.954	0.961
22. P1SEX_1	0.997	0.988	0.988	0.987	0.988	0.988	0.974	0.984	0.978	0.962	0.954	0.961

	13	14	15	16	17	18	19	20	21	22
13. T2INTERP	0.957									
14. T2EXTERN	0.954	0.963								
15. T2INTERN	0.950	0.955	0.959							
16. GENDER	0.957	0.963	0.959	1.000						
17. WKSESL	0.957	0.963	0.959	1.000	1.000					
18. R_A1	0.957	0.963	0.959	1.000	1.000	1.000				
19. R_B2	0.957	0.963	0.959	1.000	1.000	1.000	1.000			
20. R_L3	0.957	0.963	0.959	1.000	1.000	1.000	1.000	1.000		
21. R_U4	0.957	0.963	0.959	1.000	1.000	1.000	1.000	1.000	1.000	
22. P1SEX_1	0.957	0.963	0.959	1.000	1.000	1.000	1.000	1.000	1.000	1.000

Table 4-3. The latent intercept, linear, quadratic, and cubic factor coefficients, their standard errors, and p-values for the cultural variable other people of color for the research questions 4 and 5 as applied to reading and mathematics achievement LGCM's.

Variable	Reading LGCM			Mathematics LGCM		
Other People of Color	Factor Coefficient	S.E.	*ρ-value*	Factor Coefficient	S.E.	*ρ-value*
Research Question 4						
(γ_{ETA_0}): Intercept	-3.84	3.80	0.312	-5.62	3.15	0.074
(γ_{ETA_1}): Linear Slope	-1.11	3.17	0.726	-0.88	2.66	0.740
(γ_{ETA_2}): Quadratic Slope	1.65	1.29	0.200	**1.62**	**0.60**	**0.007**
(γ_{ETA_3}): Cubic Slope	0.72	1.44	0.615	0.27	0.81	0.737
Research Question 5						
(γ_{ETA_0}): Intercept	-3.93	3.82	0.303	-5.65	3.14	0.072
(γ_{ETA_1}): Linear Slope	-1.25	3.20	0.697	-0.98	2.66	0.712
(γ_{ETA_2}): Quadratic Slope	1.62	1.29	0.209	**1.58**	**0.59**	**0.008**
(γ_{ETA_3}): Cubic Slope	0.76	1.44	0.596	0.28	0.81	0.729

Note. Bolded values are significantly different from the mean quadratic slope factor.

Table 4-4. The latent intercept, linear, quadratic, and cubic factor coefficients, their standard errors, and p-values for the variable for gender of responding parent/guardian for the research questions 4 and 5 as applied to reading and mathematics achievement LGCM's.

Variable	Reading LGCM			Mathematics LGCM		
Gender of Responding Parent/Guardian	Factor Coefficient	S.E.	*ρ-value*	Factor Coefficient	S.E.	*ρ-value*
Research Question 4						
(γ_{ETA_0}): Intercept	-0.67	2.29	0.769	-1.16	2.41	0.631
(γ_{ETA_1}): Linear Slope	-1.01	1.23	0.411	-0.10	1.38	0.944
(γ_{ETA_2}): Quadratic Slope	0.02	0.88	0.979	-0.03	0.57	0.961
(γ_{ETA_3}): Cubic Slope	1.70	0.91	0.060	-0.09	0.52	0.861
Research Question 5						
(γ_{ETA_0}): Intercept	-0.83	2.31	0.720	-1.22	2.41	0.614
(γ_{ETA_1}): Linear Slope	-1.17	1.23	0.343	-0.22	1.38	0.877
(γ_{ETA_2}): Quadratic Slope	0.02	0.87	0.983	-0.06	0.57	0.914
(γ_{ETA_3}): Cubic Slope	1.74	0.90	0.054	-0.08	0.52	0.874

Table 4-5. Standardized correlations, observed means, and model estimated means for reading achievement using the HMLM cubic polynomial model.

	Read Time 1	Read Time 2	Read Time 3	Read Time 4	Read Time 5
Reading Time 1: Fall 1998	1.00	—	—	—	—
Reading Time 2: Spring 1999	0.83	1.00	—	—	—
Reading Time 3: Spring 2000	0.68	0.76	1.00	—	—
Reading Time 4: Spring 2002	0.56	0.60	0.74	1.00	—
Reading Time 5: Spring 2004	0.52	0.56	0.70	0.86	1.00
Estimated Mean	34.73	45.79	76.82	125.42	148.35
Observed Mean	34.56	45.76	76.67	125.40	148.37
Standard Deviations	10.30	14.08	23.56	27.23	25.49

Notes. — is inserted for duplicates to the correlation matrix.

Table 4-6. Standardized correlations, observed means, and model estimated means for mathematics achievement using the HMLM cubic polynomial model.

	Math Time 1	Math Time 2	Math Time 3	Math Time 4	Math Time 5
Math Time 1: Fall 1998	1.00	—	—	—	—
Math Time 2: Spring 1999	0.83	1.00	—	—	—
Math Time 3: Spring 2000	0.72	0.78	1.00	—	—
Math Time 4: Spring 2002	0.69	0.73	0.78	1.00	—
Math Time 5: Spring 2004	0.63	0.68	0.74	0.87	1.00
Estimated Mean	25.77	35.64	61.19	97.64	121.70
Observed Mean	25.77	35.98	60.92	97.95	121.88
Standard Deviations	9.40	12.13	18.05	24.18	23.95

Notes. — is inserted for duplicates to the correlation matrix.

Table 4-7. Comparison of the model estimated trajectory means for reading achievement.

	Read Time 1	Read Time 2	Read Time 3	Read Time 4	Read Time 5
Observed Means	34.56	45.76	76.67	125.40	148.37
Linear Estimates	36.10	43.50	65.70	110.11	154.53
Free Loading Estimates	34.67	45.92	77.41	125.91	147.93
HMLM Quadratic Orthogonal Polynomial Estimates	34.86	46.63	78.19	124.51	148.43
HMLM Cubic Orthogonal Polynomial Estimates	34.73	45.79	76.82	125.42	148.35

Table 4-8. Comparison of the model estimated trajectory means for mathematics achievement.

	Math Time 1	Math Time 2	Math Time 3	Math Time 4	Math Time 5
Observed Means	25.77	35.98	60.92	97.95	121.88
Linear Estimates	27.95	34.50	54.16	93.49	132.81
Free Loading Estimates	25.73	36.06	61.09	98.27	121.39
HMLM Quadratic Orthogonal Polynomial Estimates	25.92	35.16	60.27	98.79	121.71
HMLM Cubic Orthogonal Polynomial Estimates	25.77	35.64	61.19	97.64	121.70

Table 4-9. EFA factor structure used to select the indicators for difficult attachment symptoms.

Factor Structure	1	2	3
P2CHDOES	**0.66**	-0.29	-0.35
HRDWRMB	**0.51**	-0.24	-0.30
P2FLTRAP	**0.73**	-0.27	-0.47
P2FEELAN	**0.83**	-0.26	-0.45
P2CHHARD	**0.69**	-0.28	-0.36
P2ARGCHD	-0.20	**0.63**	0.17
P2ARGAFF	-0.22	**0.59**	0.24
P2ARGHEA	-0.14	**0.70**	0.20
P2HITCHR	-0.27	**0.58**	0.33
P2DEPRES	-0.37	0.39	**0.61**
P2FEARFL	-0.29	0.26	**0.83**

Note. Factor loadings greater than .50 and are low loading on other factors are shown in bold.

Table 4-10. Descriptive statistics for difficult attachment symptoms.

	Mean	SD	Min	Max
Difficult Attachment Symptoms	-0.06	0.55	-1.25	2.93

	Proportion of Occurrence		
	Category 1	Category 2	Category 3
P2HARDWRM	0.76	0.18	0.06
P2CHDOES	0.89	0.05	0.06
P2FLTRAP	0.96	0.02	0.02
P2FEELAN	0.98	0.01	0.01
P2CHHARD	0.95	0.02	0.03

Category 1: Not at all true
Category 2: Somewhat true
Category 3: Completely/Mostly true

Table 4-11. Descriptive statistics for traumatic stress symptoms.

	Mean	SD	Min	Max	Response Scale
Traumatic Stress Symptoms	-0.08	0.54	-1.02	2.13	
Continuous Composite Variables					
T2CONTRO	1.76	0.60	1.00	4.00	1. very often 2. often 3. sometimes 4. never
T2INTERP	1.82	0.62	1.00	4.00	1. very often 2. often 3. sometimes 4. never
T2EXTERN	1.60	0.60	1.00	4.00	1. never 2. sometimes 3. often 4. very often
T2INTERN	1.53	0.49	1.00	4.00	1. never 2. sometimes 3. often 4. very often
Ordinal Categorical Variable	Proportion of Occurrence				
	Category 1	Category 2	Category 3		
P1ATTENI	0.25	0.60	0.15		1. Better than others 2. As well as others 3. Slightly less/much less well than others

Table 4-12. Standardized factor loadings, their standard errors, factor correlations, and R^2 estimates for latent variables traumatic stress symptoms and difficult attachment symptoms.

Factor Loadings	Traumatic Stress Symptoms	Difficult Attachment Symptoms	R^2
T2CONTRO	0.94 (0.01)		0.90
T2INTERP	0.84 (0.01)		0.70
T2EXTERN	0.78 (0.01)		0.61
T2INTERN	0.34 (0.03)		0.11
P1ATTENI	0.36 (0.02)		0.13
P2HRDWRM		0.47 (0.04)	0.22
P2CHDOES		0.71 (0.04)	0.51
P2FLTRAP		0.80 (0.04)	0.64
P2FEELAN		0.77 (0.06)	0.60
P2CHHARD		0.75 (0.05)	0.56
Factor Correlations			
Traumatic Stress Symptoms	—	0.25 (0.05)	
Difficult Attachment Symptoms	—	—	

Note. — is used for correlations equal to one or are repeated values.

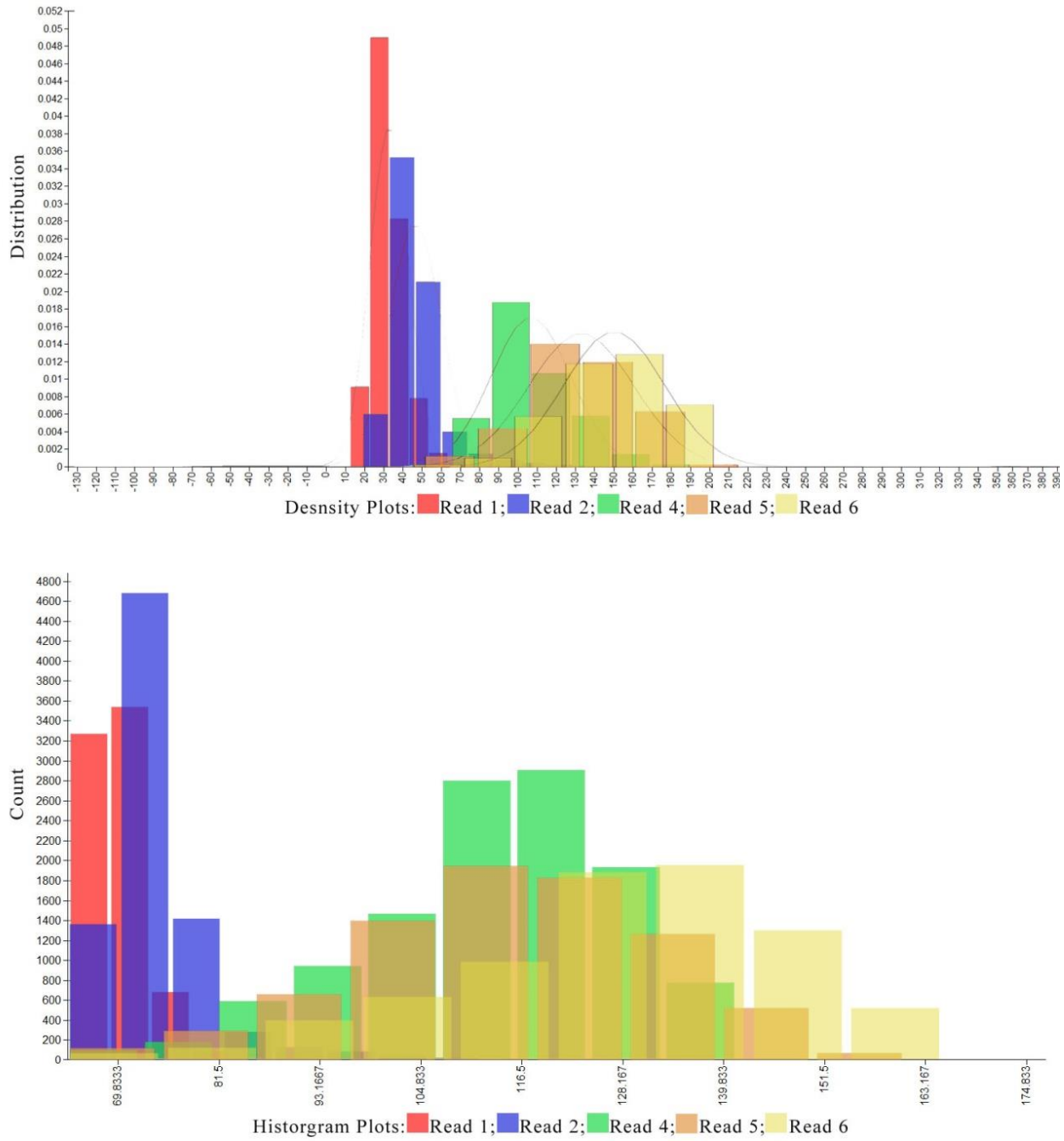

Figure 4-1. The density plots (on top) and histogram plots (on bottom) of the five measurement periods for reading achievement.

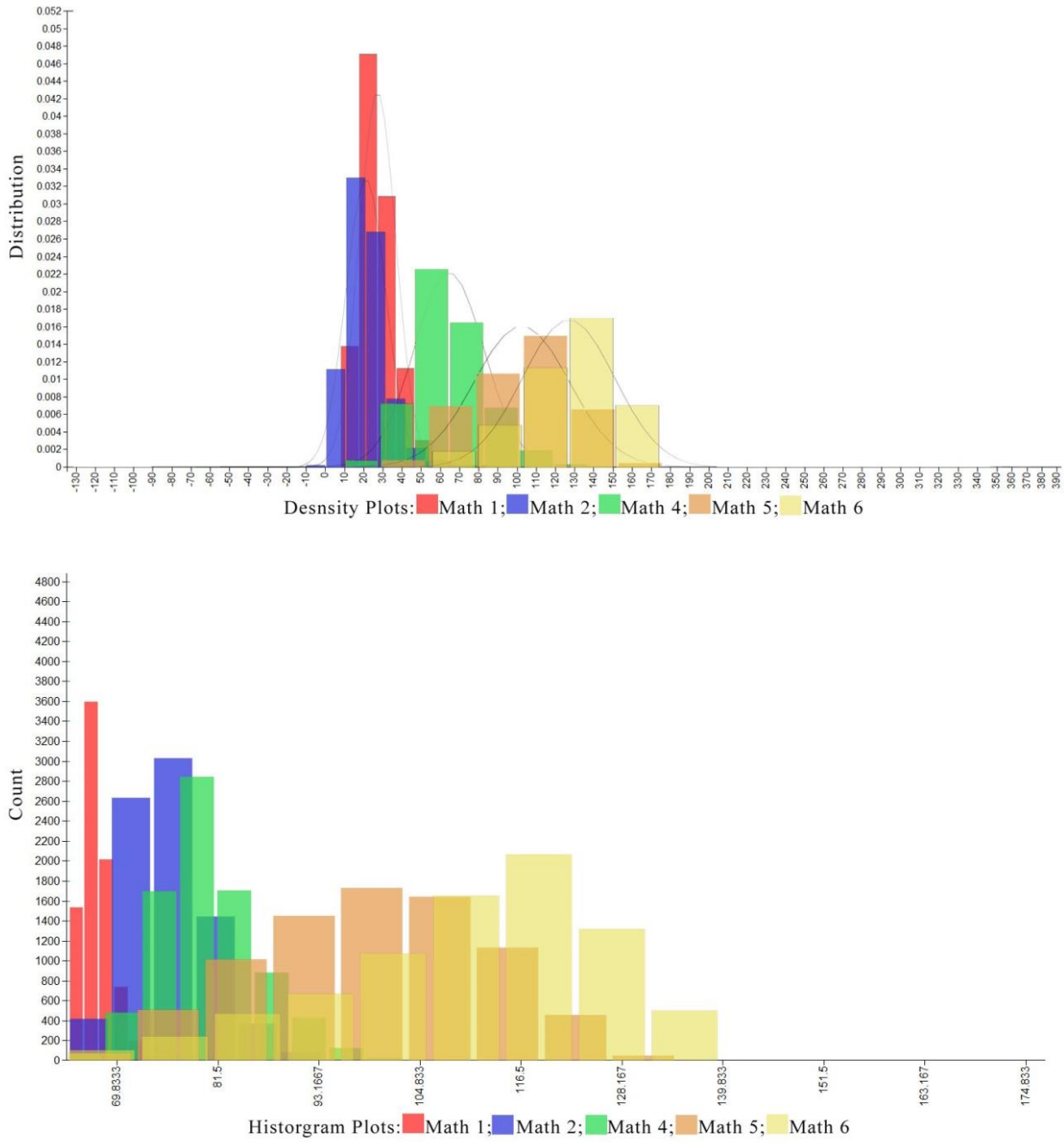

Figure 4-2. The density plots (on top) and histogram plots (on bottom) of the five measurement periods for mathematics achievement.

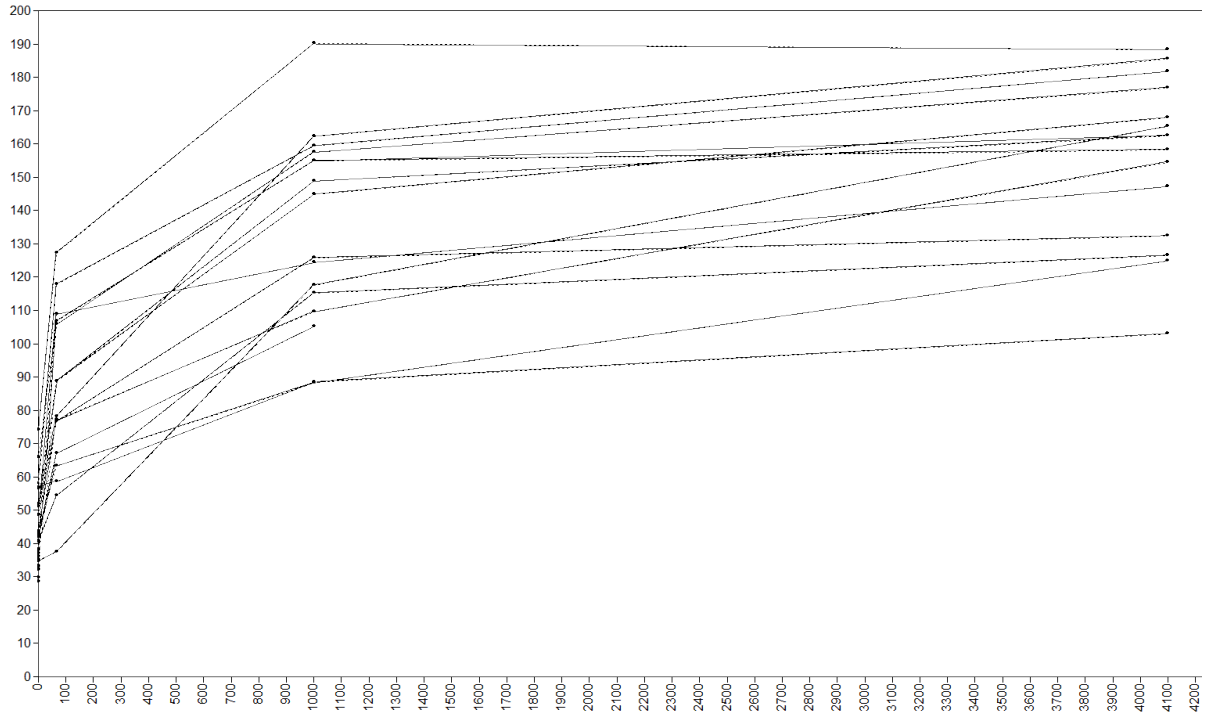

Figure 4-3. The randomly selected plots of fifteen individuals observed longitudinal trajectories for reading achievement.

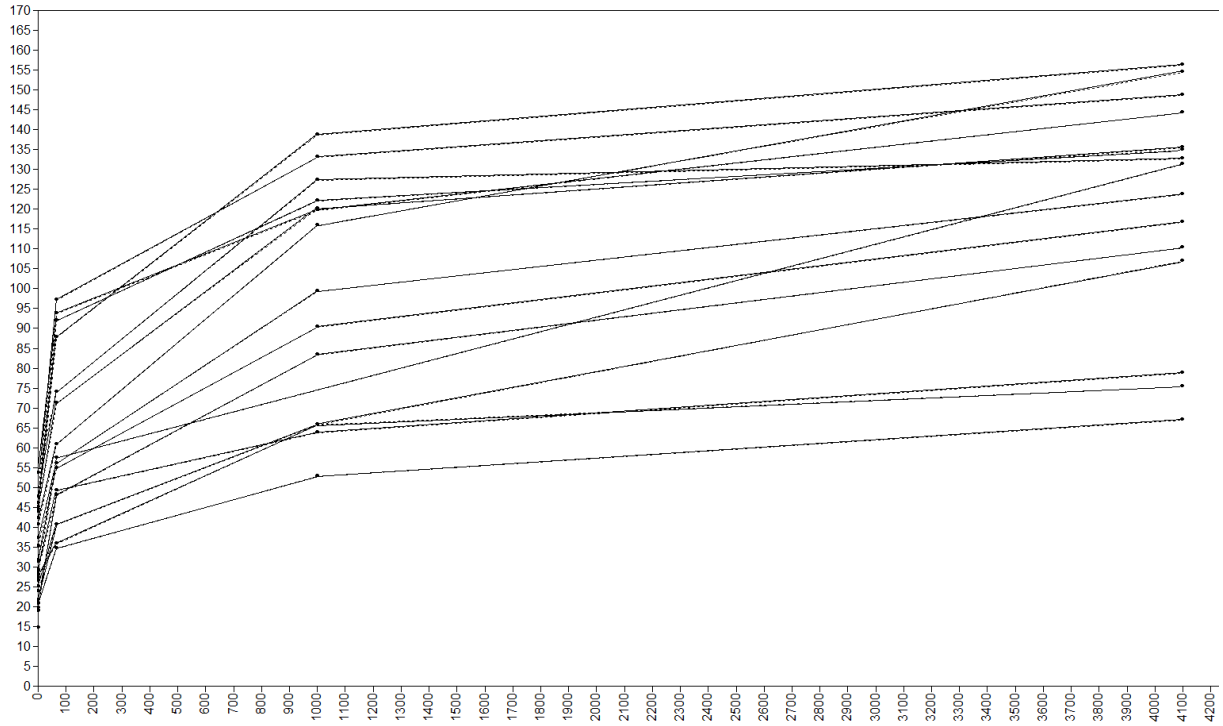

Figure 4-4. The randomly selected plots of fifteen individuals observed longitudinal trajectories for mathematics achievement.

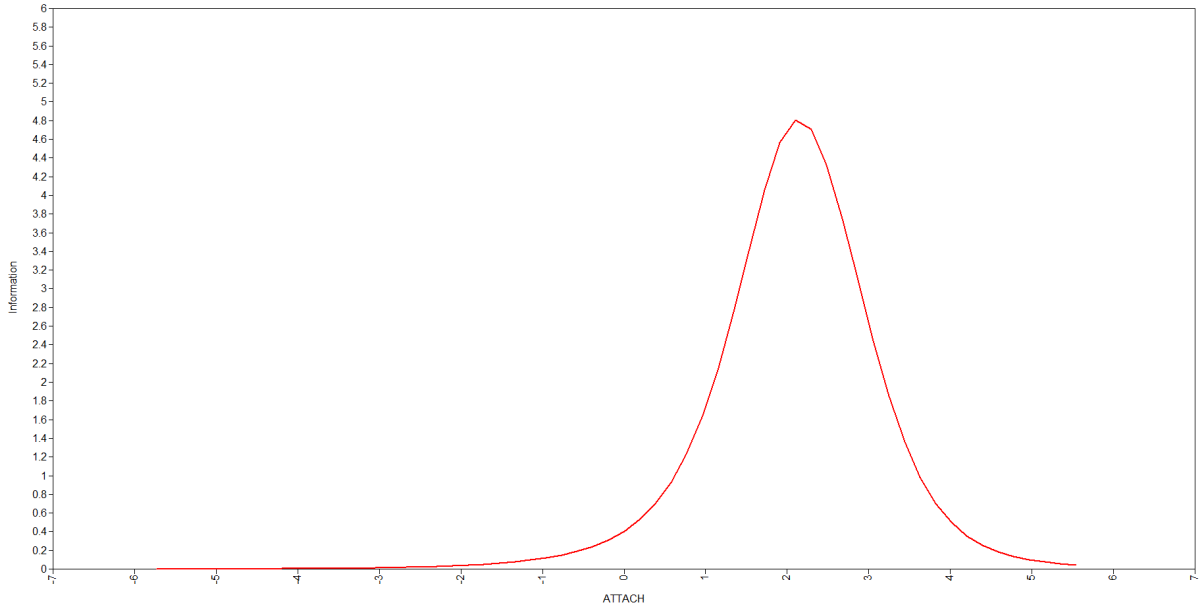

Figure 4-5. The total information curve of all of the indicators as a function of the latent variable difficult attachment symptoms.

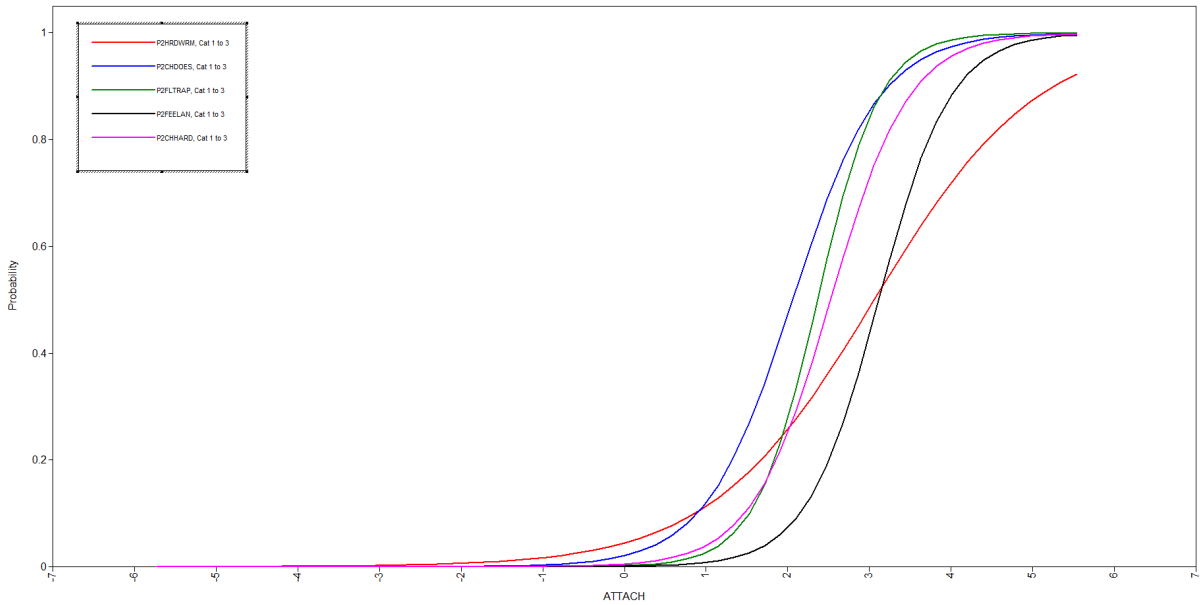

Figure 4-6. The characteristic curves of all of the indicators as a function of the latent variable difficult attachment symptoms.

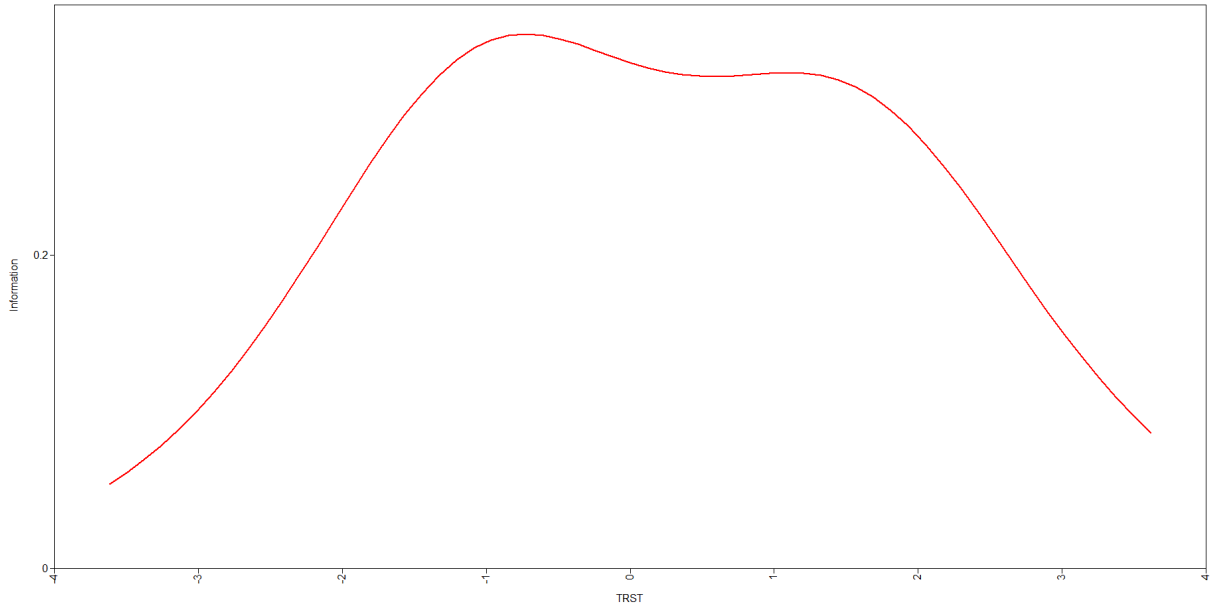

Figure 4-7. The total information curve of all of the indicators as a function of the latent variable traumatic stress symptoms.

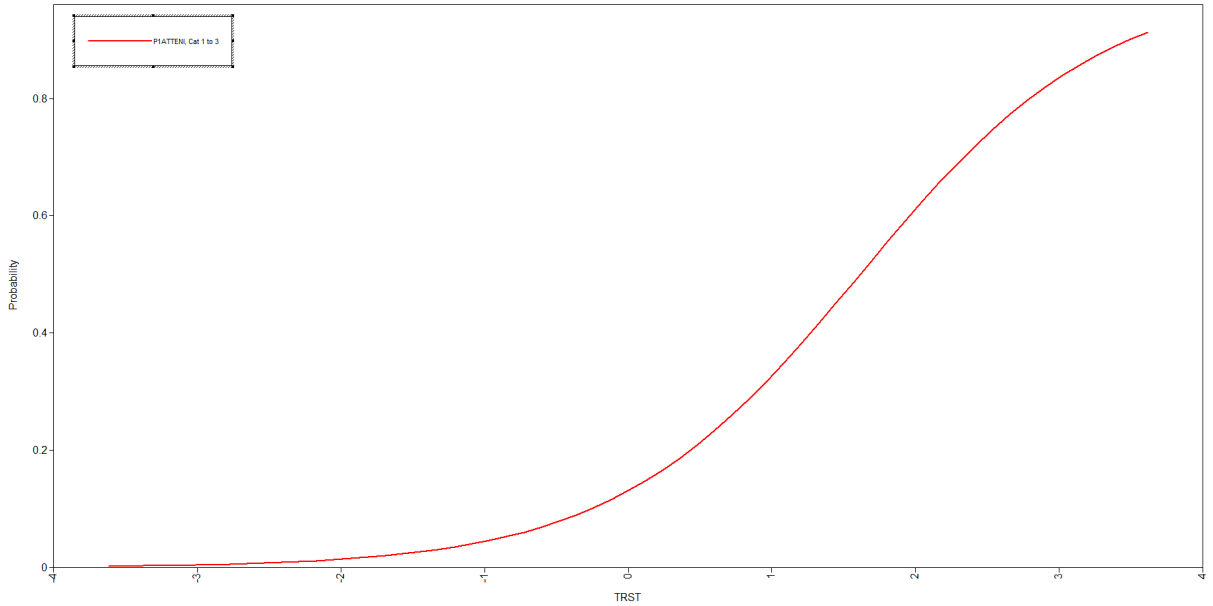

Figure 4-8. The characteristic curve of the indicator P1ATTENI as a function of the latent variable traumatic stress symptoms.

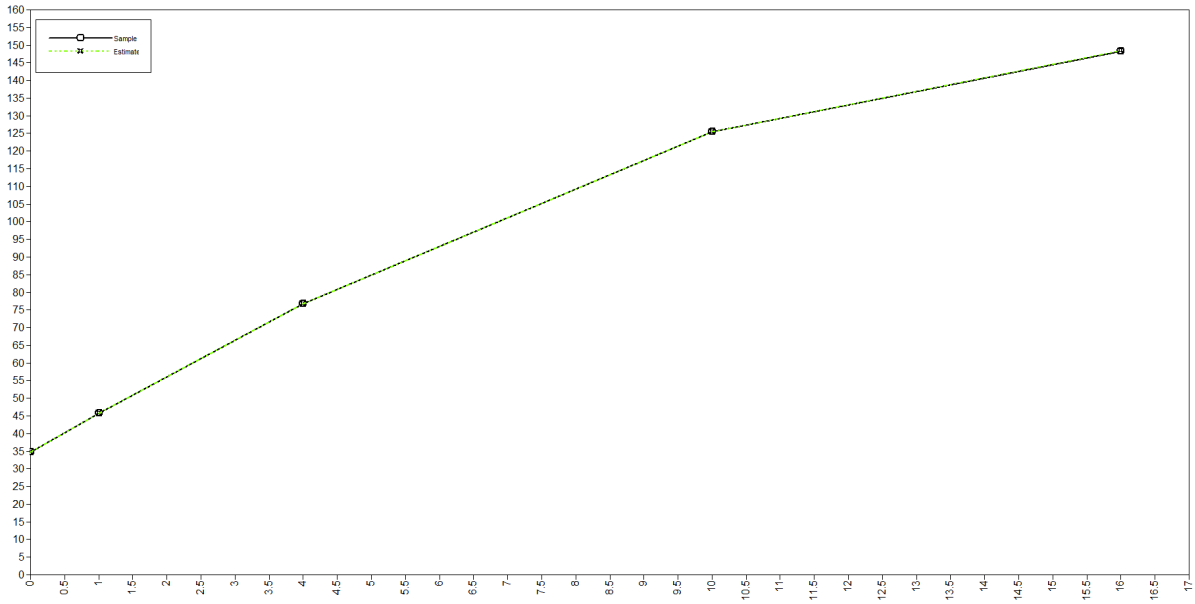

Figure 4-9. The plot of the reading achievement linear trend.

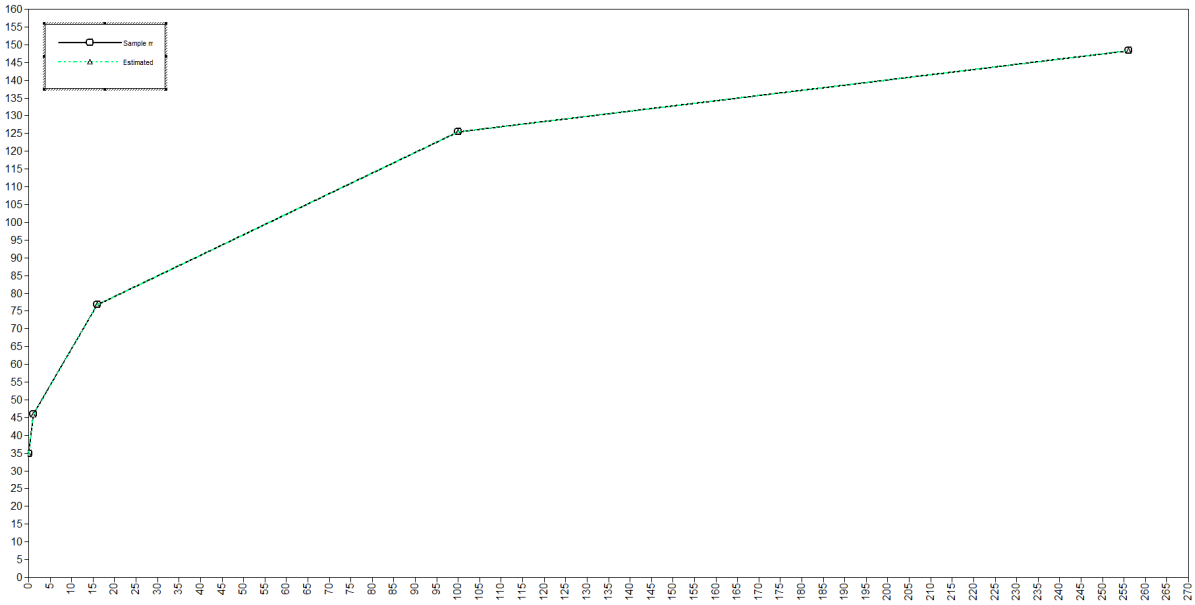

Figure 4-10. The plot of the reading achievement quadratic trend.

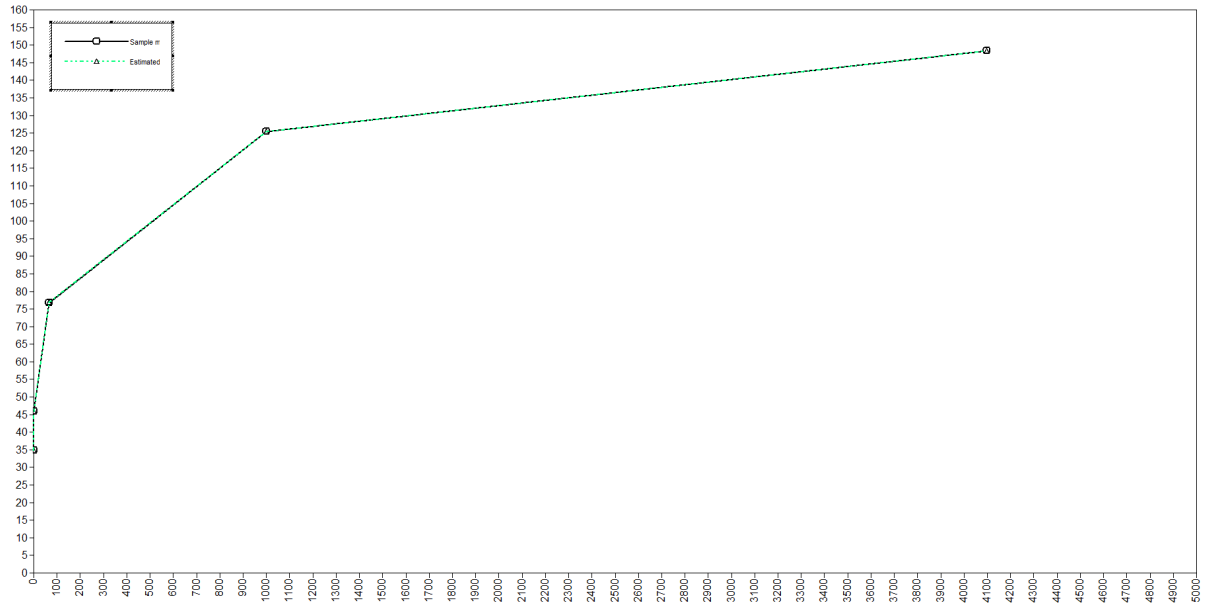

Figure 4-11. The plot of the reading achievement cubic trend.

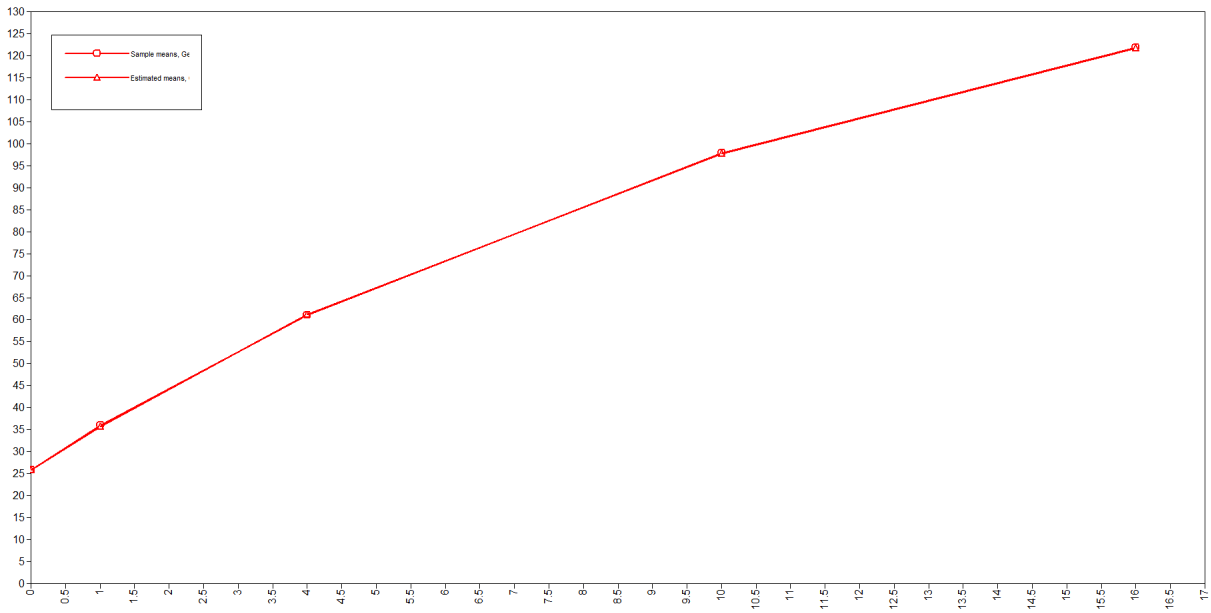

Figure 4-12. The plot of the mathematics achievement linear trend.

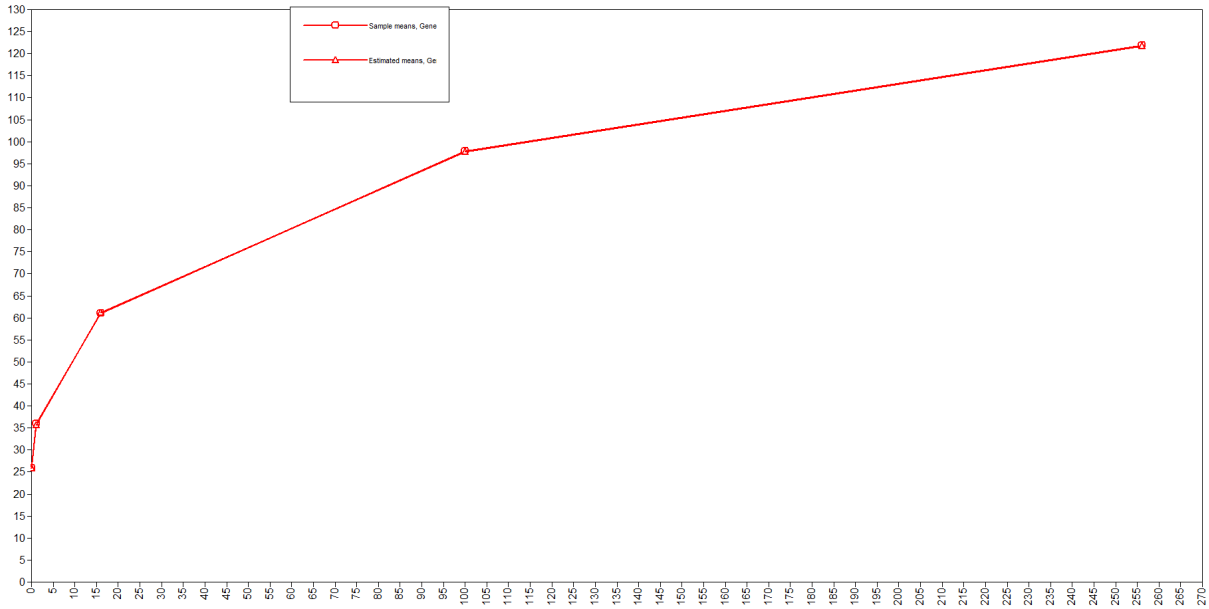

Figure 4-13. The plot of the mathematics achievement quadratic trend.

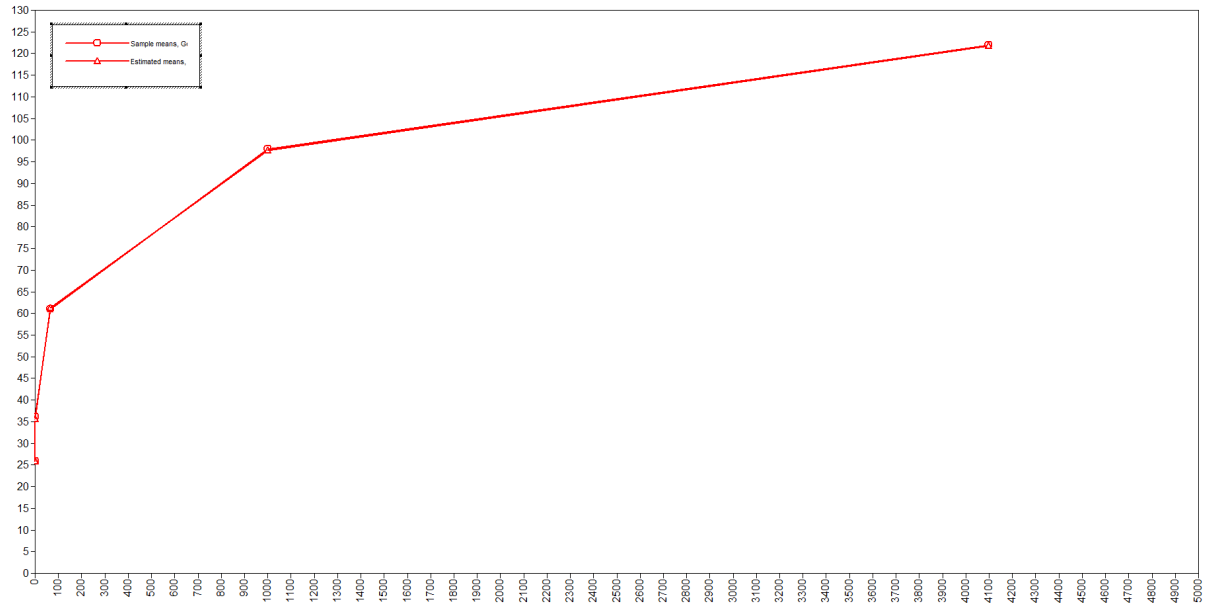

Figure 4-14. The plot of the mathematics achievement cubic trend.

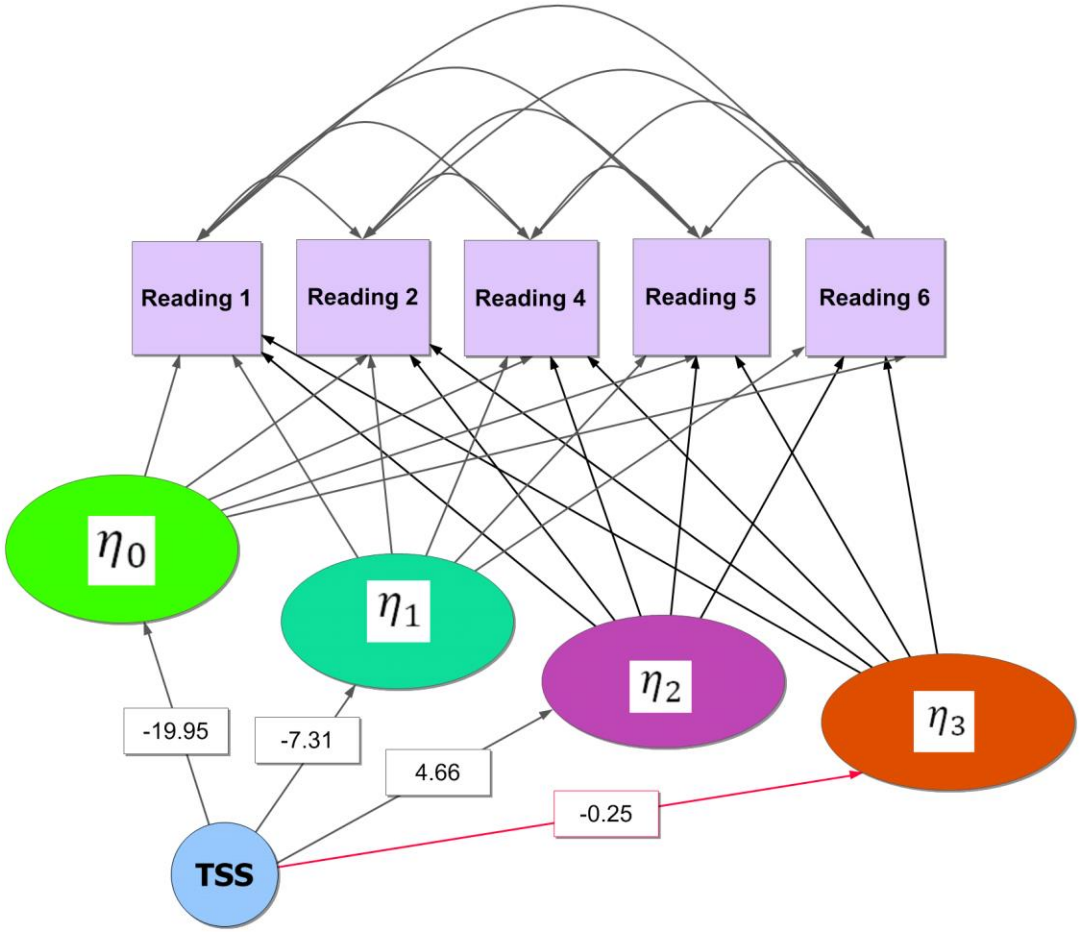

Figure 4-15. The path model analyzing the LGCM of reading achievement with the time-invariant covariate traumatic stress symptoms. The red line is an insignificant estimate all others were significant.

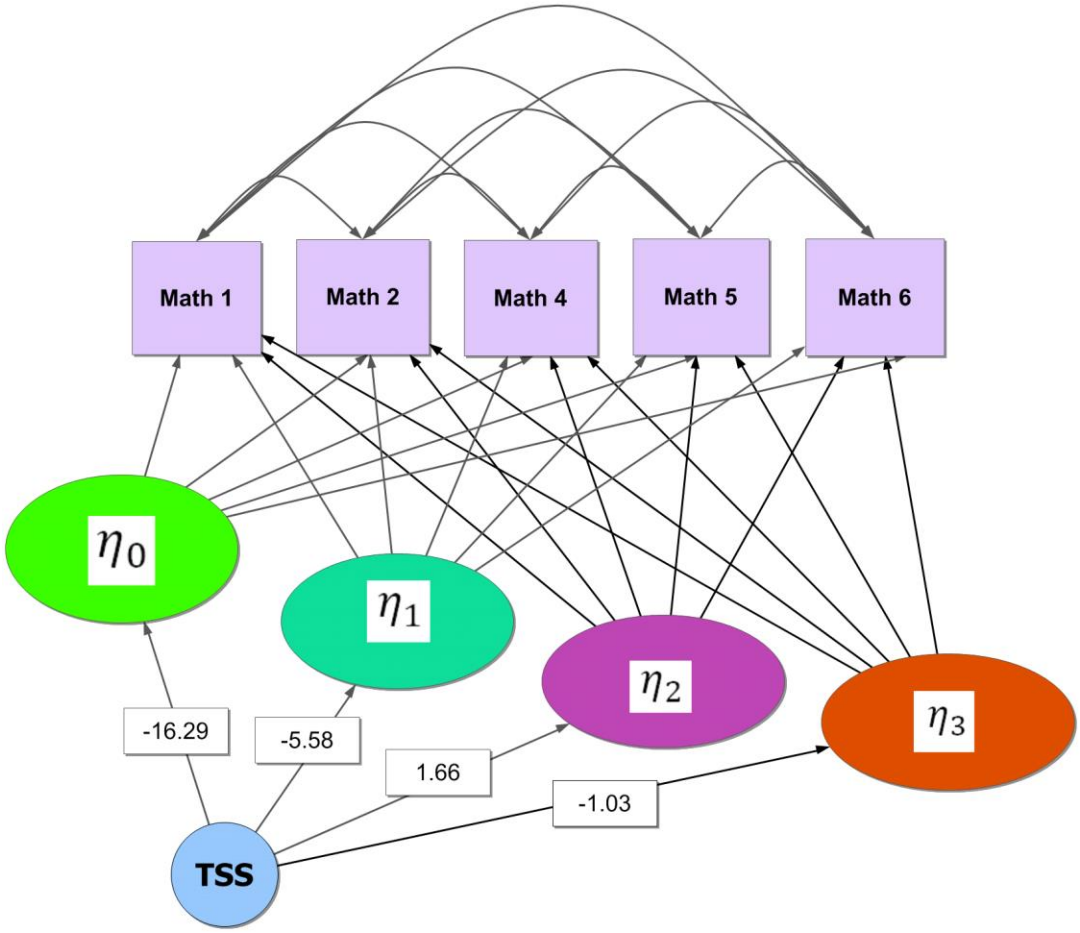

Figure 4-16. The path model analyzing the LGCM of mathematics achievement with the time-invariant covariate traumatic stress symptoms. All paths were significant.

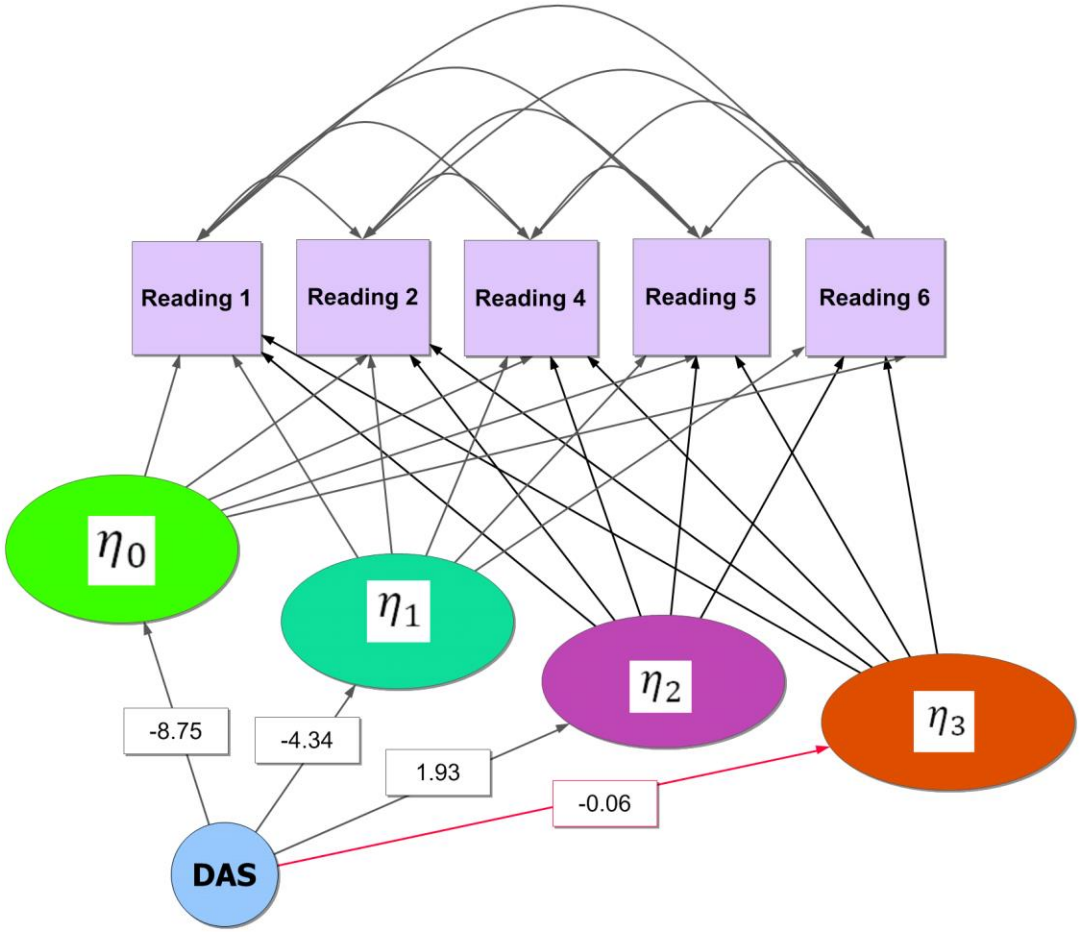

Figure 4-17. The path model analyzing the LGCM of reading achievement with the time-invariant covariate difficult attachment symptoms. The red line is an insignificant estimate all others were significant.

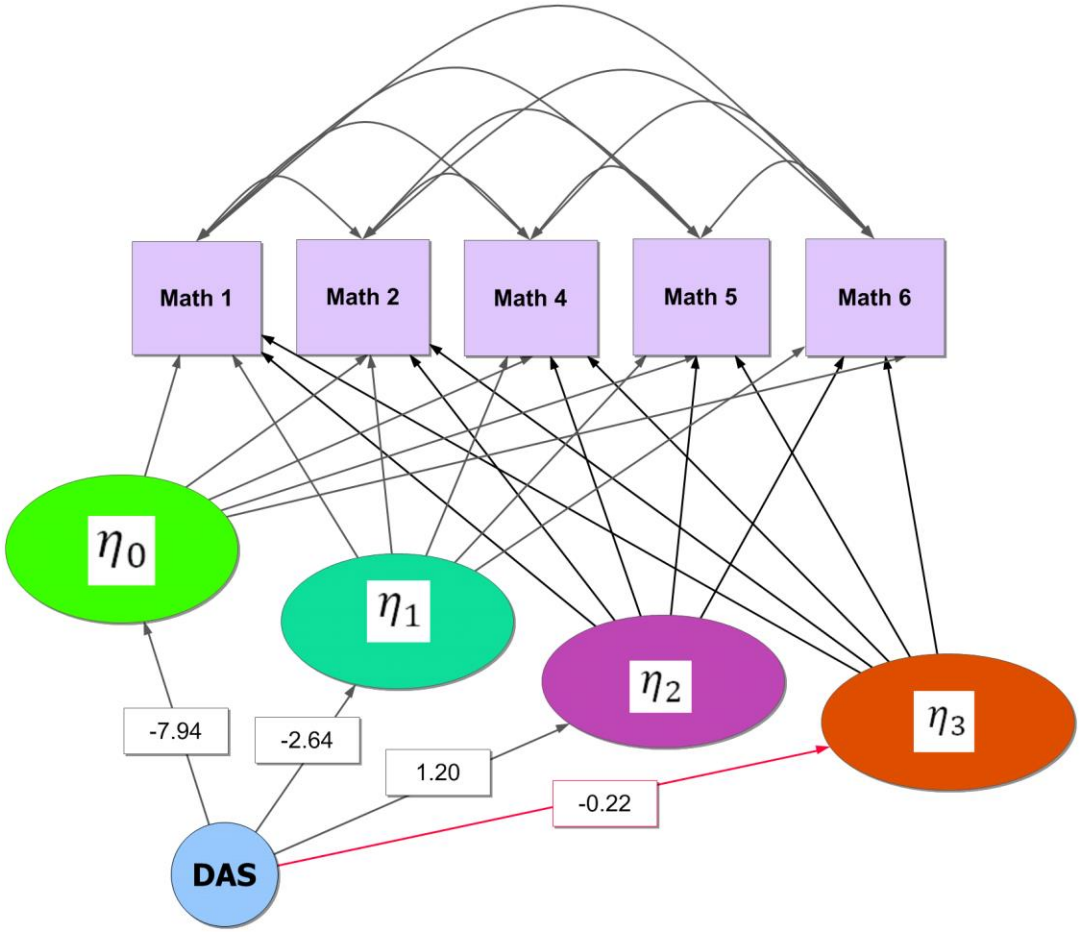

Figure 4-18. The path model analyzing the LGCM of mathematics achievement with the time-invariant covariate difficult attachment symptoms. The red line is an insignificant estimate all others were significant.

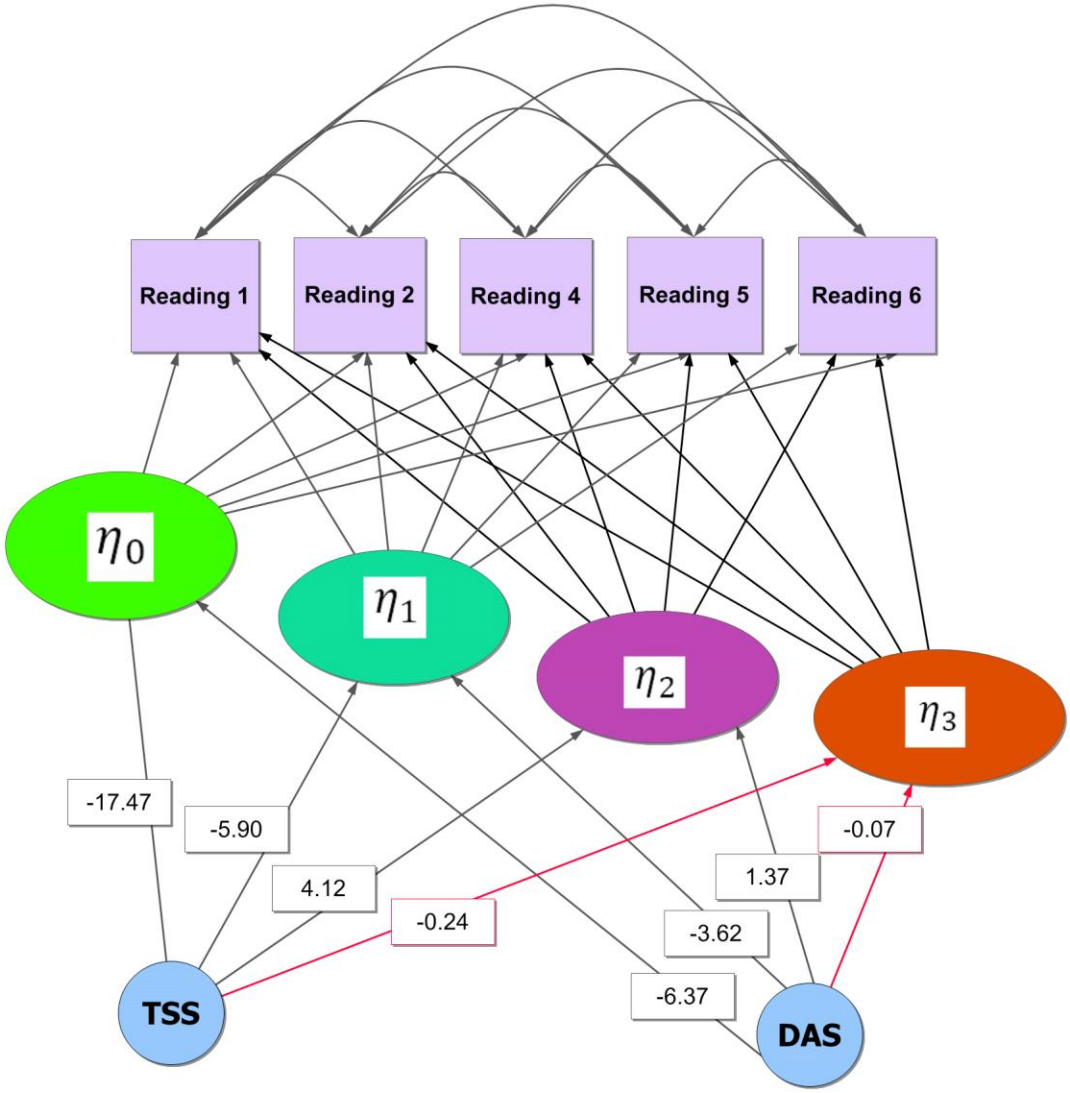

Figure 4-19. The path model analyzing the LGCM of reading achievement with the time-invariant covariates traumatic stress symptoms and difficult attachment symptoms. The red line is an insignificant estimate all others were significant.

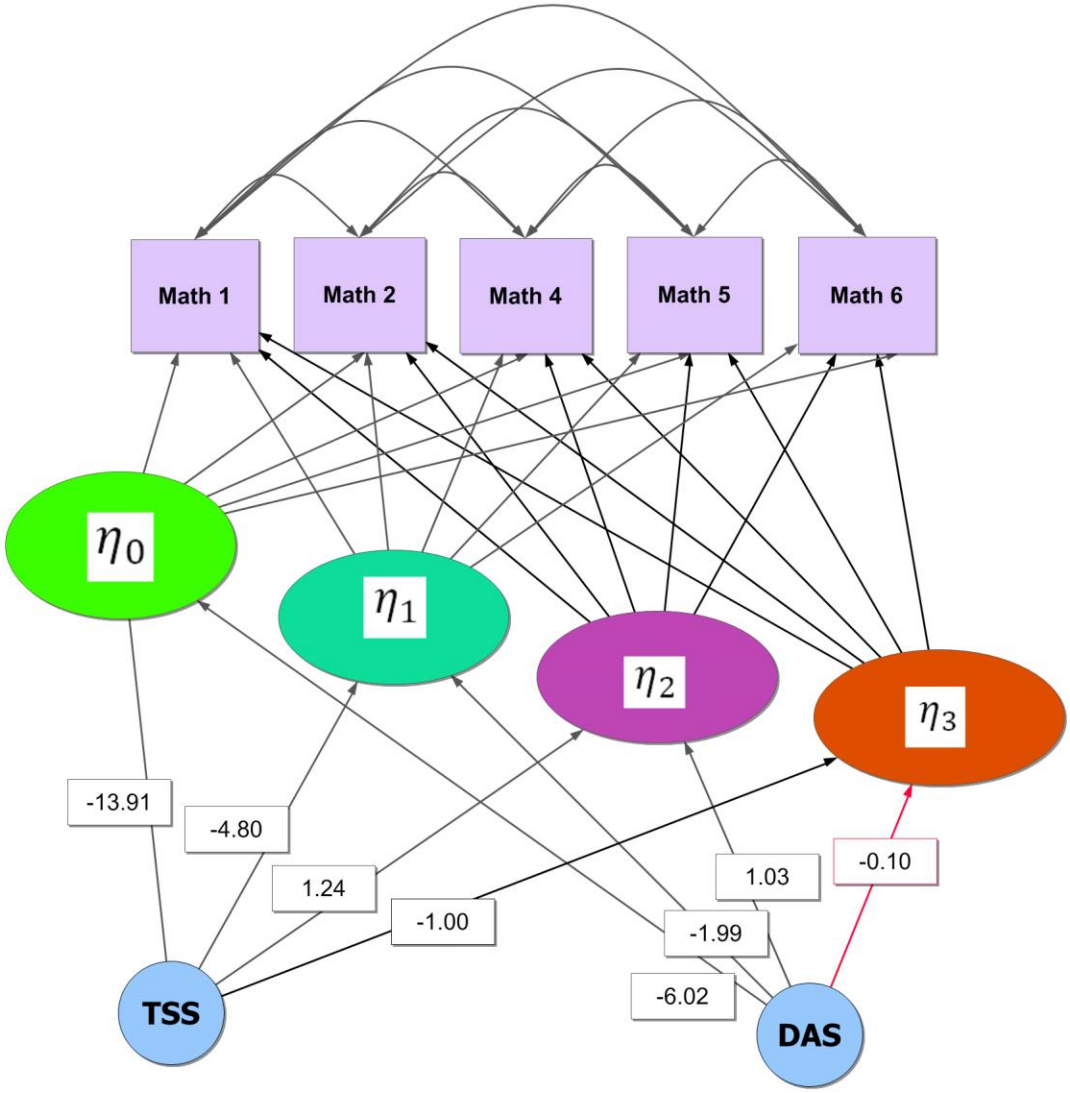

Figure 4-20. The path model analyzing the LGCM of mathematics achievement with the time-invariant covariates traumatic stress symptoms and difficult attachment symptoms. The red line is an insignificant estimate all others were significant.

Latent Variables	Observed Dependent Variables	Factors					Mean
		TICs	intercept	slope	quadratic factor	cubic	(K-5)
Traumatic stress	Reading	1	-	-	+		+intercept, +slope, -quad, -cubic
		2	-	-	+		
		7	-	-	+		
		8	-	-	+		
Traumatic stress	Mathematics	1	-	-	+	-	+intercept, +slope, -quad, -cubic
		2	-	-	+	-	
		7	-	-	+	-	
		8	-	-	+	-	

Latent Variables	Observed Dependent Variables	Factors					Mean
		TICs	intercept	slope	quadratic factor	cubic	(K-5)
Attachment	Reading	1	-	-	+		+intercept, +slope, -quad, -cubic
		2	-	-	+		
		7	-	-			
		8	-	-			
Attachment	Mathematics	1	-	-	+		+intercept, +slope, -quad, -cubic
		2	-	-	+		
		7	-				
		8	-	-	+		

Observed Independent Variables	Observed Dependent Variables	Factors					Mean
		TICs	intercept	slope	quadratic factor	cubic	(K-5)
Gender	Reading	F7	+	+	-		Male
		F8	+	+	-		
SES	Reading	7	+	+	-		Average SES
		8	+	+	-		
Culture	Reading	A7		-			White
		AA7	-	-			
		L7	-				
		OPC7					
		A8		-		+	
		AA8	-	-			
		L8	-				
		OPC8					
Interaction	Reading	8		-			

Observed Independent Variables	Observed Dependent Variables	Factors					Mean
		TICs	intercept	slope	quadratic factor	cubic	(K-5)
Gender	Mathematics	F7	-	-	+		Male
		F8	-	-	+		
SES	Mathematics	7	+	+	-		Average SES
		8	+	+	-		
Culture	Mathematics	A7		+	+	-	White
		AA7	-	-	+		
		L7	-		+		
		OPC7			+		
		A8		+	+	-	
		AA8	-	-	+		
		L8	-		+		
		OPC8			+		
Interaction	Mathematics	8		-			

Note. F = Female, A = Asian American, AA = African American, L = Latina/o, OPC = Other people of color, SES = Socioeconomic Status, TIC = Time Invariant Covariates

Figure 4-21. This describes the overall results across all five models with the cubic orthogonal polynomial latent growth curve model with seven time-invariant covariates (TICs) and one time-invariant covariate interaction.

CHAPTER 5
DISCUSSION

The purpose of this chapter is to discuss the findings regarding this study, the implications of these findings, and how these can be applied to practice, policy, and future research. The relationships explored in this study used complex methodologies and covered several areas that impact children's longitudinal educational experiences. Results of this study support the need for further work and development in this area.

Findings From the Study

This study provided support that the relationships between children's longitudinal development is significantly affected by the following intersecting aspects of their lives: traumatic stress symptoms, difficult attachment experiences, gender, SES, and culture/ethnicity. The following sections are a beginning to this discussion.

Traumatic Stress Symptoms

This study found relatively large effects from the latent variable traumatic stress symptoms (TSS) of young children as assessed at entry into kindergarten. The results of children expressing the various forms of hyper/hypo arousal, avoidance, or re-experiencing through verbal and nonverbal behaviors (Bailey et al., 2007; De Young et al., 2011a, 2011b; Mongillo et al., 2009) were related to significant levels of underachievement. While controlling for the other covariates, TSS was associated with a relatively large reduction in achievement scores at entry into kindergarten as well as a persistent lower growth rate over time. There was also evidence of significant nonlinear trends that often resulted in a flattening or premature plateauing effect on children's reading and mathematics achievement trajectories.

The TSS measurement model adapted from prior research (Goodman, 2009; Goodman et al., 2012; R. D. Goodman, personal communication, March 7, 2013) appeared well suited to

explaining much of children's longitudinal underachievement trends. The concepts of being low in self-control, having trouble forming interpersonal relationships, and high in externalized behaviors explained 90%, 70%, and 60% respectively of the variance in the LGCM. However, the measures of internalizing behavior and attention qualities of the children appear to address less of this issue as they only explained 11% and 13% of variance respectively. There could be several possible reasons for this. These may not be developmentally appropriate as young children may not be displaying these behaviors yet. Alternatively, it could be the issue where behaviors are passed off as personal or cultural deficits, which often inhibit educators from accurately assessing the risks and barriers for marginalized students (Robinson & Biran, 2006; O'Connor & Fernandez, 2006). Or it could be that parents and teachers are not aware of how to properly assess young children for internalizing behaviors and attention qualities. This supports the need for better developmentally appropriate direct assessments for children in this area.

Difficult Attachment Symptoms

The exploratory nature of this latent variable provided insight into the effects of relationships that get in the way of warmth and support for young children. This study found significant effects for reading and mathematics where children high in DAS showed persistently lower achievement scores at entry into kindergarten and had reduced growth trends over time, while controlling for the other covariates. DAS also showed effects on the nonlinear growth trends associated with mathematics achievement.

The DAS measurement model was chosen based on literature reviewed (Bergin & Bergin, 2009; George & Solomon, 2008; Kobak & Madsen, 2008; Perlman & Doyle, 2012) and was moderate in its ability to explain the reading and mathematics longitudinal trends. As other covariates were added to the model, DAS showed differing results. However, a strong interaction effect was shown to be present with traumatic stress symptoms, which could explain some of this

variability. Other explanations for DAS's variability could be due to the fact that attachment behaviors were not directly assessed and these indicators explained parent appraisals of the relationships with their children. Regardless, four of the five items were found to explain above 50% of the variance in reading and mathematics longitudinal achievement.

Interaction Between TSS and DAS

An important contribution this study had to current literature was exploring the interaction relationship between TSS and DAS, while controlling for the other covariates. The significant interaction effect between traumatic stress and attachment adds to the conversation of how does children's traumatic experiences interact with the attachment system (Bailey et al., 2007; De Young et al., 2011a, 2011b; Lieberman, 2004; Lieberman & Van Horn, 2008; Mongillo et al., 2009).

The interaction effect between TSS and DAS was statistically significant. Therefore the effects of TSS on the linear slope factor (η_{01}) are dependent on the value of DAS and likewise the effect of DAS on the linear slope factor (η_{01}) are dependent on the value of TSS; meaning they enhance each other's effects. This results in a reduction in growth over time for children high in TSS and DAS both from direct effects and from their interactions.

This informs the need to do further studies exploring the extent to which traumatic stress and attachment behaviors interact with children's academic achievement. Several studies have looked at the interaction between mother-child and their effect on academic success (Pianta & Harbers, 1996), however, the effects of experiences that are negative, sudden, and out of control are not all explained by mother-child interactions. Therefore, direct assessments that explore the relationship between attachment experiences and traumatic stress experiences will be important for future work in the area of early childhood mental health.

Academic Achievement and Sociodemographic Factors: Gender, SES, and Culture

The effects of gender on the academic achievement were significant in predicting children's growth trajectories. A child's gender estimated a strong relationship with the reading and mathematical achievement trajectory. Gender explained linear effects as well as nonlinear quadratic growth in children. When controlling for other covariates, females showed lower mathematics scores and higher reading scores. Likewise, male children performed higher in mathematics and lower in reading. This trend has been supported by many prior studies (Chatterji, 2006; Dearing et al., 2009; Morris, 2008).

In this sample, SES significantly predicted children's beginning reading and mathematics achievement scores, their linear trends, and nonlinear quadratic and cubic slopes for both reading and mathematics. These results indicated agreement with the literature review that even after controlling for other covariates, lower initial reading and mathematics scores as well as reduction in growth rate over time in kindergarten seem to be highly associated with children's poverty levels (Chatterji, 2006). This study found that children high in SES have large gains at initial levels, large gains in growth over time, and interestingly have larger quadratic trends that level off growth around third through fifth grade.

A child's culture showed significant linear effects, resulting in lower initial reading and mathematics scores for both African American and Latina/o children when compared to their European American peers. A surprising finding was that Asian American children predicted a significant lower growth trend in reading. The trend of African American children showing large significant gaps compared with European American children, even when other background characteristics were controlled was shown in this study as large negative intercepts were seen and lower growth rates over time were prevalent (Chatterji, 2006). A positive occurrence since this data was collected, is that even though European American student's continue to score

higher on average than African American and Latina/o students, the gap is narrowing as both African American and Latina/o students have made greater gains in both reading and mathematics achievement as shown in the National Center for Education Statistics (2012) *The Nation's Report Card*. Of particular interest was the similarity between the large negative intercept factor for both children of African American culture and children high in TSS. This hints that evidence of environmental factors may better explain the experiences of children of color. For example, traumatic stress symptoms for African American children across SES may be related to contextual factors, such as racism and other forms of bias embedded institutionally in schools and other systems, as previously discussed by Sue and Sue (2013) and Staton et al., (2012).

Limitations

This study, as mentioned before, used a nationally norm referenced data set collected by the National Center for Education Statistics (NCES). There were several limitations to this study needing to be mentioned. The most obvious concern surrounds generalizability and construct validity, due to the pre-collected nature of the data for post hoc analyses. Concerns surround construct underrepresentation with the latent variables traumatic stress symptoms and difficult attachment symptoms (American Educational Research Association, 1999). The low R^2 values found in the internalizing and attention constructs of TSS showed that there is a more complex process going on that may require more sophisticated questions or methods for collecting items for this construct.

As for DAS, the issue is more involved, as construct underrepresentation, construct-irrelevant variance, and construct validity are potential issues. This latent variable did not have previous studies that created a factor structure to draw from and there were not direct measures of attachment from the data set used. This required explorative methods to construct and assess

difficult attachment symptoms in this post hoc analysis. This was done with an extensive literature review and consultation with experts. Regardless of these issues, the results still suggest that there were significant effects from the theoretically driven latent variable difficult attachment symptoms (DAS).

Implications for Practice

Health in early childhood is dependent on the quality of attachment relationships as well as responsiveness to adverse situations that can create traumatic stress responses. In order to address the growing needs of young children, counselors and educators need to be skilled at providing developmentally appropriate and culturally sensitive ecosystemically informed interventions. From a counseling developmental perspective young children are seen as being capable of defining and contextualizing their experiences. Thus, through their attachment relationships and cultural perspectives they are in a continuous process of transforming their reality to meet their needs. This requires counselors and educators to use specialized assessment and case conceptualization skills that take into account young children's special developmental and cultural perspectives such as non-verbal communication and behaviors that allow counselors and educators to provide direct services.

Specialized Early Childhood Assessments

As this longitudinal study shows, when children's needs go unmet, significant persistent reading and mathematics underachievement is suggested to be the result. It therefore becomes important for counselors and educators who are going to work with young children to practice methods that attend to these young children's needs early rather than later. It is suggested that the best approaches comprise of multimodal perspectives that adjusts basic interviewing skills used with older children and adults to better work with young children's needs. Some of these needs require (a) establishment of safety, (b) need for warmth and care, (c) developing trust by

showing trust through culturally appropriate gestures, vocal tones, and facial expressions, (c) using explorative, empowering, ways grounded in theory in order to better make contact with young children at their own level (Erdman & Lampe, 1996). This becomes particularly important when they may be experiencing traumatic stress and/or difficulties in their attachment relationships or educational experiences. By incorporating differentiated cultural orientations of independence and interdependence, counselors and educators can apply a more ecosystemically accurate model of practices to work with young children (Suizzo et al., 2008).

Attachment and Traumatic Stress Assessments

In order to asses young children's experiences for quality of attachment or level of distress that may be traumatic due to sudden, negative events, that are perceived as out of control (Goodman & West-Olatunji, 2008b), a direct ecosystemic observation process is required. This means observing the child and their caregivers (parents, guardians, teachers, daycare, etc.) in many different environments that they are normally situated in, such as at home, in the classroom, daycare, or any community activities. These observations allow for a contextualized assessment so that any discrepancies can be used to formulate a plan of intervention.

In order to assess the levels of trouble that may be experienced in children's attachment relationships or in their experience of traumatic stress requires counselors and educators to have specialized training. This training should familiarize counselors and educators in ways of observing indicators of somatic, physiological, and behavioral symptoms in young children (Levine & Kline, 2007). This means understanding the context, such as lower SES, culturally marginalized, or in the case of attachment looking at displays of avoidance, resistance, or disorganized behaviors. When looking at traumatic stress it is important to look at non-verbal behaviors that cause the child to avoid, be repetitive, or highly aroused thus making it difficult to work with others. These neurological, behavioral, and relational systems require specialized

attention, which has led to a new area in development for counselors working with young children ages 0 to 5 called pediatric counseling (Wolfgang et al., 2012).

Pediatric Counseling

Pediatric counseling is a method developed for working with young children that incorporates the basic pedagogies and assumptions of the counseling profession such as preventative and strength based approaches to wellness (Mellin, Hunt, & Nichola, 2011). Pediatric counseling uses a range of interventions that are culturally sensitive to the child's family and community, comprising of more than play therapy, and promotes professionalism within and outside of the counseling profession (Wolfgang et al., 2012). Pediatric counseling goes further than allowing for young children (ages 0 to 5) to express themselves; rather these techniques are designed to provide opportunities for movement and transformation. Pediatric counselors provide young children the opportunity to make sense of their experiences in culturally sensitive ways through sociodramatic play (McDevitt & Ormrod, 2010), creating mediated learning experiences where young children can develop the ability to self-define, contextualize, and change their reality into healthy developmental journeys. By making appropriate assessments and case conceptualizations young children's traumatic stress experiences and attachment difficulties can be addressed in the moment so that the condition does not become worse, thus ending in academic underachievement. We therefore, can move from ameliorative practices with children and underachievement, to ones of prevention and greater success.

Implications for Policy

Underachievement for young children with traumatic stress and/or attachment difficulties creates disadvantages in schools and it is important to intervene through education and mental health policy. One of the ways to enhance the educational performance of young children

requires the assistance of educational policy makers. What this study and previous studies have been finding is that there is need for greater attention on environmental factors that affect the socio-emotional development in children (Koller & Bertel, 2006; Lockhart & Keys, 1998; Paylo, 2011). With support for these environmental factors children will be more likely to perform to their full abilities in school. Therefore, it becomes necessary for educational policy makers to provide direct funding for school counselors within elementary schools, who are specially trained to assist in the socioemotional needs of children. It also requires that school counseling be included in the educational reform agenda (Pérusse, Goodnough, Donegan, & Jones, 2004). By funding school counselors in this area it will allow for more accurate assessment, conceptualization, and intervention leading to better outcomes for all children, thus allowing the school counselor to help the school in educational equity and accountability. Moving school practices from remediation to preventative methods.

Young children experiencing traumatic stress and/or attachment difficulties are in need of culturally sensitivity and developmentally appropriate intervention. School counselors who are trained as mental health professionals (Koller & Bertel, 2006; Lockhart & Keys, 1998; Paylo, 2011), are capable of providing interventions which allow for support rather than deficit based practices; thereby, avoiding further oppressive experiences, cultural insensitivities, and other experiences that allow for disproportionate levels of traumatic stress and/or attachment difficulties to persist in children's educational and development trajectories (Ford et al., 2002; Goodman &West-Olatunji, 2010; Sue & Sue, 2013; Wycoff, 1996).

This can be most efficiently achieved by providing direct funding for school counseling positions in elementary schools, as well as developing an agenda that allocates job descriptions so that trained professional counselors can provide the mental health services needed for young

children (Carey, Harrington, Martiin, & Stevenson, 2012; Koller & Bertel, 2006). The importance of having school counselors in elementary schools can impact more than just direct services delivery, as school counselors can serve as consultants for teachers and administrators around the socio-emotional needs of young children. This is of great need since educator's are challenged by not only needing to teach content driven academic pedagogy, but also being required to create classroom environments where all learners' needs are addressed (Koller & Bertel, 2006).

Since counselors focus on developmental models, particularly school counselors trained in pediatric counseling, can aid teachers in developing more accurate assessments and develop more effective interventions for young children. Fundamentally, by utilizing these more effective interventions the development of children’s education will improve, because of this important interplay between emotional health and school success (Koller & Bertel, 2006). Allowing counselors, teachers, and administrators to prepare and prevent exacerbated effects from children’s traumatic stress and/or attachment difficulties would thus create improved outcomes not only in physical health, mental health, but also educational growth.

Mental Health policy makers can support the needs of young children by including them in service delivery rather than continuing the predominant focus on adult mental health services that has been the trend for more than ten years (Lockhart & Keys, 1998). By allocating more attention and support for the use of developmentally and culturally sensitive practices for young children, it would lessen the burden now affecting adult mental health. Early interventions would lessen the negative effects of distress so that they do not continue into academic underachievement, persistent mental health problems, or the growing juvenile justice difficulties for our youth (Koller & Bertel, 2006). Policy makers can make it a priority for mental health

counselors who work with young children to address issues of distress earlier instead of waiting and facilitate family's cultural context to improve a stronger collaborative effort (Paylo, 2011). The earlier the traumatic stress and/or attachment difficulties are assessed; it will provide opportunity for a prevention focus. This would be in place of current practices that often wait until young children achieve developmental competence where they can articulate their concerns. This allows counselors and educators to implement preventative interventions that emphasize resilience and wellness.

Recommendations for Future Research

Given that pediatric counseling (Wolfgang et al., 2012) is a developing paradigm, it is important that professional counselors reach agreement regarding the definitions, procedures, and culturally sensitive interventions that make up this new area in the field. To advance our understanding of pediatric counseling, a Delphi study is recommended (Clayton, 1997; Fish & Busby, 2005; Vázquez-Ramos, Leahy, & Estrada Hernández, 2007). The Delphi methods would allow counseling researchers proficient in the area of early childhood work to create a consciousness about cross-cultural issues in development in counseling young children that doesn't currently exist. This systematic way of interacting with experts who are knowledgeable in working with young children in early childhood would be able to refine these experts knowledge and opinions through subsequent reviews; with the eventual outcome being a converging consensus about pediatric counseling (Solmonson, Roaten, & Cheryl, 2010; Vázquez-Ramos et al., 2007). This would provide a foundation for further developing our understanding of how traumatic stress, attachment difficulties, and their interactions impact young children.

Delphi studies provide a flexible and time efficient way to come to consensus (Fish & Busby, 2005) and would help the shaping of the future of pediatric counseling. This would be an

ideal way to move forward with pediatric counseling as its own entity within the professional counseling field. The results could provide valid, reliable feedback from current experts on how to address the issues of pediatric counseling and illustrate these against the other practices utilized today. This practice could aid in the refining of the pediatric counseling competencies presented in Table 5-1.

Summary of Study

In sum, academic underachievement is a significant national problem that has disproportionately affected culturally diverse students. Prior research has suggested that sociodemographic factors are significant contributors towards this disproportionality, these include: (a) hegemony within the educational system positions culturally diverse students as academically and behaviorally deficient (O'Connor & Fernandez, 2006), (b) academic relevance or the view that education will lead to better jobs and the intersectionality of race and culture with gender has been a contributing component to the gender differences found in both reading and mathematics achievement (Clark et al., 2008; Crumpton & Gregory, 2011; Morris, 2008), and (c) that children from poor families are marginalized, disenfranchised, and are not provided access to tools that make educational achievement possible (Biles et al., 2012; Chatterji, 2006; Pressley & Sifford, 2012). Additionally, researchers have found that attachment quality is significantly correlated with achievement outcomes particularly in preschool and elementary (Moss & St-Laurent, 2001; Moss et al., 2011; Solomon & George, 2011a; Pianta & Harbers, 1996). It has also been suggested that difficult attachment relationships are significantly connected with traumatic stress experiences and that both should be assessed (Lieberman, 2004; Lieberman & Van Horn, 2008). Traumatic stress experiences have been shown to be connected with insecure attachments, transgenerational trauma, systemic oppression, as well as the many events that can cause young children to perceive things as negative, sudden, and out of control;

thus affecting academic achievement (Bergin & Bergin, 2009; Dass-Brailsford, 2007; Danieli, 2007; Johnson, 1997; Moss & St-Laurent, 2001; Moss et al., 2011; West-Olatunji & Conwill, 2011).

The gap that this study fills is that these conditions were assessed together and their effects were tracked over time from kindergarten to fifth grade. No other studies reviewed had started at the kindergarten years and looked at the relationships longitudinally towards reading and mathematics achievement. The research design of this study was a longitudinal nonlinear latent growth curve model with time-invariant covariates. This study explored the relationships of the covariates with the mean trajectory of a national cohort of kindergarteners till fifth grade in reading and mathematics academic achievement. The significant findings of this study are that there is a significant interaction between traumatic stress symptoms and difficult attachment symptoms that predicts individuals high in traumatic stress and difficulty with attachments show lower growth over time. Traumatic stress symptoms and difficult attachment symptoms significantly estimate lower initial values in achievement assessments and that low growth persist over time. It was also shown that difficult attachment symptoms have nonlinear effects on the growth rate when the other covariates and interaction are controlled for. The effects of gender, SES, and culture show significant lower initial values and lower growth over time for males, who are poor, and are culturally diverse in the area of reading achievement. Also, gender, SES, and culture show significant lower initial values and lower growth over time for females, who are poor, and culturally diverse in mathematics achievement. The significance of these findings to this research area is that they emphasize the extreme importance of considering the impact that environmental characteristics have on young children's achievement and development.

The recommendations for practice and policy involve a strong suggestion that professional counselors who become skilled at working with young children and in working within the school system, such as school counselors and other counselors trained in pediatric counseling, be employed to assist young children in navigating difficult environmental circumstances. This means that educational policy makers need to make specific budget allocations to include counselors in schools, that the role of these counselors need to be specifically for counseling children, and support for supervision and continuing education need to be implemented. The recommendations for future research involve the further development of the pediatric counseling paradigm, through the use of a Delphi study, allowing for valid, reliable, feedback from experts on how to proceed forward with the development of pediatric counseling at its own entity.

Table 5-1. Pediatric Counseling Competencies.

1. Counselor education training incorporating a paradigm of specific training geared to children age 0 to 5 populations.
2. Specialized skills, training, and dialogue to work with children so counselors are equipped with the tools that acknowledge characteristics and cultural nuances that are specific to child populations.
    a. Foundational elements of communication, with a focus on the use of audible and tactile messages, eye-contact and facial recognition, and kinetic or experiential means of expression.
    b. Training in first-aid and CPR.
    c. Cross-culturally effective interventions.
    d. Empowerment of child-client skills.
3. Knowledge and skill of development and the variety of developmental models a child could have within context of culture.
4. Be comfortable with differences in terms of culture, beliefs, individual, and social experiences of where a child is in their development.
5. Recognize the impact of human development with communication and gestures that are ethical and appropriate for the child's development phase.
6. Knowledge about own developmental cultural beliefs and influences while helping to identify strengths and resources of young children ages 0 to 5.
7. Consultation with colleagues, research, and people beyond family/caregiver within the child's community (teachers, friends, peers, etc.) on the developmental process, cultural trends, school and federal perspectives of development, implications of how child and family/caregiver are effected by the child's development process.
8. Focus on interventions geared toward young children (ages 0 to 5) that incorporate direct service delivery and secondary family/caregiver support services.
9. Actively seek out experiences that support children's ability to self-define identity, contextualization experiences, and transform their reality.
10. Advocate for the development, exploration of new paths to development, and culture-centered treatment plans with children; thus, creating further applications of multimodal therapies within pediatric counseling.

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BIOGRAPHICAL SKETCH

Jeff Drayton Wolfgang received a Bachelor of Science, in fall 2003, graduating with cum Laude status in his zoology major. In fall of 2008, he received a Master of Education and Specialist in Education, majoring in marriage and family counseling. In summer 2013, he received his Doctor of Philosophy, majoring in marriage and family counseling. He received his bachelor's, master's, and doctorate degrees from the University of Florida.

His research has focused on traumatic stress, attachment, marginalized and oppressed populations, multicultural counseling, and pediatric counseling. A theme of his research, publications, presentations, and practice are that theories and methodologies need to embody emancipatory frameworks thus leading to mutually empowering and transformative relationships.