TEACHER-CHILD RELATIONSHIP QUALITY AND CHILDREN'S BEHAVIORAL AND ACADEMIC TRAJECTORIES ACROSS ELEMENTARY SCHOOL

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Despite recent growth in research highlighting the potential of teacher-child relationships to promote children's development, important questions remain about the stability and relevance of relationships between teachers and children beyond the early school years. By incorporating results from two related, longitudinal studies using data from the National Institute of Child Health and Human Development Study of Early Child Care (NICHD SECC, 1993), this investigation answer nuanced questions about the developmental pattern of teacher-child relationships and their association with children's development across elementary school.

The first study identifies distinctive developmental trajectories of teacher-child relationship quality from kindergarten through 5th grade, using a semiparametric group-based approach (Nagin, 2005). In addition, it tests whether child and family characteristics are linked to particular relationship trajectory groups. The second study examines longitudinal connections between teacher-child relationships and children's development throughout elementary school. Using two-level hierarchical linear models (HLM, Raudenbush & Bryk, 2002), this study examines within- and between-child associations between teacher-child relationship quality and academic achievement and behavior problems from kindergarten through 5th grade.

Additionally, it considers whether relationships with teachers matter more for the developing competence of disadvantaged children.

Results from the first study demonstrate that four distinct trajectories of teacher-child relationship quality can be identified from kindergarten through 5th grade. Specifically, one large group of children showed a stable trajectory of high relationship quality, two groups showed qualitatively different trajectories of decreasing quality, and a fourth group showed a trajectory of increased quality. Both characteristics and competencies of the child and his or her family were found to be useful predictors of membership in each trajectory group. Results of the second study indicate that relationship quality teachers report with students is associated with trajectories of achievement and behavior problems from kindergarten through 5th grade for all children, regardless of their socioeconomic risk status. Taken together, these findings support the idea that different quality teacher-child relationships constitute an important context for the development of children's competence in school.

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PREFACE

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1.0   INTRODUCTION

Contemporary theories in applied developmental psychology are founded on the idea that the basis for development lies in the connections among the different levels of organization in which life is embedded (Bronfenbrenner, 1979). Within this perspective, relationships between the developing individual and people, objects and symbols in the immediate contexts, as well as the interactions with more distal contexts drive development (Bronfenbrenner & Morris, 1998, Lerner, 1998). Since this framework was introduced, there has been a shift in the focus of developmental analysis from individual structures, functions, and attributes, to relational and interactional processes across contexts. Within this approach, relationships with adults and peers are considered to be some of the principal factors that influence child development (Lerner, 1998, Pianta, 1999; Sameroff & Fiese, 2000).

Relationships are enduring dyadic systems, the character of which is not equivalent to the characteristics of the individuals, but emerges from the history of the interaction between them. In addition, relationships are connected to other relationship systems and are not static, but change over time (Hinde, 1987; Sameroff & Emde, 1989). Hinde (1976) argued that when studying relationships it is important not only to consider what the individuals do together (e.g., the content of interaction, the diversity of interactions, the reciprocity or complementarity of interactions), but also how they do it. How individuals interact or the quality of the relationship

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depends on the emotions involved in the interaction and on the alignment in the individuals' goals.

There is widespread agreement in the developmental literature that early relationships with adults play a significant role in child development. Among children and adolescents at risk for behavior and/or school problems, the presence of a close relationship with an adult can make the difference between adjustment and psychopathology (Masten & Garmezy, 1985; Rutter, 1985; Werner & Smith, 1992). Child-adult relationships mediate children's adaptation across contexts by shaping early social expectations, emotion regulation, interpretation of emotions, self control, and conformity to rules (see Berk, 2004; Shonkoff & Phillips, 2000 for reviews). The quality of children's relationships with adults is an important determinant of the extent to which contexts provide resources to support children's development (Berk, 2004; Shonkoff & Phillips, 2000).

Although relationships with parents are most important in shaping children's development, it is increasingly evident that relationships with other familial and non-familial adults normally play a salient role in children's lives (Howes, 1999). In some families and cultures, grandparents and other kin are regularly involved in caregiving and provide significant emotional support to young children (Chase-Lansdale, Brooks-Gunn, & Zamsky, 1994; Jackson, 1993; Spieker & Bensley, 1994). Outside the family, teachers have a central role in children's lives and, especially in early child care settings, assume significant responsibility for children's social, emotional and academic development (Howes & Hamilton, 1992; Howes & Ritchie, 2002).

1.1 THEORETICAL APPROACHES TO TEACHER-CHILD RELATIONSHIPS

The last twenty years has seen a wealth of studies exploring the role that teacher-child relationships may play in shaping children's social and behavioral competencies, cognitive abilities, motivation, and classroom learning experiences. Indeed, the study of teacher-child relationships has a long tradition both in education and psychology.

Relationships are central in Vygostky's theory and his conceptualization of the *zone of proximal development* (Vygotsky, 1978). Vygotsky argued that it is through interaction with others (e.g., parents, teachers, peers) within that zone that children become able to carry out complex thinking independently, and to use and transform cultural tools (Vygotsky, 1978). Drawing on Vygostky's work, authors working from a social constructivist approach argue that learning is a "social accomplishment" (Goldstein, 1999; Tharp, Estrada, Dalton & Yamauchi, 2000), and good relationships with teachers are seen as the main context in which the development of independent and complex thinking occurs (Goodenow, 1992; Rogoff, 1990, 2003). The emphasis therefore is put on teachers' ability to serve as a guide and connect with students to facilitate their understanding of increasingly complex concepts and social problems (DeVries & Zan, 1996). Teachers' ability to demonstrate "caring", using techniques that match with students' needs, and creating spaces of joint activity is then considered to be central to support children's development (Goldstein, 1999; Tharp et al., 2000).

The role of teachers in shaping children's success in school was also highlighted within the motivational literature with Brophy and Good's (1974) seminal work on the causes and consequences of teacher-child relationships. From a motivation perspective, children who have good relationships with teachers will be more engaged in classroom activities, conform more to classroom norms, and be more motivated to learn and pursue academic goals (Brophy, 1998;

Davis, 2001; Wentzel, 1993, 1997, 1998). Authors working from this approach also stress that teacher' beliefs, goals, and behaviors, as well as the emotional and evaluative climate they create in the classroom contribute to high quality teacher-child relationships that in turn facilitate student's motivation and learning (Turner & Meyer, 2000).

Within developmental psychology, attachment theory constitutes one of the strongest theoretical frameworks for understanding the nature and implications of children's affective relationships with adults. From an attachment perspective relationships with teachers are primarily understood as an extension of attachment relationships with parents. Teachers, especially in early childhood, are seen as "alternative caregivers" (Howes, 1999; Howes & Hamilton, 1992), who can help children's development by providing an environment of support and emotional security in which children are better able to organize and modulate their emotions, effectively interact with others and confidently explore classroom resources (Howes & Hamilton, 1992; Pianta, 1999). Central to this approach is the idea that the quality of teacher-child relationships is shaped by teachers' ability to respond to children's emotional as well as academic needs, and by children's mental representation about the self, others and relationships, which is based on early experiences with caregivers (Bowlby, 1982; Howes, 1999).

1.2   PIANTA'S CONCEPTUAL MODEL OF TEACHER-CHILD RELATIONSHIPS.

Pianta (1999; Pianta, Hamre & Stuhlman, 2003) proposed a conceptual model to advance understanding of the nature of relationships between teachers and children, and their contribution to children's development. This model integrates the theoretical and empirical contributions from the attachment perspective, with emphasis on relationships as the unit of analysis and the

embeddedness of children's lives within proximal and distal contexts of influence from the Bioecological Model (Bronfenbrenner & Morris, 1998) and Developmental Systems Theory (Lerner, 1998).

This conceptual model defines teacher-child relationships as its unit of analysis, and describes them as dynamic, multicomponent systems, connected to other relationships and levels of organization (Pianta et al., 2003). According to Pianta (1999; Pianta et al., 2003), the primary components of teacher-child relationships are four. First, relationships encompass teachers' and children's biological (e.g, temperament) and sociodemographic characteristics (e.g., gender, race/ethnicity, socioeconomic status), cognitions (e.g., perceptions of self and others, beliefs), social competencies, and behaviors. Other characteristics of teachers are also incorporated in the relationship, including teaching experience, education, and instructional practices. Second, and drawing heavily on attachment theory, mental representations of relationships that shape individuals' perceptions, beliefs and behavior are reflected in the quality of the relationship. Third, teacher-child relationships also include the processes by which individuals exchange information and provide feedback to the relationship, such as behavioral interactions, language and communication. And finally, relationships receive external influences from the larger contexts in which they are embedded. For example, classroom characteristics (e.g., teacher-child ratio, ethnic and sociodemographic composition), school climate, state regulations for student performance, cultural conception of education, and so forth, may influence teacher-child relationships.

Within this conceptual model, good relationships with teachers are defined by a combination of high levels of closeness and low levels of conflict (Davis, 2003). Closeness in teacher-child relationships indicates the degree of warmth, positive affect, and open

communication that teachers perceive in their relationship with a child. In contrast, conflict in teacher-child relationships reflects the levels of negativity, hostility, absence of communication, and difficulty teachers perceive in managing children's behavior. Defined in this way, high quality teacher-child relationships have been empirically associated with children's development of competencies in the areas of peer relations, self-regulation, self-esteem, classroom adjustment, and academic achievement (Birch & Ladd, 1997; Howes, Matheson & Hamilton, 1994; Lynch & Cicchetti, 1992; Pianta, 1992).

These dimensions of closeness and conflict have been consistently found in several studies and across different samples (Birch & Ladd, 1998; Burchinal, Peinser-Feinberg, Pianta & Howes, 2002; Hamre & Pianta, 2001; Pianta, Steinberg and Rollins, 1995; Pianta & Stuhlman, 2004) using Pianta's *Student-Teacher Relationship Scale* (STRS; Pianta, 2001). Although these dimensions reflect only the teacher's view of the relationship, the focus of the assessment is on the relationship, in that the measure's items provide information about the child's relational behavior (Pianta et al., 2003). Other studies using children's reports of relationship quality have identified similar dimensions of emotional closeness, involvement, and negativity (Pianta et al., 2003). However, it is important to note that the definition of relationship quality within Pianta's conceptual model and in the vast majority of existing empirical research studies is limited to the teacher's perception of the relationship. Therefore, it is not clear whether conclusions about associations between the quality of teacher-child relationships and children's development result from use of this single method.

In sum, Pianta's conceptual model of teacher-child relationships integrates the concepts, and empirical findings from different theoretical approaches to teacher-child relationships. Even though children's perceptions of and feelings about the relationship with teachers have not been

sufficiently incorporated in this model, its focus is on a relational unit of analysis, and the incorporation of influences from multiple levels of organization provides a comprehensive framework for the study of teacher-child relationships.

1.3   THE PRESENT INVESTIGATION

A growing number of studies grounded in Pianta's conceptual model have been conducted in the last dozen years, focusing on two aspects of teacher-child relationships. Based on the idea that children have a mental model for relationships, a first group of studies examined to what extent the quality of children's relationships with teachers is consistent with the quality of their relationships with parents, and is stable across school years. In general, these studies suggest that while some children's relationships with teachers are consistent in quality with their relationships with parents (Howes & Matheson, 1992; Howes, Rodning, Galluzzo, & Myers, 1988), other children with insecure relationships with parents may develop secure relationships with teachers (Howes & Segal, 1993; Lynch & Cicchetti, 1992). In addition, research suggests that there is moderate stability in teacher-child relationship quality across the early years of school (Howes & Hamilton, 1992; Howes, Phillipsen, & Peisner-Feinberg, 2002; Jerome, Hamre & Pianta, in press; Pianta & Stuhlman, 2004).

Because relationships with teachers are hypothesized to support children's adjustment and developing competencies, another group of studies within this framework has focused on exploring the association between teacher-child relationship quality and children's outcomes. Results from these studies suggest that secure and close relationships with teachers predict – albeit modestly- a wide range of outcomes in the emotional, social and cognitive domains, and

may even serve as a protective factor against the development of psychopathology later in life (Birch & Ladd, 1997; Howes et al, 1994; Lynch & Cicchetti, 1992; Pianta, 1999).

These studies however, left unanswered many important questions about the nature and potential impact of relationships between teachers and children. With only a few exceptions, the vast majority of recent research has focused on the preschool years and the first years of elementary school, although important developmental changes take place during middle childhood and transformations occur in the structure of classrooms and the role of teachers as children move through elementary school. Furthermore, extant studies are characterized by methodological limitations not fully recognizing existing heterogeneity in teacher-child relationship quality over time, or using approaches in which associations may be explained by omitted variable bias, or rater effects.

By incorporating results from two related, longitudinal studies, this investigation helps fill gaps in the literature and answer nuanced questions about the developmental pattern of teacher-child relationships and their association with children's development across elementary school. The first study identifies distinctive developmental trajectories of teacher-child relationship quality from kindergarten through 5th grade, using a semiparametric group-based approach (Nagin, 2005), which recognizes existing heterogeneity characterizing interactions between teachers and children across the elementary school years. In addition, it tests whether child and family characteristics are linked to particular relationship trajectory groups.

The second study examines longitudinal connections between teacher-child relationships and children's development throughout elementary school. Using two-level hierarchical linear models (HLM, Raudenbush & Bryk, 2002), this study examines within- and between-child associations between teacher-child relationship quality and academic achievement and behavior

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problems from kindergarten through 5th grade. Additionally, it considers whether relationships with teachers matter more for the developing competence of disadvantaged children.

Both studies use data from the National Institute of Child Health and Human Development Study of Early Child Care (NICHD SECC, 1993), a large longitudinal dataset has collected extensive data about child development and child care of 1,364 American children. Participants were selected using a conditional sampling plan to ensure that the sample reflected the economic, educational, and ethnic composition of the 10 cities where participants were recruited: Little Rock, AR; Irvine, CA; Lawrence, KS; Boston, MA; Philadelphia, PA; Pittsburgh, PA; Charlottesville, VA; Morganton, NC; Seattle, WA; and Madison, WI. Children eligible to be included in the sample were those who stayed less than 7 days in the hospital, were singletons with no medical problems, had mothers over 18 years of age with no history of substance-abuse problems, and not planning to move in the next three years. Of the 8,986 women screened for eligibility, 1,364 became study participants in the first phase of the study that followed children from birth to age three years. A second phase followed 1226 children from age 3 through 2nd grade, and a third followed 1100 children from 2nd through 6th grade. Data collected during the second and third phases were included in this study. The longitudinal nature of these data allows use of rigorous analytic techniques to document trajectories of teacher-child relationship quality, as well as longitudinal associations with academic achievement, and behavior problems from kindergarten through 5th grade.

This investigation is based on Pianta's conceptual model. Therefore, relationships with teachers are viewed as dynamic multicomponent systems, determined by features of the various contexts in which they are embedded. As is the case with most research studies within this framework, the two studies that comprise this investigation are based on teacher's reports of

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relationship quality as defined by levels of closeness and conflict. Therefore, subsequent references to teacher-child relationship quality should be understood as strictly reflecting teachers' perception of relationship quality.

2.0   TRAJECTORIES OF TEACHER-CHILD RELATIONSHIP QUALITY

Although relationships with parents are typically the most important in shaping children's socioemotional and cognitive development, it is increasingly evident that relationships with other non-familial adults play a salient role in children's lives (Howes, 1999). A growing body of literature suggests that relationships with teachers shape children's development in important ways during the early school years (Pianta, 1999). Researchers have demonstrated associations between teacher-child relationship quality and child wellbeing across a wide range of domains, including peer relations, self-regulation, self-esteem, classroom adjustment, and academic achievement (Birch & Ladd, 1997; Burchinal et al, 2002; Howes, et al, 1994; Lynch & Cicchetti, 1992; O'Connor & McCartney, 2007; Pianta, Nimetz & Bennett, 1997; Pianta et al., 1995; Pianta & Stuhlman, 2004; Silver, Measelle, Armstrong & Essex, 2005).

In spite of the rapid growth in research linking teacher-child relationships with children's outcomes, significant questions remain about stability and change in these relationships across the elementary school years. Existing studies about the stability of teacher-child relationship quality have largely been conducted in the preschool years and the early years of elementary school. It is not clear how relationship quality evolves as children progress through elementary school. Between kindergarten and 5th grade, children face new teachers and numerous developmental challenges as classroom structure and the role of teachers change. Using data from the National Institute of Child Health and Human Development's Study of Early Child

Care (NICHD SECC), this study identifies distinctive developmental trajectories of teacher-child relationship quality from kindergarten through 5th grade, and tests child and family characteristics as predictors of each trajectory.

2.1   RELATIONSHIP QUALITY IN THE EARLY YEARS OF SCHOOL

When children first enter school, teachers assume significant responsibility for their social, emotional, and academic development. They can provide an environment of support and emotional security in which children are more able to organize and modulate their emotions, effectively interact with others and confidently explore classroom resources.   Teacher-child relationships in recent years have been studied most extensively in the context of preschool and child care classrooms. High quality teacher-child relationships during early childhood are defined as those in which teachers report a combination of closeness and low conflict (Davis, 2003; Pianta, 1999). Closeness in teacher-child relationships is characterized by warmth, positive affect, and open communication. In contrast, conflict reflects negativity, hostility and difficulty in managing children's behavior (Pianta et al., 1995).

Based on current theoretical models of child development (Bronfenbrenner & Morris, 1998; Lerner, 1998; Sameroff & Fiese, 2000), Pianta (1999) has conceptualized teacher-child relationships as dyadic systems that are not only embedded within other systems, but also determined by the characteristics of proximal and distal levels of organization and the reciprocal interactions between them. For example, the way in which children interact with teachers may be shaped not only by children's demographic characteristics, behavior, and competencies, but also by experiences that children have in the home environment.

Most evidence about characteristics of children and families associated with teacher-child relationship quality comes from correlational studies focused on the earliest years of school. One exception is provided by Murray and Murray (2004), who investigated teacher-child relationships in a sample of children from 3rd to 5th grade. These studies ask whether child, family and home characteristics are linked to children's relations with teachers.

Child characteristics. Existing studies are fairly consistent in documenting differences in the quality of teacher-child relationships related to student gender and race. Teachers tend to report less positive relationships with boys and with African American children (Howes, et al., 2002; Ladd, Birch, & Buhs, 1999; Meehan, Hughes & Cavell, 2003; Murray & Murray, 2004; Murray, Waas & Murray, 2008; O'Connor & McCartney, 2006; Pianta & Stuhlman, 2004; Saft & Pianta, 2001). Child behavior problems and academic skills have also been linked to teacher reports of relationship quality. Teachers report more conflict with children exhibiting behavior problems (Birch & Ladd, 1998; Hamre & Pianta, 2001; Hamre, Pianta, Downer & Mashburn, 2008; Howes, et al., 2002; Murray & Murray, 2004; O'Connor & McCartney, 2006) and more closeness with children who are stronger academically (Birch & Ladd, 1997; Ladd et al., 1999; Murray & Murray, 2004; O'Connor & McCartney, 2006; Pianta, et al., 1997; Pianta & Stuhlman, 2004).

Family characteristics. Characteristics of the family and experiences at home that children bring to school also seem to be associated with the quality of the relationship with teachers. Studies have suggested that the quality of teacher-child relationships may be related to children's socioeconomic background. Pianta and Stulhman (2004b) found that first grade teachers reported less positive relationships with children from low-income families than with children from middle and upper income families in the NICHD sample. However, Jerome and colleagues (in press)

found no association between maternal education and levels of conflict and closeness from kindergarten through 5th grade in the same sample. Thus, the relation of socioeconomic status to teacher reported relationship quality is unclear.

Studies have explored other characteristics of the home environment that may be associated with the quality of the relationship that children establish with teachers. It has been argued that children who experience sensitive caregiving internalize a representation of caregivers as trusting and supportive and tend to have more harmonious relations with others (Howes et al., 2000). Researchers have consistently found that maternal sensitivity is a salient predictor of children's social and cognitive competencies during the early years of school (Campbell, Matestic, von Stauffenberg, Mohan, & Kirchner, 2007; NICHD ECCRN, 2003, 2002, 1999). Results of studies investigating the association between maternal sensitivity and teacher-child relationship quality are, however, mixed. Although mother's sensitivity and a more developmentally supportive home environment were associated with decreasing levels of conflict from kindergarten through sixth grade in the NICHD sample (Jerome et al., in press), these factors failed to predict levels of conflict and closeness in studies conducted by the NICHD Early Child Care Research Network (2003, 2004) in the early years of elementary school.

In sum, extant literature suggests that teachers feel somewhat less close to and in greater conflict with boys and African American children, as well as with children having more behavior problems and lower academic achievement. The same may be true for children from low-income families and/or with mothers showing less sensitivity in their caregiving.

2.2   STABILITY AND CHANGE IN TEACHER-CHILD RELATIONSHIPS

The literature reviewed so far shows that there is variability in the quality of the relationship that teachers form with individual children. A related but different question is whether relationship quality remains stable as children progress through school and form new relationships with different teachers.

According to attachment theory (Bowlby, 1982; Sroufe & Fleeson, 1986), caregiver-child relationships should show increasing continuity over time when there is consistency in the caregiving context. Through repeated interaction with caregivers, attachment theory suggests that children develop internal representations about the self and others that become self-perpetuating and increasingly resistant to change (Howes et al., 2000). However, it is reasonable to question this assumption in the case of teacher-child relationships because children typically have a different teacher each year and even from class to class within a given elementary school year. Thus, children form relationships with several teachers throughout elementary school, with no single teacher being consistently involved in a child's life from year to year. Howes (1999) has argued that stability in relationship quality may stem less from continuity in relationships over time and more from a relationship "template" that is developed early on and is altered only incrementally from one relationship to the next. So while teacher-child relationships may not demonstrate the same level of stability as parent-child relationships, there should still be some consistency over time.

Evidence about the stability of teacher-child relationships comes primarily from early educational contexts, such as preschool and kindergarten classrooms. The quality of teacher-child relationships seems to remain stable when preschool-aged children retain the same teacher from 18 to 36 months of age (Howes & Hamilton, 1992). However, relationship quality tends to

decline over the preschool years when children are enrolled in more academically oriented child-care programs where teacher instruction is emphasized over caregiving.

Moderate stability of teacher-child relationships has also been demonstrated during the transition to kindergarten and first grade, in spite of changes in both teacher and in the teacher's role as children start formal schooling. Evidence suggests that teacher perceived closeness and conflict in kindergarten is predicted, in part, by relationship quality in preschool (Howes et al., 2000), and that the overall quality of the teacher-child relationship in 1st grade is predicted by the quality of the relationship in kindergarten and preschool (O'Connor & McCartney, 2006). Pianta and Stuhlman (2004) also found that teacher perceptions of relationship quality are moderately correlated from preschool to first grade but they discovered an overall trend of decreasing average levels of conflict and closeness over time.

2.2.1   The elementary school years.

An important limitation of the literature examining the stability of teacher-child relationships is its focus on preschool and early elementary school. Important developmental changes during middle childhood as well as transformations in the structure of classrooms and the role of teachers raise questions about the stability of teacher-child relationships as children move through elementary school.

Across middle childhood, children have to interact with an ever-widening range of people, gain greater independence from parents and, especially, learn how to negotiate relationships with peers and teachers (Rimm-Kaufman & Pianta, 2000). Furthermore, the development of new cognitive abilities such as flexible thinking, enhanced memory, and new reasoning abilities and strategies for recall also takes place during these years (Huston & Ripke, 2006; Nelson, 1996).

These abilities help children meet the more explicit academic goals that confront children soon after (and increasingly in) kindergarten. In fact, as children move through elementary school they are expected to raise their skill level in literacy and numeracy, and they experience a shift from the preschool emphasis on play, exploration, and nurturance to a focus on formal instruction in a more structured classroom context (Howes & Hamilton, 1992; Pianta & Kraft-Sayre, 1999). Within this context, self-regulation is a crucial competency since children have to be able to adhere to classroom routines, stay attentive for longer periods of time, and work autonomously in large groups.

In addition to these developmental changes, there are key transformations in the role of teachers and classroom structure between preschool and the elementary years. Beginning in first grade teachers become increasingly focused on their role as instructors and less concerned with supporting exploration and providing nurturance (Davis, 2003; Rimm-Kaufman & Pianta, 2000). Additionally, classrooms are structured differently, with changes in teachers for different subjects and larger class sizes and child-to-teacher ratios that both impose new demands on children in terms of self-regulation and socialization and reduce opportunities for one-to-one teacher-child interaction (Davis, 2003; Howes & Hamilton, 1992; Pianta & Kaft-Sayre, 1999; Rimm-Kaufman & Pianta, 2000).

If changes occur throughout the elementary school years, both at the individual level and in the context in which the teacher-child relationships are embedded, it seems reasonable to expect changes in teacher-child relationship quality as children progress through school. Empirical data on this question, however, are scarce. Jerome and colleagues (in press) examined the stability of teachers' reports of closeness and conflict from kindergarten through 6th grade in a sub-sample of 878 children from the NICHD SECC. They found that teachers' perceptions of

both conflict and closeness were moderately stable over time, with conflict (range = .38 to .54) showing somewhat greater stability than closeness (range = .30 to .36) between consecutive years. The authors also explored trajectories of closeness and conflict from kindergarten through 6th grade and found that average levels of teacher-reported conflict increased during this time, with the greatest increase taking place between kindergarten and 1st grade and only slight reductions taking place between 5th grade and 6th grade. Reported closeness, on the other hand, showed consistent reductions over time.

Similarly, O'Connor and McCartney (2007) found that average teacher-child relationship quality fell from preschool through third grade in the NICHD data. However, they uncovered substantial variation between clusters of individuals in the quality of teacher-child relationships over time. Specifically, three groups of children with homogeneous trajectories of stable-moderate, declining-low, and increasing-high quality relationships emerged when they used a semiparametric group-based approach to analyze the data. These data suggest that although relationship quality decreases on average across elementary school, there is significant variation between individuals. Although this study advances knowledge of how teacher-child relationships change by describing the existence of different trajectories of relationship quality, it didn't explain what factors distinguish children in each group and it only examined teacher-child relationships until 3rd grade.

In sum, with only a handful of studies available on the topic, there is still a need to document how teacher-child relationships change beyond the early years of school, and what factors are associated with this change. Furthermore, extant studies examining the stability of teacher-child relationship quality are characterized by significant methodological limitations, as most do not fully recognize existing heterogeneity in teacher-child relationship quality between

clusters of individuals over time (see O'Connor & McCartney, 2007, for an exception). Unlike studies using OLS regression or repeated measures ANOVA (Howes et al., 2002; O'Connor & McCartney, 2006; Pianta & Stulhman, 2004), those using growth curve analysis (Jerome et al., in press) have an advantage since they recognize that growth varies across individuals (Raudenbush & Bryk, 2002). However, growth curve analysis assumes that all individuals in the population follow a trajectory with a common functional form and is based on a multivariate normal distribution of parameters (Nagin, 2005; Willet, Singer & Martin, 1998). This assumption makes growth curve analysis ideal for modeling processes that follow a consistent trend of increase or decrease over time that is common across members of a population (Raudenbush & Bryk, 2002). Qualitative change in teacher-child relationships across the school years, though, may not be characterized by a pattern of incremental growth common to all children. Some may maintain close and warm relationships with their teachers throughout most of elementary school, whereas others may start school with a close relationship, but experience increasing conflict with teachers over time as family troubles spill over into school behavior, child ability beliefs deteriorate, or children simply have increasing reluctance or difficulty following classroom rules and expectations. A third group of children may start out in kindergarten exasperating their teacher with chronic attentional and behavior problems, but show improving behavior and relations with subsequent teachers as they become more able to self-regulate.

Thus, it is important to apply analytic techniques that can represent this kind of heterogeneity in children's experiences. The semiparametric group-based modeling technique described by Nagin (2005) is well suited for this purpose since it assumes the existence of qualitatively different trajectories in the population. The present study uses this analytic approach to advance understanding of patterns of stability and change in teacher-child

relationships. It accomplishes this by identifying distinctive trajectories of teacher-reported relationship quality over time. Based on teachers' reports of relationship quality from kindergarten through 5th grade, this study provides the first description of teacher-child relationship trajectories throughout elementary school.

2.2.2 Factors associated with stability in teacher-child relationships

Although several studies have looked at predictors of teacher-child relationship quality at a single point time, there is a lack of information about characteristics of children and their families that are linked to the stability of teacher-child relationship quality over time. In fact, only one study has examined factors associated with trajectories of conflict and closeness between teachers and children across elementary school (Jerome et al., in press). Although this study has the methodological limitation that was mentioned before for using growth curve analysis, it suggests that some child and family characteristics are associated with relationship quality from kindergarten through 6th grade. Using the NICHD SECC data, results of this study indicate that teachers tend to report decreasing levels of closeness with boys, and increasing levels of conflict with African American children and with children whose mothers appear less responsive as caregivers. Surprisingly, neither child factors such as academic achievement and behavior problems, nor maternal education and quality of the home environment were significantly associated with trajectories of relationship quality from kindergarten through 6th grade. Although a longitudinal association was not found, academic achievement and behavior problems were linked to higher levels of conflict at kindergarten, and the quality of the home environment was related to greater closeness at kindergarten.

As it was said before, some studies have suggested that differences in the quality of teacher-child relationships may be related to characteristics of children and their families. However, it is not clear whether these factors are merely cross-sectional correlates or can actually predict different trajectories of teacher-child relationship quality over time. By testing child and family characteristics as predictors of the semiparametric, group-based model, this study offers better understanding about factors that help to distinguish different trajectories of teacher-reported relationship quality from kindergarten through 5th grade. This study begins by identifying distinct developmental trajectories in the quality of teacher-child relations from kindergarten through 5th grade. Then it tests whether child and family characteristics are linked to particular relationship trajectory groups.

2.3   METHOD

2.3.1   Sample

Data for this study came from the NICHD Study of Early Child Care and Youth Development (NICHD SECC, 1993), a large longitudinal study that documented the home, child care and school experiences of a geographically, ethnically and economically diverse sample of 1,364 American children. The sample for the current study includes 979 children who participated in the second and third phases of the NICHD SECC, who had at least three reports of teacher-child relationship quality from kindergarten through 5th grade, and who were of White and African American race/ethnicity. Children identified by their parents as Native American, Asian/Pacific Islander or Other race/ethnicity were excluded from the sample because the sample sizes were

too small to obtain reliable estimates for these groups. Demographic characteristics of children and their families are presented in Table 2-1 along with descriptive information about teacher-child relationship quality from kindergarten through 5th grade. Attrition analyses indicated that children in this sample were more advantaged than children in the original NICHD SECC sample. For example, they were more likely to be White, their families were less likely to have incomes at or below the poverty line, and to have four or more minors living in the household. In addition, mothers of the children included in this sample tended to be more educated and less likely to be either single or less than 21 years old when the child was born.

2.3.2   Measures

Teacher-child relationship quality. Teachers' perceptions of the quality of their relationship with individual children were assessed using the *Student Teacher Relationship Scale* (STRS) (Pianta, 2001). A short version of the instrument comprised of 15 items was rated by teachers once a year from kindergarten through 5th grade using a 5-point scale ranging from 1 = definitely does not apply to 5 = definitely apply. The STRS includes eight items to assess the level of closeness in the relationship that reflect warmth, positive affect and open communication with individual children. Examples of these items are "If upset, this child will seek comfort from me" and "I share an affectionate, warm relationship with this child." The scale also includes seven items that reflect conflict, which is characterized by high levels of negativity and low levels of communication. Examples of these items are "This child is uncomfortable with physical affection or touch from me" and "This child easily becomes angry with me." The items reflecting conflict were reverse coded and all 15 items were summed to compute a total positive relationship score. Computed in this way the total score had a possible range of 15 to 75 with

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high scores indicating that the teacher perceives the relationship with an individual child as positive and effective, with lower levels of conflict and higher levels of closeness. This instrument has been widely used in studies of student-teacher relationships, showing adequate test-retest reliability over a 4-week period (.89 for the total score), and good internal consistency (Cronbach's alpha = .89 for the total score) (Pianta, 2001). The total score has good internal reliability (Cronbach's alpha ranging from .86 to .89 from kindergarten to 5th grade). (NICHD, 2007)

Behavior Problems. Children's behavior problems were measured in the fall of kindergarten using mother's report on the *Child Behavior Checklist* (CBCL) (Achenbach, 1991). The CBCL is a 118-item checklist rated with a Likert scale in which 0 = not true (as far as you know), 1 = somewhat or sometimes true, and 2 = very true or often true. The standardized score (T-score) for the Total Problem scale was used in this study, which is the combination of the CBCL's eight syndrome scales: withdrawn, somatic complaints, anxious/depressed, social problems, thought problems, attention problems, delinquent behavior, and aggressive behavior. This scale has a range of 23 to 100 with higher scores indicating that the child has a greater affinity to have more overall problems. The CBCL has been extensively used and has demonstrated good psychometric properties (Achenbach, 2001).

Academic Skills. A measure of children's academic skills was obtained from the *Academic Rating Scale* from the Early Childhood Longitudinal Study (Nicholson, Atkins-Burnett, & Meisels, 2002) administered by the NICHD SECC in the fall of kindergarten. With this instrument, teachers rate children's skills in language, literacy and mathematics using a 5-point scale in which 1 = Not yet and 5 = Proficient. The Total Academic Skills score was used in this study. It corresponds to the mean of 15 questions about listening, speaking, early reading and

writing behaviors, and 15 questions about child's ability to perceive, understand and use skills to solve mathematical problems. This instrument has excellent psychometric properties (U.S, Department of Education, National Center for Education Statistics, 2002) and had a high internal consistency in the NICHD sample (Cronbach's alpha = 0.96). (NICHD, 2007)

Child and family characteristics. Several demographic characteristics of children and families that have been linked to the quality of the teacher-child relationship were included as predictors in the analyses. Child's age at each assessment was measured in months and child's gender was included as a dummy variable. Child race was reported by the mother and was represented with a dummy variable indicating whether the child was African American versus White. Several dichotomous indicators were constructed to capture family structure and household socioeconomic resources. Mother's education was reported when children were 1 month old and it was represented by an indicator of whether they held less than a high school degree. Maternal age was dummy coded to indicate whether mothers were less than 21 when the child was born. Family structure in kindergarten was represented by two dummy variables indicating whether four or more minors were living in the family, and whether the mother was single (not married or cohabiting, widowed or separated). Finally, two measures of economic disadvantage were used. Both were measured in kindergarten. The first indicated whether a child lived in a low-income household, which was defined as a household with income less than 2 times the poverty line. The second was an indicator of whether mothers reported receiving assistance from one of several means-tested programs (i.e. Food Stamps, Aid to Families with Dependent Children or WIC).

Maternal Sensitivity. A measure of maternal sensitivity was coded by trained observers from videotapes of children and their mothers during a lab visit structured interaction at 54

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months. Mothers' supportive presence, respect for child's autonomy and hostility were rated using a 7-point scale in which 1 = Very low and 7 = Very high. The maternal sensitivity composite is the sum of the scores in these three areas (hostility was reverse coded). It has range of 4 to 21 with higher scores indicating more support and autonomy and less hostility. Psychometric analyses for this composite shows that it has a moderately high internal reliability (Cronbach's alpha = 0.84) (NICHD, 2007).

Home Environment. A measure of the stimulation and support available in the home at 54 months was provided by the *Home Observation for Measurement of the Environment* (HOME, Caldwell & Bradley, 1984). The version of the *HOME Inventory* used at 54 months has 55 present/absent items to evaluate eight areas: learning materials, language stimulation, physical environment, parental responsivity, learning stimulation, modeling of social maturity, variety in experience, and acceptance of child. The items from the learning materials subscale were converted into a questionnaire to be completed by the mother to provide information about the types of toys and games available to the child at home. The rest of the items were scored by an interviewer during a one-hour home visit. The total *HOME Inventory* score used in this study corresponds to the sum of all items. It has a range of 18 to 55 with higher scores indicating a home environment characterized by higher levels of child stimulation and support. The scale has good internal reliability (Cronbach's alpha = 0.82) (NICHD, 2007).

Table 2-1: Descriptives

	Mean	Sd
Child characteristics		
Boy (%)	50.60	0.50
Black (%)	11.85	0.32
Behavior Problems	48.85	9.78
Academic Skills	3.01	0.91
Family characteristics		
Poverty (%)	27.14	0.44
Four or more children at home (%)	8.33	0.37
Single mom (%)	16.99	0.37
Public assistance receipt (%)	10.66	0.31
Mother is less than 21 years (%)	10.62	0.31
Mother has less than high school (%)	7.66	0.27
Mother's sensitivity	17.08	2.83
Home environment	46.15	5.44
Total Positive Teacher-child Relationship		
Kindergarten	65.78	8.39
1st Grade	65.14	8.14
2nd Grade	64.74	8.66
3rd Grade	63.48	9.36
4th Grade	63.59	8.83
5th Grade	62.54	9.02

Note: N=979

2.4   ANALYTIC APPROACH.

Trajectories of teacher-child relationship quality from kindergarten through 5th grade were identified using the semiparametric group-based modeling approach described by Nagin (1999). This method tests for the existence of distinctive developmental trajectories in longitudinal data and identifies factors that predict them. Unlike conventional growth curve modeling methods, this approach assumes the existence of groups of distinctive developmental trajectories in the population that are not necessarily continuously distributed according to a normal distribution. This assumption makes it useful to analyze processes that don't have a clear developmental pattern of increase or decline over time common to most individuals in the population. Teacher-child relationships are a good example of a phenomenon that is difficult to characterize by a common process of growth over the time. Therefore, a semi-parametric group-based approach is well suited to analyze patterns of stability and change over time in teacher-child relationship quality.

The first step was to identify distinctive developmental trajectories in relationship quality from kindergarten through 5th grade. Semi-parametric group-based models were estimated using SAS PROC TRAJ (Jones, Nagin & Roeder, 2001). Trajectories of were modeled as a function of age using maximum likelihood estimation. Since total quality in the relationship is a psychometric scale with clusters of data at the scale minimum or maximum, the function was based on the censored normal distribution in which the relation between the outcome and age is established through a latent variable (y_{it}^{*j}). Equation 1 shows the form of the function in this study.

(1) $y_{it}^{*j} = \beta_0^j + \beta_1^j Age_{it} + \varepsilon_{it}$

Here the level of quality in the relationship for child i at time t given membership in group j, is modeled as a function of age. The variable age was created to measure the child's age in months at each of the six assessments from kindergarten through 5$^\text{th}$ grade. The intercept (β_0^j) captures the quality of the teacher-child relationship for child i in group j at the time of the kindergarten assessment, and the slope term (β_1^j) represents the linear rate of change of the quality in the relationship for child i in group j from kindergarten through 5$^\text{th}$ grade. It is important to notice that since each trajectory group is allowed to have a separate set of parameters in this model, the shape of the trajectory of teacher-child relationship quality can vary freely across groups. Finally, the function includes a disturbance term (ε_{it}) assumed to be normally distributed with a mean of zero and a constant standard deviation.

Preliminary analyses identified the optimal number of groups and the shape of the trajectories. Models with three, four and five groups with linear trajectories were estimated and compared using the Bayesian Information Criterion (BIC). The BIC scores were -17854.68, -17801.97 and -17793.74 for the three-, four-, and five-group models, respectively. Following D'Unger, Land, McCall and Nagin (1998), the model with five groups is preferred since it had the largest BIC score. However, the four-group model was selected because the addition of a fifth group resulted in two trajectory groups that were not meaningfully different. Furthermore, in the model with five groups the average posterior probability of assignment for the additional group didn't achieve the .7 recommended as a minimum for all groups (Nagin, 2005). Therefore, the four-group model was preferred because is more parsimonious and satisfies important diagnostic criteria outlined by Nagin (2005). Finally, linear trajectories were specified because they provided the best fit to the data and because there is no theoretical or empirical reason to expect that teacher-child relationships would follow non-linear trajectories over time.

The next step in analyses was the creation of profiles of trajectory group members using a series of child (race, gender, behavior problems and academic skills) and family characteristics (poverty status, public assistance receipt, number of children in the household, mother's age, education and marital status, mother's sensitivity and quality of the home environment). The creation of these profiles was based on the assignment of each individual to a trajectory group using the posterior probabilities of group membership (Nagin 1999, 2005). Although informative about the characteristics of children in each trajectory group, these profiles are not appropriate to determine what characteristics predict the probability of group membership. Therefore, in order to address the second research goal, the initial model was extended to include the same set of child and family characteristics as predictors of group membership. Multinomial logit models were performed to test whether each characteristic affected the probability of group membership, controlling for the other child and family characteristics. In this model the coefficients indicate if a variable influences the probability of membership in each group relative to a comparison group. Since the model is composed of four trajectory groups, several multinomial logit models were estimated, rotating the comparison group to test which factors statistically distinguish each trajectory from one another.

2.5   RESULTS

Descriptive statistics for teachers' ratings of relationship quality are shown in Table 2-1. It can be seen that average scores consistently decreased from kindergarten through 5th grade in this sample. Repeated measures analyses indicated that the mean total relationship quality scores were significantly different across grades ($F = 18.09$ $p < .001$). Posthoc analyses indicated that

3rd, 4th, and 5th grade mean scores were significantly lower than kindergarten, 1st and 2nd grade mean scores. Pearson bivariate correlations were used to examine the stability of teachers' perceptions of relationship quality for the entire sample. In general, moderate correlations were found between consecutive years (range r =.32 between kindergarten and 1st grade to r = .47 between 3rd and 4th grade).

2.5.1 Are there distinct developmental trajectories of teacher-child relationship quality?

The first aim of this study was to identify distinct developmental trajectories of teacher-child relationship quality from kindergarten through 5th grade. The trajectories for the final, four-group model are depicted in Figure 2-1 and parameter estimates are provided in Table 2-2.

Table 2-2: Parameter Estimates for Trajectories of Teacher-Child Relationship Quality

	High stable n = 608 (60.7%)		Moderate decreasing n = 245 (26%)		Low decreasing n = 60 (6%)		Increasing n = 66 (7.3%)	
	Coefficient	*SE*	*Coefficient*	*SE*	*Coefficient*	*SE*	*Coefficient*	*SE*
Intercept	72.49 ***	0.64	73.37 ***	1.62	75.27 ***	3.59	37.25 ***	2.57
Slope	-0.04 ***	0.01	-0.13 ***	0.02	-0.25 ***	0.03	0.19 ***	0.03

Note. ***$p < .001$.

As it can be seen in Figure 2-1, one large group of children showed a fairly stable trajectory of high relationship quality, two groups of children had trajectories of decreasing quality in their relationship with teachers, and one group had an increasing trajectory. Inspection of parameter estimates shown in Table 2-2 confirms these patterns.
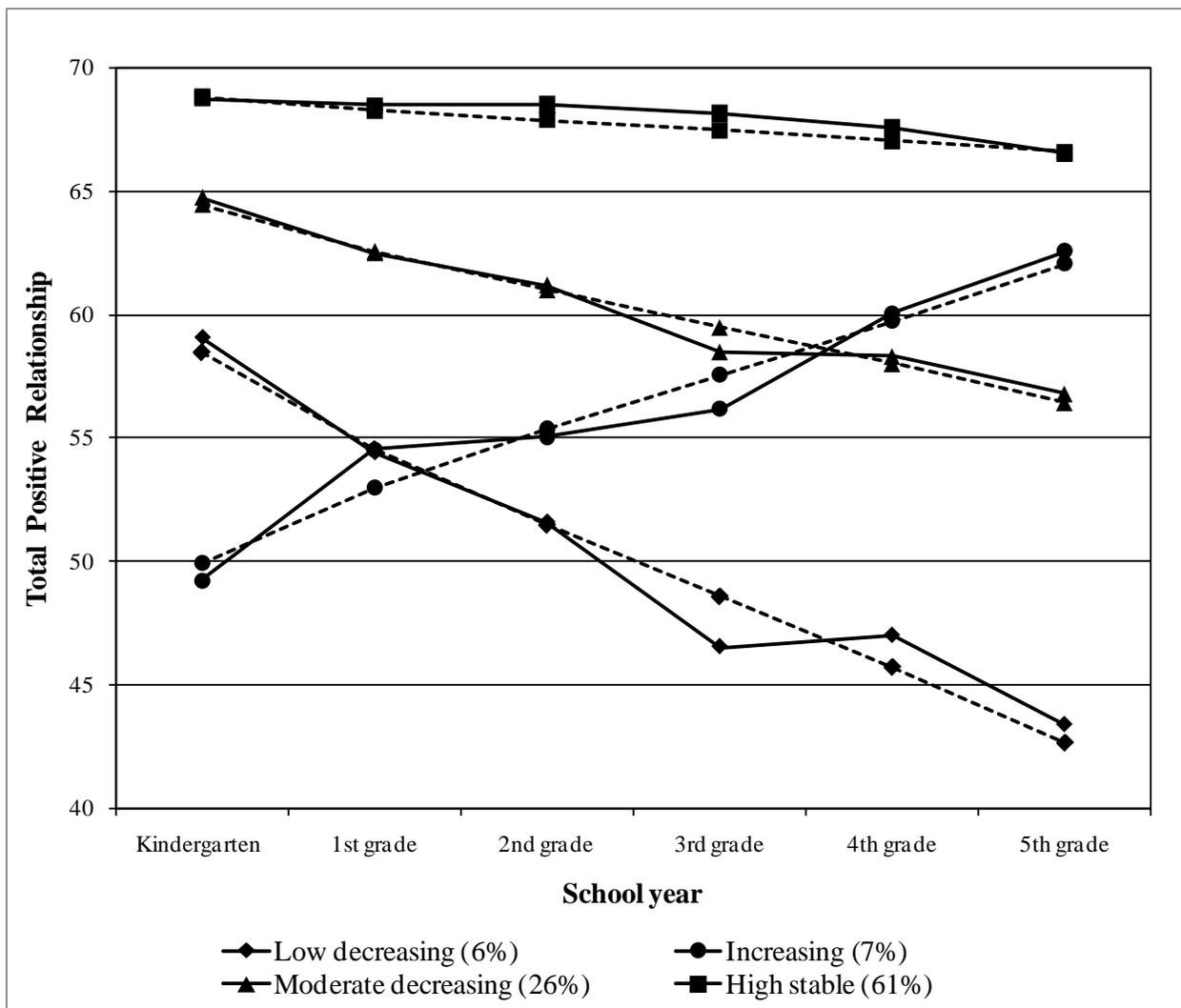
Note: Solid lines represent actual trajectories and dotted lines represent predicted trajectories.

Figure 2-1: Trajectories of Teacher-Child Relationship Quality

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The largest group, referred to as "High Stable" includes almost 61% of the sample and is comprised by children who sustained a positive relationship with their teachers from kindergarten through 5th grade. Children in this first group had average scores above the mean across elementary school. Although a decline in the quality of the relationship of this group of children was observed, it was only one quarter of a standard deviation. A second group called "Moderate Decreasing," consists of 26% of the children in the sample. This group of children had a less positive relationship with their teachers, scoring on average just one-eighth of a standard deviation below the mean in kindergarten, but showing a clear decline in the quality of the relationship after that, scoring on average more than a half of standard deviation lower in 5th grade. The third group with a declining trajectory was named "Low Decreasing". It makes up 6% of the sample. This group of children started with a score that was almost one standard deviation below the mean in kindergarten, and showed a marked decline in the quality of the relationship, ending elementary school more than two standard deviations below the mean. The fourth group of children was the only one that showed a trajectory of increasing quality in the relationship with teachers across elementary school. This group referred to as "Increasing" includes 7.3% of the sample. These children started in kindergarten with an average score that was almost two standard deviations below the mean. In this case, the kindergarten student-teacher relationship was typically marked by conflict and a lack of warmth and trust. However, the quality of the relationship for this group of children showed a marked increase across the elementary school years, scoring at the mean by 5th grade.

2.5.2   What factors distinguish the trajectories of teacher-child relationship quality?

Based on the assignment of each child to one of the four trajectories of relationship quality, group profiles were created using a series of child (race, gender, behavior problems and academic skills) and family characteristics (poverty status, public assistance receipt, number of children in the household, mother's age, education and marital status, mother's sensitivity and quality of the home environment). Table 2-3 shows the descriptive statistics on these characteristics for each of the four groups of children.

It can be seen that children in the high stable quality group, on average, were least likely to be boys and African American, to have mothers with less than high school, young and single, or to come from poor families that receive public assistance. Children in this group obtained lower behavior problems scores and higher scores on tests of academic skills, mother's sensitivity and quality of home environment when compared to all other trajectory groups. Conversely, children in the low decreasing group were the most disadvantaged. They were most likely to be boys and African American, to have mothers who were less educated, single and young, and to come from poor families with more than four children and receiving public assistance. Children in the moderate decreasing and increasing quality groups were demographically in between these two more extreme groups, with children in the moderate decreasing quality group being less disadvantaged across all dimensions of family structure and mother's characteristics than children in the increasing quality group. Children in the increasing quality group, however, had the highest behavior problem scores and the lowest scores on academic skills at the start of kindergarten and lowest maternal sensitivity of all groups.

Table 2-3: Child and Family Characteristics by Trajectories of Teacher-Child Relationship Quality

	High stable n= 608	Moderate decreasing n= 245	Increasing n= 66	Low decreasing n= 60
	Mean	Mean	Mean	Mean
Child characteristics				
Boy (%)	40	67	68	78
Black (%)	6	16	18	47
Behavior Problems at start of Kindergarten	48	49	54	53
Academic Skills at start of Kindergarten	3	3	2	3
Family characteristics				
Poverty (%)	20	32	45	60
Four or more children at home (%)	7	9	8	17
Single mom (%)	11	21	30	46
Public assistance receipt (%)	7	14	18	28
Mother is less than 21 years (%)	6	16	17	28
Mother has less than high school (%)	5	9	9	30
Mother's sensitivity at 54 months	17	17	15	16
Home environment at 54 months	47	45	44	40

These profiles show that children with different characteristics and from diverse backgrounds compose the four trajectory groups but they don't indicate whether these factors statistically distinguish the groups. In pursuit of the second research goal, multinomial logit models were estimated to test which factors are associated with the probability of group membership. Table 2-4 shows the results of a four-group multinomial logit model with the high quality group serving as the comparison group. The coefficients reported in Table 2-4 indicate whether a variable increases or decreases the probability of membership in each group relative to the high quality group. The odds ratio measures how much the probability of belonging to one group as opposed to other changes with a one-unit change in the predictor variable, holding all other predictors constant.

Results show that only three factors distinguish children in the high stable and the moderate decreasing trajectories of teacher-child relationship quality. Being a boy and having a single mother increases the probability of membership in the moderate decreasing quality group relative to the high stable group, whereas having high academic skills in kindergarten decreases the probability of membership in this group. The odds ratios indicate that among these three variables, being a boy has the largest association with the probability of membership in the moderate decreasing group relative to the high quality group. Specifically, for boys compared to girls the odds of belonging to the moderate decreasing group versus the high quality group increase 5.12 times, holding all other variables constant. In contrast, the odds of belonging to the moderate decreasing group compared to the high quality group decrease by a factor of .69 for a unit increase in kindergarten academic skills, and increase by a factor of 2.17 for children with a single mother.

Table 2-4: Predictors of Group Membership in the Moderate Decreasing, Increasing and Low Decreasing Groups Relative to the High Quality Group

	Moderate decreasing			Increasing			Low decreasing		
	Coefficient Estimate	SE	Odds Ratio	Coefficient Estimate	SE	Odds Ratio	Coefficient Estimate	SE	Odds Ratio
Boy	1.63 ***	0.24	5.12	1.56 ***	0.42	4.77	2.61 ***	0.56	13.53
Black	0.69	0.54	2.00	1.11	0.64	3.04	3.77 ***	0.72	43.38
Behavior Problems	0.02	0.01	1.02	0.06 **	0.02	1.07	0.11 ***	0.03	1.12
Academic Skills	-0.37 **	0.15	0.69	-1.11 ***	0.25	0.33	0.24	0.30	1.28
Poverty	0.10	0.36	1.10	0.20	0.51	1.22	-0.39	0.70	0.68
Four or more children at home	-0.29	0.41	0.75	0.02	0.61	1.02	0.13	0.68	1.14
Single mom	0.78 *	0.36	2.17	1.39 **	0.50	4.02	0.66	0.66	1.93
Public assistance receipt	-0.82	0.57	0.44	-1.16	0.73	0.32	-1.76 *	0.82	0.17
Mother is less than 21 years	0.68	0.49	1.98	0.50	0.66	1.66	-0.50	0.86	0.60
Mother has less than high school	-0.28	0.61	0.75	-0.31	0.76	0.73	2.63 **	0.73	13.80
Mother's sensitivity	-0.03	0.05	0.97	-0.19 **	0.07	0.83	-0.03	0.09	0.97
Home environment	-0.05	0.03	0.95	-0.01	0.04	0.99	-0.14 **	0.05	0.87

Note. ***p < .001. **p < .01. * p < .05.

The same three factors predict membership in the increasing quality group, relative to the high quality group. Here again the odds ratio indicates that being a boy has the greatest impact in predicting membership (nearly 5-fold difference). Having a single mother also increases the odds of belonging to the increasing quality group substantially (a 4-fold difference). In contrast, a unit increase in kindergarten academic skills decreases the odds of belonging to the increasing quality group relative to the high quality group by .67. In addition to these variables, the probability of belonging to this group is also increased by having behavior problems in kindergarten. On the

other hand, having a sensitive mother decreases the probability of membership in the increasing quality group, relative to the high quality group.

Finally, relative to the high quality group, being a boy, and having behavior problems in kindergarten predict membership in the low quality group, as well as other factors indicating that children in this group are more socioeconomically disadvantaged. As the results show, being African American and having a less educated mother increase the probability of being a member of this group. In contrast, children who come from families that receive public assistance and have a high quality of the home environment have a decreased probability of membership in this low decreasing quality group compared to the high quality group. Among these, being African American, being a boy and having a less educated mother have the greatest impact in predicting membership in the low quality group relative to the high quality group.

To check whether the same factors distinguish among the other three groups with moderate decreasing, low decreasing and increasing relationship quality from kindergarten through 5th grade, several multinomial logit models were estimated rotating the comparison group. Table 2-5 summarizes the results of these models. In general it can be seen that being African American, having higher academic skills, and a less educated mother, increase the probability of membership in the low decreasing group relative to the other two groups. Table 2-5 also shows that three factors distinguish group membership in the increasing and moderate decreasing quality groups: behavior problems, academic skills, and mother's sensitivity. Among these, the level of behavior problems in kindergarten is the one with the greatest impact in predicting membership to the increasing quality group.

Table 2-5: Predictors of Group Membership among the Increasing, Moderate Decreasing and Low Decreasing Groups

	Versus Moderate Decreasing Group			Versus Increasing		Group
	Coefficient Estimate	SE	Odds Ratio	Coefficient Estimate	SE	Odds Ratio
Low Decreasing Quality Group						
Boy	0.97	0.57	2.64	1.04	0.65	2.83
Black	3.08 ***	0.70	21.78	2.66 ***	0.79	14.31
Behavior Problems	0.09 ***	0.03	1.10	0.05	0.03	1.05
Academic Skills	0.62 *	0.30	1.86	1.36 ***	0.36	3.88
Poverty	-0.49	0.70	0.62	-0.59	0.80	0.56
Four or more children at home	0.42	0.70	1.52	0.11	0.82	1.12
Single mom	-0.11	0.68	0.89	-0.73	0.74	0.48
Public assistance receipt	-0.94	0.78	0.39	-0.60	0.91	0.55
Mother is less than 21 years	-1.19	0.84	0.30	-1.01	0.99	0.36
Mother has less than high school	2.91 ***	0.75	18.32	2.94 **	0.91	18.92
Mother's sensitivity	0.00	0.09	1.00	0.16	0.10	1.17
Home environment	-0.08	0.05	0.92	-0.12 *	0.06	0.88
Increasing Quality Group						
Boy	-0.07	0.45	0.93			
Black	0.42	0.58	1.52			
Behavior Problems	0.04 *	0.02	1.04			
Academic Skills	-0.74 **	0.26	0.48			
Poverty	0.10	0.51	1.11			
Four or more children at home	0.31	0.64	1.36			

Single mom	0.62	0.50	1.85
Public assistance receipt	-0.33	0.69	0.72
Mother is less than 21 years	-0.18	0.59	0.84
Mother has less than high school	-0.03	0.77	0.97
Mother's sensitivity	-0.16 *	0.07	0.85
Home environment	0.04	0.05	1.04

Note. ***p < .001. **p < .01. * p < .05.

2.6   DISCUSSION

This study extends existing research about stability and change in teacher-child relationship quality by providing the first description of distinctive trajectories of teacher-child relationship quality across elementary school using data from the NICHD Study of Early Child Care and Youth Development. It also provides evidence about the child and family characteristics that are linked to particular relationship trajectory groups.

The present study suggests that four distinct trajectories of teacher-child relationship quality can be identified from kindergarten through 5th grade. Specifically, one large group of children showed a stable trajectory of high relationship quality, two groups showed qualitatively different trajectories of decreasing quality, and a fourth group showed a trajectory of increased quality. In addition, both characteristics and competencies of the child and his or her family were found to be useful predictors of membership in each trajectory group.

The most notable contribution of this study is that it used a semiparametric group-based modeling approach that uncovered differences in relationship trajectories that were not apparent

in existing studies in which assumptions about normally distributed parameters and the existence of individual trajectories with a common functional form were made. By doing so this study recognizes the heterogeneity that characterizes interactions between teachers and children across the elementary school years.

2.6.1 Distinct Trajectories of Teacher-Child Relationship Quality

By assuming that relationship quality is normally distributed among the population with trajectories fitting into one average functional form, previous studies have concluded that the levels of teacher-child relationship quality are moderately correlated between consecutive years and that relationship quality tends to decrease over time (Howes et al., 2000; Jerome et al, in press; Pianta & Sthulman, 2004). The results of this study confirmed that trend when average levels of teacher-child relationship quality for the entire sample were examined using correlations and repeated measures analyses. However, when a semiparametric group-based approach is used for the analyses, it becomes apparent that this pattern of increasing decline in relationship quality across the elementary school characterizes only a portion of relationships (about one third of the NICHD SECC sample, in this case). The majority of these children (26% of the sample) showed a trajectory of moderate but decreasing quality, starting just below the mean in kindergarten and scoring more than a half of a standard deviation lower in 5th grade. A second smaller group (6% of the sample) showed a marked decline in the quality of the trajectory, ending elementary school scoring more than two standard deviations below the mean in relationship quality.

In contrast to the previously described patterns of decreasing relationship quality, two other trajectory groups were observed in the NICHD sample when using a semiparametric group-based approach. The first, largest group of children that includes almost 61% of the sample had very positive and stable relationships with teachers across all six years of elementary school, with only a slight decline occurring mostly after fourth grade. The slight decline in teacher-child relationship quality observed for this group of children may coincide with the changes in classroom organization, teaching practices and expectations, and academic standards that occur in many schools in anticipation of the transition to middle school. By 5th grade many schools begin to have larger class sizes, to organize instruction by subject area (increasing teacher rotation), to emphasize teacher control and discipline, and to introduce practices such as whole-class organization, ability-grouping and stricter grading practices (Eccles & Midgley, 1989; Eccles & Roeser, 1999). Numerous studies of the transition to middle school or junior high school (Roeser, Eccles, & Sameroff, 1998, 2000; Rudolph, Lambert, Clark, & Kurlakowsky, 2001) conclude that there are adverse consequences for children's functioning associated with switching to this teaching model in terms of self-confidence, attitudes towards learning, classroom engagement, interest in school, and beliefs about teacher caring. In this new context children may experience difficulties in maintaining or forming close relationships with teachers.

The final, most interesting group that has never before been identified in the literature includes 7% of the sample and consists of children whose relationships with their teachers were notably problematic in kindergarten and the early elementary grades, but showed a pattern of consistent improvement across elementary school. By 5th grade, student-teacher relationship quality in this group was above average and second only to that in the high stable group of children. More studies with longitudinal observations are needed to understand why and how this

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increase in teacher-child relationship quality happens among this group of children. The improvement may be linked to an increase in these children's abilities to self-regulate, remain attentive in classroom activities and engage in more positive interactions with peers. In other words, children in this increasing quality group may be the ones who start kindergarten with self-regulation problems, whether physiologically based, environmentally exacerbated, or both but who seem to grow out of them (Barkley, et al., 2002; Coie & Dodge, 1998; Keenan & Shaw, 2003). A related possibility is that these children are part of the group of preschool-age boys with clinical levels of behavior problems whose problems fade with time (Campbell, 2002; Coie & Dodge, 1998; Nagin & Tremblay, 1999; Moffitt, Caspi, Harrington, & Milne, 2002).

These results only partially replicate findings from the only other study using a semiparametric group-based approach to analyze data from the NICHD study (O'Connor & McCartney, 2007). In that study, three trajectories with increasing-high, declining-low, and stable-moderate teacher-child relationship quality from preschool to 3rd grade were described. The existence of this latter group and the absence of an increasing quality group, are the results most discrepant from those of the present study. This inconsistency may be due to the selection of a three-group model that obscured the existence of the group of children with increasing teacher-child relationship quality that emerged in the present study by combining it with a larger group of children with moderate decreasing quality. The discrepancy in results may also be related to differences in timeline (preschool- 3rd grade versus kindergarten - 5th grade in the present study) or by the different ways in which the sample was limited (880 African American, Latino American and European American children with attachment data at 36-months and who were still in the study at 3rd grade, versus 979 White and African American children with at least three reports of teacher-child relationship quality from kindergarten through 5th grade in the

present study). With the inclusion of a more extended timeline and the specification of a four group model, the present study extends the findings obtained by O'Connor & McCartney (2007) by identifying a group of children with increasing relationship quality that hasn't been described in the literature, and by looking at predictors of the different trajectory groups.

In sum, this study shows that there are distinct patterns of teacher-student relationship that change across elementary school. Although relationship quality was found to be fairly positive and stable for most children, for some children teacher-child relationships either substantially increase or decrease in quality from kindergarten through 5th grade.

2.6.2 Factors Distinguishing Trajectories of Teacher-Child Relationship Quality

The results of the present study demonstrate that both characteristics and competencies of the child and his or her family help distinguish student-teacher relationship trajectory groups. Child gender and race provide the most consistently useful information in predicting group membership, although academic skills at kindergarten entry, maternal reported child behavior problems, and some indicators of family socioeconomic disadvantage contribute as well.

Consistent with the results of previous longitudinal and cross-sectional studies, boys do seem to be at a disadvantage throughout the elementary school years as far as teacher-child relationships are concerned (Jerome et al., in press; Howes et al., 2002; Ladd, et al., 1999; Murray & Murray, 2004; Murray, et al., 2008; O'Connor & McCartney, 2006; Pianta & Stulhman, 2004; Saft & Pianta, 2001). The results of this study showed that the most consistent predictor of not having a good relationship with the teacher from kindergarten through 5th grade is being a boy. In fact, relative to the high quality group, boys were overrepresented in the two

groups with trajectories of declining quality, and in the group with a trajectory of increasing quality in which teacher-child relationships were notably problematic in kindergarten and the early school grades.

It has been suggested that teachers form less positive relationships with boys because the latter are more vulnerable to develop early behavior problems (Hamre, et al., 2008). However, in the present study boys were more likely to have lower quality relationships with teachers even after controlling for behavior problems previous to kindergarten entry. Another explanation is that teachers form more positive relationships with girls because they tend to be more engaged in the classroom, have more positive school attitudes, and are less likely to be referred and placed in special education (Birch & Ladd, 1997; Silver et al., 2005). In addition, boys typically show lower levels of self-regulation, and higher levels of impulsivity (McCabe, Cunnington, & Brooks-Gunn, 2004; Zahn-Waxler, Schmitz, Fulker, Robinson & Emde, 1996). These characteristics may predispose boys to be perceived as difficult to teach, to be singled out and to experience difficult interactions with teachers.

Equally discouraging is the fact that African American children were disproportionately represented in the low decreasing group in which children ended elementary school scoring well below the average in relationship quality. In fact, being African American was the most important predictor of membership in the low decreasing quality group, when compared with the other three groups. This finding is also consistent with previous longitudinal and cross-sectional studies indicating that mostly White teachers tend to form less positive relationships with African American children (Howes & Ritchie, 1999; Jerome et al., in press; Ladd et al., 1999; Meehan et al., 2003; Saft & Pianta, 2001). There is some evidence suggesting that the association between children's race and the quality of the relationship is moderated by the ethnic congruence between

teachers and children (Saft & Pianta, 2001). Therefore, it is possible that the racial mismatch between teachers and students in the NICHD sample where the vast majority of teachers are Caucasian, may explain teachers' perceptions of less positive relationships with African American children.

However, there are other possible explanations for this finding. Classrooms are not culturally "neutral" settings; in general, teachers and peers endorse White, middle class standards (Gay, 2000). For example, research has found that teachers use instructional practices that emphasize individualism and competition, whereas African American children prefer vervistic and communal learning themes (performance of simultaneous classroom activities where sharing of ideas and materials and helping others are emphasized; Boykin, Tyler & Miller, 2005; Boykin, Tyler, Watkins-Lewis, & Kizzie, 2006). Furthermore, teachers report higher levels of achievement and motivation to learn in students who show individualistic and competitive learning behaviors (Tyler, Boykin, & Walton, 2006). Research has also shown that there is a discontinuity between African American children's language use at home and teacher's expectations for language use at school. Whereas African American children are socialized to use a *participatory-interactive* communication style in which the speaker expects comments, encouragement and movement from the audience, teachers endorse a *passive-receptive posture* in which students have to listen quietly and await the teacher's permission to participate (Gay, 2000; Lovelace & Wheeler, 2006). Researchers have found that teachers penalize and have more negative perceptions of children who use a participatory-interactive style (Au, 1993; Gay, 2000). Therefore, the racial/ethnic mismatch alone may not explain why teachers report less positive relationships with African American children than with White children.

Children's initial academic skills and behavior problems prior to kindergarten entry were also important for differentiating children in different trajectory groups. In general, having more behavior problems and lower academic skills increased the probability of belonging to groups with less positive teacher-child relationships. This finding adds to existing cross-sectional studies that have found a link between the quality of the relationship with teachers and children's behavior problems and academic skills (Birch & Ladd, 1998; Hamre & Panta, 2001; Hamre et al., 2008; Howes et al., 2002; Jerome et al., in press; Ladd, et al., 1999; Murray & Murray, 2004; O'Connor & McCartney, 2006; Pianta et al., 1997; Pianta & Stuhlman, 2004). Teachers presumably have less positive relationships with children who have behavior problems since they tend to disrupt classroom activities, have problematic interactions with peers, and make effective teaching difficult to accomplish. Likewise, children with lower academic skills are generally less motivated to learn and less engaged in classroom activities, making it difficult for teachers to form positive relationships with them (Davis, 2003; Pianta, 1999).

However, the causal direction of associations between children's academic and behavioral competencies and the quality of teacher-child relationships remains unclear. Studies conducted during preschool and early elementary school have established that teacher-child relationship quality predicts contemporaneous and, on occasion, subsequent development of academic skills (Burchinal et al., 2002; O'Connor & McCartney, 2007; Pianta et al., 1997; Pianta et al., 1995; Pianta & Stuhlman, 2004) and behavioral adjustment (Birch & Ladd, 1998; Pianta & Stuhlman, 2004; Silver et al., 2005). However, prediction alone does not constitute causality, and it is plausible that academically and socially competent children tend to create more positive relationships and also tend to gain in academic skills ahead of their peers.

Finally, results of this study provide evidence that children from socioeconomically disadvantaged families are more likely than their middle-class peers to form poorer quality relationships with their teachers. These children may be challenging for teachers when they bring to the classroom fewer middle-class competencies and more poverty-related problems, making effective teaching and positive interactions in the classroom more difficult to attain. Having a mother who dropped out of school before graduating is one of strongest predictors of children's membership in the group with the worst relationship quality, in addition to coming from a less developmentally supportive home. Having a single mother also distinguishes most trajectory groups from the high stable pattern. Among the rest of family characteristics examined in this study, only maternal sensitivity helped to distinguish children with increasing relationship quality from the ones who have stable positive relationships.

Results from this study, surprisingly enough, are not consistent with evidence from the only other longitudinal study examining factors associated with trajectories of closeness and conflict across all grades in elementary school (Jerome et al., in press). In that study neither child characteristics such as academic achievement and behavior problems, nor maternal education and quality of the home environment were associated relationship quality from kindergarten through 6th grade. The analyses used by Jerome and colleagues (in press) may explain the discrepancy with the present results. The growth curve models used in that study assume that all individuals in the sample follow a common trajectory of quadratic growth in relationship quality. It is possible that when relationship quality trajectories are averaged in this way, the predictive value of these factors is masked since the largest differences that were found in the present study were observed for the group disproportionately containing boys, African American and lower class children.

In sum, the results of this study suggest that boys and African American children, as well as children with behavior problems and low academic achievement prior to kindergarten entry who come from socioeconomically disadvantaged families, are more likely than other school children to experience less than ideal relationships with teachers across the grades of elementary school.

2.6.3 Conclusion

This study shows that there are distinct patterns of teacher-student relationship quality that change across elementary school, a finding that has hitherto been obscured by averaging longitudinal data across entire samples of school children. Although most children in this heterogeneous but mostly middle-class sample were found to have a fairly stable positive relationship with teachers, three groups of children showed trajectories of teacher-child relationships that either decrease or substantially increase in quality from kindergarten through 5th grade. This study suggests that children in these three groups who form less than ideal relationships with teachers are more likely to be boys and African American, to have behavior problems and low academic achievement prior to kindergarten entry, and to come from socioeconomically disadvantaged families. Without allowing distinctive trajectory patterns to emerge in analyses, these children's relationships cannot easily be distinguished from those of their more advantaged peers.

3.0   TEACHER-CHILD RELATIONSHIPS AND THE DEVELOPMENT OF ACADEMIC AND SOCIAL SKILLS

A growing body of literature suggests that relationships with teachers play a significant role in children's development and constitute an important context for development during the early school years (Pianta, 1999). High quality teacher-child relationships during early childhood are defined by a combination of high levels of closeness and low conflict (Davis, 2003; Pianta, 1999). Closeness in teacher-child relationships is characterized by warmth, positive affect, and open communication. In contrast, conflict reflects negativity, hostility and difficulty in managing children's behavior (Pianta, et al., 1995). Associations have been demonstrated between teacher-child relationship quality and competencies in the areas of peer relations, self-regulation, self-esteem, classroom adjustment, and academic achievement (Birch & Ladd, 1997; Howes, Hamilton & Matheson, 1994; Lynch & Cicchetti, 1992). Based on this literature, researchers seem to agree that the quality of teacher-child relationships can forecast later problems and successes at school and in the home environment (Hamre & Pianta, 2001).

Despite recent growth in research highlighting the potential of teacher-child relationships to promote children's development, important questions remain about the relevance of relationships between teachers and children beyond the early school years. Indeed most studies examining associations between teacher-child relationship quality and child development have focused in the very early years of elementary school and even the preschool years, with few

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studies extending beyond 2nd grade. However, important developmental changes take place during middle childhood, as children have to interact with an ever-widening range of people, gain greater independence from parents, are expected to meet more explicit academic goals, and raise their skill level in literacy and numeracy. Important transformations also take place in the structure of classrooms and the role of teachers. As children move through elementary school, teachers become increasingly focused on their role as instructors and less concerned with providing nurturance, not to mention the fact that classrooms are structured differently, with changes in teachers for different subjects, larger class sizes, and higher child-to-teacher ratios (Pianta & Kaft-Sayre, 1999; Rimm-Kaufman & Pianta, 2000).

The goal of this study is to advance our understanding of longitudinal connections between teacher-child relationships and academic and behavioral development across elementary school. Specifically, this investigation tests whether the quality of teacher-child relationships across elementary school is associated with changes in behavioral and academic competencies in elementary school. It also considers whether teacher-child relationships are especially important for more disadvantaged children who are at risk for worse school adjustment.

3.1   THE DEVELOPMENT OF ACADEMIC COMPETENCE

Research in developmental psychology has established that, along with family factors (parenting practices, quality of home environment, socioeconomic status, etc), classroom experiences appear to play a prominent role in the development of school-related competencies. In particular, warm and responsive interpersonal interactions between children and teachers promote academic skills, above and beyond other characteristics of classrooms, such as teacher-child ratios,

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classroom climate, and instructional practices (Pianta, 1999; Pianta, et al., 2003). Motivation researchers have argued that children who have good relationships with teachers are more motivated to engage and participate in classroom activities, conform to classroom norms, and pursue academic goals in effort to gain or maintain the approval of teachers (Brophy, 1998; Davis, 2001, 2003). In this way, close relationships with teachers may promote learning and achievement. In fact, there is evidence to suggest that children's perceptions of teachers as caring and supportive are related to their effort and academic achievement (Roeser, Midgley & Urdan, 1996; Wentzel, 1993, 1994, 1998).

A growing body of research has examined the association between the quality of the teacher-child relationship and academic skills development, showing a moderate association between teacher-child relationship quality and contemporaneous, and on occasion, subsequent development of academic skills (Burchinal, et al., 2002; O'Connor & McCartney, 2007; Pianta, et al., 1997; Pianta & Stuhlman, 2004). However, the results from studies focusing in the transition to elementary school are mixed. Whereas Pianta and colleagues (1997) found that teacher-child relationship quality in preschool predict scores in standardized measures of academic knowledge in kindergarten, Pianta and Stulhman (2004) did not replicate this association from preschool to 1st grade. They found that after controlling for previous social and academic skills, only concurrent closeness and conflict in 1st grade contributed to teacher-rated academic achievement, but not to standardized assessments of academic skills.

Evidence from subsequent years of elementary school is scarce. The only study that has modeled growth in achievement trajectories did so using hierarchical linear models to examine links between teacher-child relationship quality and academic skills development from preschool through 2nd grade (Burchinal et al, 2002). This study found that closer teacher-child relationships

were related to greater language skills growth for African American children and faster development of reading skills for children with more authoritarian parents. Evidence of this kind is rare for the years beyond 2nd grade, with two notable exceptions. The first, by O'Connor & McCartney (2007) showed that changes in teacher-child relationship quality from kindergarten through 3rd grade predict achievement scores in 3rd grade, but associations were fully mediated by child and teacher behaviors in the classroom. The other, by Hamre and Pianta (2001), found that relational negativity in kindergarten predicted grades and achievement test scores through 5th grade; however these associations were mediated by earlier test scores.

3.2   CHILDREN'S BEHAVIORAL ADJUSTMENT

Although the development of behavior problems is associated with a broad set of individual, family, peer, and neighborhood factors (Campbell, 1994; Keenan, Shaw, Delliquadri, Giovanelli, & Walsh, 1998), once children enter school, relationships with teachers may be critical for behavioral development. Like parents, it has been argued that teachers can promote students social and behavioral development by providing an environment of support and emotional security in which children feel confident and supported and are more able to organize and modulate their emotions, effectively interact with others and competently explore the resources provided in the classroom (Davis, 2003). On the other hand, children's behavioral difficulties may be exacerbated in the classroom by harsh or coercive interactions between students and teachers (CPPRG, 2004).

The quality of teacher-child relationships during preschool and early elementary school has been associated with children's behavioral adjustment. Results indicate that after controlling behavior in kindergarten, teacher-reported conflict predict less prosocial behavior (Birch and Ladd, 1998) and more externalizing behavior problems (Pianta & Stuhlman, 2004), whereas teacher-reported closeness predict less internalizing problems in 1st grade (Pianta & Stuhlman, 2004). It is important to note that many of the associations were found when both relationships and outcomes were rated concurrently by teachers, thereby raising concerns about common source bias.

As was the case with data on academic competencies, longitudinal studies of the relation between teacher-child relationships and children's behavioral adjustment are scant. Silver et al. (2005) found that teacher-reported conflict predicted externalizing trajectories from kindergarten through 3rd grade. Consistent with this result, Hamre and Pianta (2001) found that teacher-reported relational negativity in kindergarten predicted fewer positive work-habits through 4th grade and more disciplinary infractions in 5th and 6th grades. In sum, this literature shows that teacher-child relationship quality, particularly conflict, is a useful predictor of subsequent behavioral adjustment.

3.3   LIMITATIONS TO EXISTING LITERATURE

Existing literature shows that teacher's perception of relationship quality is a useful predictor of subsequent academic achievement and behavior adjustment. However, most of the studies focused on the transition to and early years of elementary school, and rely on teacher report for both predictor and outcome measures so that observed associations may be an artifact of rater

effects. Furthermore, existing studies have relied entirely upon between-child comparisons. In other words, they have shown that children who have closer relationships with teachers, compared with children who have less close relationships, tend to have better outcomes over time. The problem with this approach is that associations between teacher-child relationship quality and behavioral and academic development may be explained by omitted variables (e.g., child sociability). In other words, if child temperament leads to both higher quality relationships and better academic and social functioning, failure to measure child temperament may confound associations between teacher-child relationship quality and child development. Although prior studies have attempted to reduce omitted variable bias by including comprehensive sets of covariates, it is impossible to be sure that all potentially confounding factors have been included in the analysis.

Within-child associations between teacher-child relationship quality and child functioning have not yet been estimated in this literature, but they are an effective way of reducing the threat of omitted variables by eliminating bias associated with unobserved characteristics that are constant over time (Allison, 1990; Dearing, McCartney, & Taylor, 2006; Singer & Willet, 2003). Thus, testing for within-child associations strengthens causal arguments about the importance of teacher-child relationship quality. It is important to mention, however, that within-child analyses cannot rule out the threat of omitted variable bias entirely. Bias still may be introduced when using this approach by unobserved time-varying factors and by reciprocal causation.

3.4 TEACHER-CHILD RELATIONSHIPS AND CHILDREN'S DEVELOPMENT IN CONTEXT

Research has shown that children exposed to any single component of socioeconomic disadvantage, such as having parents with low incomes, low levels of education, or employment with low occupational prestige, are especially at risk for the development of social, behavioral, and academic problems (Dearing, et al, 2006; Duncan & Brooks-Gunn, 1997; Li-Grining, 2007; Mash & Dozois, 2003; McLoyd, 1998; Votruba-Drzal, 2006). Ethnic minority status is also associated with lower levels of academic achievement, worse school adjustment and higher rates of behavior problems beginning in preschool (Alexander & Entwisle, 1988; Entwisle & Alexander, 1999; Moffitt, Caspi, Rutter & Silva, 2001).

Researchers studying teacher-child relationships have argued that close and supportive relationships with teachers may be especially protective for children who are at risk for worse developmental outcomes (Lynch & Cicchetti, 1992; Pianta, 1999). More specifically, warm and responsive relationships with teachers may serve as a source of resilience for children who experience risk. On the contrary, low-quality teacher child relationships, characterized by high levels of conflict, coercion, and low levels of warmth, may be especially harmful for children who are disadvantaged.

Evidence suggests that teacher-child relationships may promote competence especially for children who are at risk due to their ethnic origin. Burchinal and colleagues (2002) showed that teacher-child relationship closeness is more strongly related to the language skills development of African American children, when compared to White children. Likewise, research by Meehan and colleagues (2003) demonstrated that positive teacher-child relationships

are more strongly associated with lower aggression in 3rd grade for aggressive African American and Hispanic children when compared to White children.

In sum, existing literature suggests that close teacher-child relationships may serve as a protective factor in the development of behavioral competence and academic skills for children at risk for school problems due to their sociodemographic characteristics. However, very few studies have explored the potential of teacher-child relationships to moderate the risk of school failure associated with sociodemographic disadvantage after the early years of school.

3.5 RESEARCH QUESTIONS

The aims of this study are threefold. The first is to determine whether between-child differences in academic achievement and behavior problems are associated with teacher-child relationship quality throughout elementary school. Specifically, it tests whether average levels and gains over time in academic achievement and behavior problems are related to average levels of teacher-child relationship across elementary school. The second is to explore within-child associations between children's development and teacher-child relationship quality across elementary school. In doing so, analyses test whether changes in teacher-child relationship quality are associated with changes in academic achievement and behavior problems. The final aim is to decide whether teacher-child relationship quality is especially salient for the development of disadvantaged children during middle childhood.

3.6   METHOD

3.6.1   Sample

Data for this study came from the NICHD Study of Early Child Care and Youth Development (NICHD SECCYD, 1993), a large longitudinal study that documented the home, child care and school experiences of a geographically, ethnically and economically diverse sample of 1,364 American children. Of this sample, the percentage of children who had complete data on all covariates and at least one outcome ranged across the different models from 64% (models where Woodcock-Johnson scores were the outcomes) to 41% (teacher-reported behavior problems). Statistical comparisons of children who were missing data on outcomes or covariates and students who had complete data revealed that the latter were less disadvantaged across several dimensions. Specifically, they were less likely to be African American and more likely to come from homes with higher incomes at baseline, and higher quality home environments. Their mothers were older when their first child was born. They were more educated and more likely to be married or partnered. These children also scored higher on academic skills and had more positive relationships with teachers across elementary school.

Since traditional approaches to handling missing data have been criticized for biasing estimates, misrepresenting statistical power, and leading to invalid conclusions (Acock, 2005; Rubin, 1987; Widaman, 2006), in this study missing data were imputed using the Stata implementation of the Multiple Imputation by Chained Equations technique (ICE; Royston, 2004). Five datasets with complete data for 1,364 cases were created and imported to HLM 6.04

(Raudenbush, Bryk, Cheong, Congdon & DuToit, 2004). The results for this study correspond to average parameter estimates and standard errors computed by HLM using standard techniques described by Raudenbush and colleagues (2004). Table 3-1 presents descriptive statistics on background and outcomes variables of the children and their families after imputation.

Table 3-1: Descriptives

	54 months		kindergarten		1st grade		2nd grade		3rd grade		4th grade		5th grade	
	M or %	SD	M or %	SD	M or %	SD	M or %	SD	M or %	SD	M or %	SD	M or %	SD
Covariates														
Teacher-child relationship quality			65.63	8.41	64.74	7.79	64.43	8.43	62.98	9.05	63.04	8.84	61.65	8.66
Boy[a]	51.7%	0.50												
Race[a]														
Black	12.7%	0.33												
Other	4.8%	0.21												
Hispanic	6.1%	0.24												
Maternal age[a]	28.10	5.63												
Maternal education[a]														
Less than high school	10.2%	0.30												
High school	54.4%	0.50												
Marital status			80.5%	0.40	80.3%	0.40	80.0%	0.40	80.2%	0.40	79.3%	0.41	79.9%	0.40
Hours of employment			23.48	18.12	26.47	19.02			26.53	19.04	27.34	19.03	27.89	19.03
Income			3.35	2.67	3.76	3.01			4.25	3.80	4.29	3.82	4.35	3.89
Number of children			2.33	0.99	2.42	1.00			2.44	1.02	2.47	1.03	2.50	1.06
Public assistance			12.5%	0.33	6.7%	0.25			7.7%	0.27	6.1%	0.24	6.1%	0.24
Quality of home environment	-0.04	1.01							-0.04	1.00			-0.02	1.00
Teaching experience			15.54	9.12	14.41	9.42	12.72	10.29	11.85	10.51	11.31	10.19	12.00	10.65

	54 months		kindergarten		1st grade		2nd grade		3rd grade		4th grade		5th grade	
	M or %	SD	M or %	SD	M or %	SD	M or %	SD	M or %	SD	M or %	SD	M or %	SD
Outcomes														
Woodcock Johnson scores														
Letter-Word Identification	369.26	21.54			452.22	24.15			493.36	18.52			509.80	17.51
Picture Vocabulary	459.15	14.12			483.38	12.27			496.55	11.48			505.33	12.21
Applied Problems	424.41	19.73			469.99	15.52			497.34	13.16			510.01	12.56
Teacher Ratings														
Language and Literacy			2.97	0.98	3.30	0.96	3.24	0.98	3.52	0.96	3.42	0.95	3.63	0.93
Mathematics			2.98	0.93	3.16	0.95	3.28	0.92	3.39	0.87	2.98	0.86	3.24	0.93
Mothers' reports														
Internalizing	47.28	8.80	46.91	9.03	48.24	8.89			48.18	9.74	47.65	9.51	48.57	9.60
Externalizing	51.71	9.31	49.90	9.31	48.71	9.47			47.53	9.63	46.64	9.72	45.92	10.00
Total Problems	51.04	9.34	48.98	9.62	48.23	9.59			47.43	10.15	46.28	10.16	46.02	10.44
Teachers' reports														
Internalizing	50.93	9.90	46.93	9.01	49.17	9.15	48.83	9.82	51.63	9.63	51.11	9.45	50.71	9.46
Externalizing	50.68	9.68	50.15	9.07	50.96	8.67	50.98	8.95	51.69	9.40	50.79	9.25	51.23	9.25
Total Problems	50.64	10.16	47.74	9.67	50.26	9.35	50.05	9.99	51.82	9.82	50.89	9.75	50.91	9.80

Note: N = 1364

[a] Variables measured when child was 1 month-old

3.6.2 Measures

Academic Achievement. Academic achievement was measured using direct assessment by field interviewers and teacher report. Reading and math achievement was assessed with the *Woodcock-Johnson Psycho-Educational Battery* (WJ-R) (Woodcock & Johnson, 1989) administered in 1st, 3rd, and 5th grades by field interviewers. W ability scores for three subscales were used: Letter-Word Identification, Picture Vocabulary and Applied Problems. W scores are a special transformation of the Rasch ability scale with mathematical properties that facilitate the interpretation of test performance and make it easier to document change over time. The first of these subscales consists of 57 items, with higher values indicating better reading identification skills and word decoding. The Picture Vocabulary subscale consists of 58 items with higher scores indicating better verbal comprehension. The Applied Problems subscale includes 60 items with higher scores indicating better skills to analyze and solve mathematical problems. The WJ-R is a nationally normed and widely used achievement test with demonstrated internal consistency. Average internal consistency from 1st through 5th grade in the NICHD sample is .90 for Letter-Word Identification, .74 for Picture Vocabulary, and .83 for Applied Problems (NICHD, 2007). The WJ-R also has excellent predictive validity for reading, writing and mathematics achievement across the life-span (McGrew, 1993; McGrew & Hessler, 1995; McGrew & Knopick, 1993).

Teacher reports of academic skills were obtained once a year from kindergarten to 5th grade from the *Academic Rating Scale* from the Early Childhood Longitudinal Study (Nicholson, et al., 2002). Using a 5-point scale in which 1 = Not yet and 5 = Proficient, teachers rated children's skills in two areas: language and literacy, and mathematics. The Language and

Literacy scale consists of 15 questions about listening, speaking, early reading and writing behaviors. The Math scale consists of 15 questions about child ability to perceive, understand and use skills to solve mathematical problems. This instrument has excellent psychometric properties (U.S. Department of Education, National Center for Education Statistics, 2001) and a high internal consistency reliability in the NICHD sample (average Cronbach's alpha from kindergarten through 5th grade is .94 for the language and literacy and .92 for mathematics) (NICHD, 2007).

Behavior Problems. Mother and teacher reports of behavior problems were used in this study. Mothers completed the 118-item *Child Behavior Checklist 4/18* (CBCL) (Achenbach, 1991) in kindergarten, 1st, 3rd, 4th and 5th grades, and teachers completed the 120-item *Teacher Report Form 4/18* (TRF) (Achenbach, 1991b) once a year from kindergarten through 5th grade. Possible behavior problems are rated on a Likert scale, with 0 = not true, 1 = somewhat or sometimes true, and 2 = very or often true. Standardized scores (T-scores) for Internalizing, Externalizing and Total Problem scales were used to enable comparisons across scales and informants. The Internalizing scale reflects the presence of anxiety/depression, withdrawal, and somatic concerns, and the Externalizing subscale describes the presence of rule-breaking behaviors, inattentiveness, and aggression. The Total Problems scale is the combination of the CBCL's eight syndrome scales: withdrawn, somatic complaints, anxious/depressed, social problems, thought problems, attention problems, delinquent behavior, and aggressive behavior. Higher scores in this scale indicate more overall problems. The CBCL and TRF have had extensive clinical and research use and have demonstrated good psychometric properties (Achenbach, 2001).

Teacher-child relationship quality. Teachers' perceptions of the quality of their relationship with individual children were assessed using the *Student Teacher Relationship Scale* (STRS) (Pianta, 2001). A short 15-item version of the instrument was rated by teachers once a year from kindergarten through 5th grade using a 5-point scale ranging from 1 = definitely does not apply to 5 = definitely applies. Eight items assess the level of closeness in the relationship, in terms of warmth, positive affect and open communication. Examples include, "If upset, this child will seek comfort from me" and "I share an affectionate, warm relationship with this child." Seven items reflect conflict, which is characterized by high levels of negativity and low levels of communication. Examples include, "This child is uncomfortable with physical affection or touch from me" and "This child easily becomes angry with me." The items reflecting conflict were reverse coded and all 15 items were summed to compute a total positive relationship score. High scores indicate teacher-child relationships that are warm, positive and effective, with lower levels of conflict and higher levels of closeness. This instrument has been widely used in studies of student-teacher relationships, showing adequate test-retest reliability over a 4-week period (.89 for the total score), and good internal consistency (Cronbach's alpha = .89 for the total score) (Pianta, 2001). Cronbach's alpha ranges from .86 to .89 from kindergarten to 5th grade in the NICHD sample (NICHD, 2007)

Child Characteristics. Several demographic characteristics of children were included as predictors in the analyses. Child age at the time of each outcome assessment was measured in months and gender was included as a dummy variable. Child race was represented with dummy variables indicating whether the child was White (omitted group), African American, Hispanic or other race.

Maternal Characteristics. Maternal age at child birth was included as a continuous variable. Mother's education at child age 1 month was represented by dummy variables indicating less than a high school degree, a high school or vocational degree, or an advanced degree (omitted group). Marital status was reported once a year from kindergarten through 5th grade and was represented by a dummy indicator of whether the mother was married or had a partner. Finally, maternal employment was reported in kindergarten, 1st, 3rd, 4th and 5th grade and was represented continuously as the number of hours that mothers work during the week.

Household Characteristics. Household income was represented by an income-to-needs ratio calculated by dividing the family income by the poverty threshold for the household. Poverty status reflected whether mothers reported receiving food stamps, Aid to Families with Dependent Children, or WIC. Mother's caregiving burden was represented by the number of children living in the household. These variables were measured in kindergarten, 1st, 3rd, 4th and 5th grades. Finally, a measure of developmental stimulation and support available in the home was provided by the *Home Observation for Measurement of the Environment* at 54 months, 3rd and 5th grades (HOME, Caldwell & Bradley, 1984). Higher scores indicate a home environment characterized by higher levels of child stimulation and support. Because the items in the early version of the HOME collected at 54 months are different from the items in the middle childhood version, the scores were standardized at each time point.

Teacher Characteristics. Information about teacher experience was collected once a year from kindergarten through 5th grade and was measured continuously as the total number of years of teaching experience.

3.7   ANALYTIC APPROACH.

Associations between teacher-child relationship quality and achievement and behavioral trajectories throughout the elementary school were examined using two-level hierarchical linear models (HLM, Raudenbush & Bryk, 2002). Separate models were estimated for each outcome. Academic achievement outcomes include Woodcock-Johnson subscales for reading and math, as well as teachers' reports of performance in language/literacy, and math. Behavior problems outcomes include internalizing, externalizing and total behavior problems rated by mothers and teachers. All models were estimated in HLM 6.06 using Full Information Maximum Likelihood estimation (Raudenbush, et al., 2004). The first step in the analyses was to estimate unconditional growth models to examine if there was significant variability in trajectories of academic achievement and behavior problems. These models were estimated using equation 1 below.

(1) $Y_{it} = \pi_{0i} + \pi_{1i}\overline{Age_{it}} + \varepsilon_{it}$

In this equation repeated assessments of academic achievement and behavior problems were modeled as a function of child age. The variable Age_{it} represented the child's age in months at each assessment and it was within-child centered by subtracting the average value of the age for child i across all time points from the value of age for child i at each assessment. So the coefficient ($\pi_{1i}\overline{Age_{it}}$) was estimated as $\pi_{1i}(Age_{it} - \overline{Age_{i.}})$. In these unconditional models, the development of child i at age t was modeled as a function of the average level of development across elementary school (π_{0i}), and the average rate of change per month in functioning over time (π_{1i}). The time points varied across models of academic achievement and behavior problems

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according to availability of data in the NICHD SECCYD. Independent assessments of academic

achievement were taken in 1st, 3rd and 5th grade, and mothers' reports of behavior problems were

collected in kindergarten, 1st, 3rd, 4th and 5th grade. On the other hand, teachers' reports of both

academic achievement and behavior problems were taken on a yearly basis from kindergarten

through 5th grade. Therefore, the starting point of the trajectory in each model varied according

to the outcome. At level 2, the coefficient on the intercept was estimated at random and the

coefficient on the slope was estimated as fixed because the level 2 slope parameter had low

reliability.

The next step in the analyses was to estimate conditional models to examine within- and

between-child associations between teacher-child relationship quality and academic achievement

and behavior problems throughout elementary school, when controlling for child, household and

teacher characteristics.   To test within-child associations, repeated measures of relationship

quality were entered as predictors of academic achievement and behavior problems at level 1

using equation 1.1. Other time-varying mother, household and teacher characteristics were also

added as predictors to control for their confounding influence.

$$(1.1) \quad Y_{it} = \pi_{0i} + \pi_{1i}\overline{Age_{it}} + \pi_{2i}\overline{RQ_{it}} + \pi_{3i}\overline{M_{it}} + \pi_{4i}\overline{H_{it}} + \pi_{5i}\overline{T_{it}} + \varepsilon_{it}$$

Here, all time-varying predictors were within-child centered by subtracting the average

value of the predictor for child *i* across all time points from the value of the predictor for child *i*

at age *t*. In this way, the estimated associations between these predictors and academic

achievement and behavior problems are less biased by unobserved heterogeneity between

children. In this equation, π_{2i}, π_{3i}, π_{4i} and π_{5i} correspond to the within-child association between

our main dependent variables of interest and relationship quality (RQ) and characteristics of mothers (M), households (H), and teachers (T). The statistical significance of these coefficients test whether changes in teacher-child relationship quality are linked to changes in academic achievement and behavior problems across time points.

At level 2, variation in the level 1 intercept and slope terms was modeled using equations 2 and 3. To test whether between-child differences in academic achievement and behavior problems over time were associated with teacher-child relationship quality, a measure of individual-average relationship quality was added as a predictor of the level 1 intercept and slope terms.

(2) $\pi_{0i} = \beta_{00} + \beta_{01}AvgRQ_i + \beta_{02}AvgC_i + \beta_{03}AvgM_i + \beta_{04}AvgH_i + \beta_{05}AvgT_i + \beta_{06}Outcome_i + r_{0i}$

(3) $\pi_{1i} = \beta_{10} + \beta_{11}AvgRQ_i + \beta_{12}AvgC_i + \beta_{13}AvgM_i + \beta_{14}AvgH_i + \beta_{15}AvgT_i + \beta_{16}Outcome_i$

Here, the between-child estimates test whether children with higher average levels of teacher-child relationship quality also have higher average levels of achievement and lower average levels of behavior problems (β_{01}), and whether these children experience differential growth in these measures over time (β_{11}). Measures of time-invariant child characteristics (C; *i.e.,* race and gender), and average levels of time-variant mother (M; *i.e.*, age, education, marital status, employment), household (H; *i.e.*, income, number of children, public assistance receipt, quality of home environment), and teacher characteristics (T; *i.e.,* teaching experience) were included in the level 2 equations as well to estimate between-child effects. All the variables at

level 2 were centered on the grand mean for the sample so that they represent adjusted means for the average participant in the sample. An earlier measure (54 months) of the outcome was also included at level 2 to control for differences in children that were present before they started elementary school. The only exception to this was for models of teacher reported academic skills. Since this outcome was not assessed before kindergarten, 54 months measures of Woodcock-Johnson achievement scores were used as control variables in these models. Here, again only the regression coefficient on the intercept was estimated at random and the other level 1 parameters were fixed because we did not have theoretical reasons to expect their influences to differ across individuals.

Lastly, to test whether teacher-child relationship quality is more strongly related to academic achievement and behavior problems for more disadvantaged children, time-invariant measures of sociodemographic risk (*i.e.,* child race, mother's education, income, public assistance receipt, and number of children in household) were added at level 2 as predictors of the level 1 within-child teacher-child relationship quality parameter.

3.8   RESULTS

3.8.1   Teacher-Child Relationship Quality and Academic and Behavioral Trajectories.

The analyses began by estimating unconditional growth models to determine whether there was significant variability in initial levels and growth of academic achievement and behavior problems over time. The first column in Table 3-2 shows the average academic achievement and

behavior problems score for the average child in the sample. The second column shows the average rate of change in academic achievement and behavior problems across time points. The positive and significant coefficients for the slope terms in all academic achievement models indicate that trajectories increased from the start of elementary school through 5th grade. In regard to behavior problems, the slope coefficients show that externalizing and total behavior problems decreased from kindergarten through 5th grade according to mothers' reports. In contrast, internalizing behavior problems reported by mothers and internalizing, externalizing and total behavior problems reported by teachers increased throughout elementary school. As the chi-squared tests revealed significant variability in the intercepts and slopes of achievement and behavior problems trajectories, subsequent conditional models were run to explain heterogeneity in these parameters.

Conditional models were estimated to examine both between-child differences in child's functioning associated with teacher-child relationship quality, and within-child associations between child's functioning and relationship quality. Between-child analyses explore whether children who have more positive relationships with teachers showed higher average levels and greater gains in levels of academic achievement and behavior problems across elementary school. In contrast, within-child analyses indicated whether within-child changes in the overall quality of the relationship were associated with within-child changes in academic achievement and in behavior problems throughout elementary school. The results of the conditional models for academic achievement and behavior problems are displayed in Table 3-3 and Table 3-4, respectively.

Table 3-2: Teacher-Child Relationship Quality and Children's Functionig Over Time:

Unconditional Models

	Intercept		Slope	
	Coefficient	SE	Coefficient	SE
Academic Achievement				
Woodcock-Johnson Scores				
Letter Word Identification	485.12 ***	0.606	1.196 ***	0.014
Picture Vocabulary	495.09 ***	0.429	0.456 ***	0.011
Applied Problems	492.45 ***	0.556	0.832 ***	0.009
Teacher Ratings				
Language and Literacy	3.35 ***	0.022	0.009 ***	0.001
Mathematics	3.17 ***	0.021	0.002 ***	0.001
Behavior Problems				
Mothers' reports				
Internalizing	47.910 ***	0.260	0.018 **	0.006
Externalizing	47.739 ***	0.251	-0.063 ***	0.006
Total Problems	47.390 ***	0.262	-0.049 ***	0.006
Teachers' reports				
Internalizing	49.730 ***	0.154	0.063 ***	0.007
Externalizing	50.967 ***	0.226	0.014 **	0.005
Total Problems	50.280 ***	0.253	0.046 ***	0.009

Note . ***$p < .001$, **p<.01

3.8.1.1 Academic Achievement Trajectories.

Between-child Differences. The first two panels in Table 3-3 show the results of the between-child analysis of associations between average levels of teacher-child relationship quality and trajectories of academic achievement. As can be seen, no significant associations were found between average teacher-child relationship quality and average levels or gains in academic achievement when Woodcock-Johnson scores are considered. In contrast, significant associations were found between average teacher-child relationship quality and teacher reports of average levels of achievement in language/literacy and mathematics. More specifically, children with more positive relationships with their teachers had higher average language/literacy and mathematics scores. Specifically, each unit increase in relationship quality was linked to an increase of .02 points in language/literacy and mathematics. However, the magnitude of these associations was relatively small, with a standard deviation improvement in relationship quality linked to only .12 and .08 of a standard deviation improvement in language/literacy and mathematics, respectively. Finally, average teacher-child relationship quality was not related to gains in academic achievement from kindergarten through 5th grade when reported by teachers.

As it can also be seen in Table 3-3, other child, mother and household characteristics were linked to average levels in academic achievement. When compared to girls, boys had higher average scores in vocabulary and math from the Woodcock-Johnson and had lower language/literacy skills and higher math skills according to teachers. When compared to White children, African American children had lower average level scores on all Woodcock-Johnson subscales. One variable that was consistently associated with average levels of academic achievement across Woodcock-Johnson subscales and teachers' ratings was maternal education. Mothers with a high school degree or less had children with lower average levels of academic

achievement across all measures, when compared with mothers who had a bachelor or an advanced degree. Finally, quality of the home environment was positively related to average level scores in math from the Woodcock-Johnson and with teachers' ratings of both language/literacy and math. As shown in Table 3-3, fewer significant associations were found between child, mother and household characteristics and average gains in academic achievement throughout elementary school.

Within-child Associations. As shown in the lowest panel in Table 3-3, no within-child associations were found between teacher-child relationship quality and scores on the three Woodcock-Johnson subscales. However, positive and significant associations were found when teachers' reports of academic achievement are considered. Results indicate that within-child improvements in teacher-child relationship quality were associated with enhancements of teacher-reported academic skills. More specifically, a unit increase in teacher-child relationship quality was linked to an increase of .01 and .007 points in language/literacy and math from kindergarten through 5th grade, respectively. The associations are again small in magnitude, such that a standard deviation increase in the quality of the teacher-child relationship was linked to increments of .10 and .06 of a standard deviation in language/literacy and math, respectively. Finally, the lowest panel in Table 3-3 shows that no other time-varying mother, household and teacher characteristics were significantly linked to within-child changes in academic achievement across elementary school.

Table 3-3: Teacher-child Relationship Quality and Children's Academic Achievement across Elementary School

| | Woodcock-Johnson Scores | | | | | | Teacher Ratings | | | |
| | Letter-Word Identif. | | Picture Vocabulary | | Applied Problems | | Language/Literacy | | Mathematics | |
	Coefficient	SE	Coefficient	SE	Coefficient	SE	Coefficient	SE	Coefficient	SE
Average Academic Achievement - Between-child estimates										
Intercept	485.124 ***	0.523	495.087 ***	0.372	492.448 ***	0.506	3.482 ***	0.019	3.260 ***	0.019
Average relationship quality	0.004	0.082	0.035	0.051	-0.017	0.051	0.023 ***	0.004	0.014 ***	0.004
Boy	0.279	1.216	1.036 *	0.512	3.132 ***	0.679	-0.096 *	0.045	0.118 *	0.048
Race										
Black	-5.635 **	1.785	-2.998 *	1.224	-2.623 *	1.180	-0.114	0.074	-0.091	0.090
Other	-2.273	2.255	2.406 *	1.143	0.969	1.364	-0.028	0.093	0.042	0.081
Hispanic	1.388	1.844	1.094	1.283	-0.397	1.478	0.123	0.090	0.145	0.091
Maternal age	0.012	0.087	0.046	0.049	0.035	0.063	-0.006	0.005	-0.005	0.004
Maternal education										
Less than high school	-7.292 **	2.523	-4.182 **	1.409	-4.365 **	1.552	-0.478 **	0.130	-0.449 ***	0.093
High school	-1.532	1.286	-2.710 ***	0.632	-1.619 *	0.778	-0.190 ***	0.047	-0.251 ***	0.049
Average marital status	0.480	1.976	0.044	0.996	0.568	1.069	0.038	0.072	0.024	0.087
Average hours of employment	0.008	0.033	-0.015	0.016	0.012	0.024	0.000	0.001	0.000	0.001
Average income	0.096	0.158	0.011	0.091	0.204 *	0.101	0.003	0.007	0.004	0.007
Average number of children	-0.488	0.596	-0.941 ***	0.277	-0.186	0.374	-0.023	0.024	-0.026	0.031
Average public assistance	-2.764	2.500	-2.013	1.426	1.288	1.903	-0.030	0.142	0.078	0.115
Average quality of home environment	1.667	1.052	0.820 t	0.476	1.657 **	0.518	0.110 **	0.038	0.112 **	0.034
Average teaching experience	0.001	0.073	0.015	0.041	0.029	0.040	0.005	0.003	-0.001	0.004
Outcome 54 months	0.403 ***	0.029	0.405 ***	0.042	0.325 ***	0.021	0.017 ***	0.002	0.011 ***	0.001

| | Woodcock-Johnson Scores | | | | | | Teacher Ratings | | | |
| | Letter-Word Identif. | | Picture Vocabulary | | Applied Problems | | Language/Literacy | | Mathematics | |
	Coefficient	SE	Coefficient	SE	Coefficient	SE	Coefficient	SE	Coefficient	SE
Change in Academic Achievement - Between-child estimates										
Intercept	1.195 ***	0.015	0.454 ***	0.011	0.829 ***	0.011	0.007 ***	0.001	0.002 t	0.001
Average relationship quality	-0.002	0.002	0.000	0.001	-0.001	0.001	0.000	0.000	0.000	0.000
Boy	0.018	0.021	-0.024	0.022	-0.064 ***	0.017	-0.002	0.001	-0.002 t	0.001
Race										
Black	-0.053	0.057	-0.057 **	0.021	-0.017	0.033	-0.006 *	0.002	0.001	0.003
Other	0.016	0.078	-0.010	0.035	0.016	0.031	0.005	0.003	0.004	0.003
Hispanic	0.043	0.046	-0.009	0.043	0.046	0.035	-0.001	0.003	0.003	0.003
Maternal Age	0.004	0.003	-0.002	0.001	0.000	0.002	0.000	0.000	0.000	0.000
Maternal education										
Less than high school	0.014	0.057	-0.080 *	0.034	-0.002	0.034	-0.001	0.004	-0.001	0.003
High school	-0.021	0.031	-0.026	0.024	0.008	0.018	-0.002	0.002	-0.002	0.002
Average marital status	0.043	0.040	0.000	0.020	0.019	0.031	-0.002	0.002	-0.002	0.002
Average hours of employment	0.000	0.001	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000
Average income	-0.002	0.004	-0.001	0.002	-0.006 t	0.003	0.000 *	0.000	0.000	0.000
Average number of children	-0.016	0.015	-0.007	0.006	0.004	0.008	0.000	0.001	-0.001	0.001
Average public assistance	0.052	0.061	-0.023	0.039	-0.083	0.056	0.001	0.004	-0.001	0.005
Average quality of home environment	0.005	0.020	-0.002	0.010	0.018	0.013	0.000	0.001	0.000	0.001
Average teaching experience	0.002	0.002	0.001	0.001	0.001	0.001	0.000 *	0.000	0.000 *	0.000
Outcome 54 months	-0.005 ***	0.001	-0.002 **	0.001	-0.003 ***	0.001	0.000 t	0.000	0.000	0.000

| | Woodcock-Johnson Scores | | | | | | Teacher Ratings | | | |
| | Letter-Word Identif. | | Picture Vocabulary | | Applied Problems | | Language/Literacy | | Mathematics | |
	Coefficient	SE	Coefficient	SE	Coefficient	SE	Coefficient	SE	Coefficient	SE
<u>Within-child estimates</u>										
Relationship quality	0.025	0.047	-0.017	0.017	-0.002	0.025	0.012 ***	0.002	0.007 ***	0.002
Marital status	-0.375	1.111	0.138	0.517	0.177	1.030	0.012	0.069	0.000	0.068
Hours of employment	0.006	0.028	-0.005	0.012	-0.014	0.020	0.000	0.001	-0.001	0.001
Income	0.158	0.178	0.081	0.090	0.177	0.173	0.002	0.009	0.012	0.011
Number of children	-0.444	0.576	0.216	0.337	-0.422	0.556	-0.033	0.032	-0.026	0.034
Public assistance	0.517	1.780	0.372	1.253	0.508	1.033	0.038	0.081	0.081	0.084
Quality of home environment	0.178	0.472	-0.349 t	0.210	-0.138	0.366	0.039	0.023	0.024	0.027
Teaching experience	-0.028	0.035	-0.012	0.014	-0.032	0.023	-0.001	0.001	-0.002	0.002

Note. ***$p < .001$. **$p < .01$. * $p < .05$. $t < .10$.

3.8.1.2 Behavior Problems Trajectories.

Between-child Differences. The results of the between-child analysis of associations between average teacher-child relationship quality and trajectories of behavior problems are shown in the first two panels of Table 3-4. The first panel shows that there is a negative and significant relation between average teacher-child relationship quality and average ratings of behavior problems across all models. Children who have more positive relationships with their teachers show lower average levels of both mother- and teacher-reported internalizing, externalizing and total behavior problems. When behavior problems are reported by mothers, these reflect low associations such that a standard deviation increase in average overall relationship quality was linked to only .08 of a standard deviation decrease in average level of internalizing behavior problems, and to .15 of a standard deviation reduction in average levels of externalizing and total behavior problems. When teacher reports of behavior problems are considered, the magnitude of the associations is larger. Specifically, a standard deviation increase in the average quality of the relationship was associated with a reduction of .19 of a standard deviation in average level of internalizing behavior problems, and to a decline of .35 of a standard deviation in average levels of externalizing and total behavior problems. Finally, as can be seen in the second panel in Table 3-4, no significant associations were found between average levels of teacher-child relationship quality and behavior problems growth from kindergarten through 5th grade when reported by mothers or teachers.

The first two panels in Table 3-4 also show that several child, mother and household characteristics were linked to average levels of behavior problems, whereas very few were associated with growth of behavior problems across elementary school. According to teachers, boys showed lower average levels of behavior problems when compared to girls. African

American children showed lower average levels of internalizing, externalizing and total behavior problems than children of any other ethnicity according to mothers, but higher average levels of externalizing behavior problems according to teachers. Lower average levels of behavior problems were also reported by mothers from higher-income families, when more children lived in the household, and with a higher quality of the home environment. Among these variables, only quality of home environment was linked to reductions in internalizing and total behavior problems according to teachers. When considering the growth of behavior problems over time, only African American children and children from families receiving public assistance were reported to have greater average gains in behavior problems according to teachers and mothers, respectively. No other significant association was found between child, mother and household characteristics and average growth in behavior problems over time.

Within-Child Associations. Within-child increases in teacher-child relationship quality were related to reductions in behavior problems from kindergarten through 5th grade. Results shown in the lowest panel in Table 3-4 show that within-child improvements in teacher-child relationship quality predicted declines in mothers' reports of internalizing and total behavior problems, as well as decreases in teachers' reports of internalizing, externalizing and total behavior problems across elementary school. Specifically, a standard deviation increase in the overall quality of the relationship was linked to .04 of a standard deviation reduction in internalizing and total behavior problems reported by mothers. The associations with teachers' reports of behavior problems were larger, such that a standard deviation improvement in relationship quality was linked to .22 of a standard deviation decrease in internalizing behavior problems, and .26 of a standard deviation decline in externalizing and total behavior problems.

Finally, the lowest panel in Table 3-4 shows that among the other time-varying child, mother and household characteristics added to the models, only the years of teaching experience were found to be significantly associated with within-child changes in behavior problems over time. Specifically, an increase in the number of years of teaching experience was linked to reductions in internalizing, externalizing and total behavior problems reported by teachers.

3.8.2   Teacher-child Relationship Quality by Family Risk Interactions.

To address the third research goal of this study, measures of sociodemographic risk were added at level-2 as predictors of associations between teacher-child relationship quality and child outcomes in the level-1 equation. This provides a statistical test of whether relationship quality is more strongly related to academic achievement and behavior problems for more disadvantaged children. Characteristics of the child, the mother and the household were used as sociodemographic risk indicators: race, maternal education, income, public assistance receipt and number of children in the household. The results of these models showed that none of these coefficients from the level-2 equation was significant. In other words, the within-child association between teacher-child relationship quality and children's outcomes didn't vary as a function of any of the risk indicators.

Table 3-4: Teacher-child Relationship Quality and Children's Behavior Problems across Elementary School

	Mother-report						Teacher-report					
	Internalizing		Externalizing		Total Problems		Internalizing		Externalizing		Total Problems	
	Coefficient	SE	Coefficient	SE	Coefficient	SE	Coefficient	SE	Coefficient	SE	Coefficient	SE
Average Academic Achievement - Between-child estimates												
Intercept	48.329 ***	0.218	47.385 ***	0.223	47.229 ***	0.240	50.503 ***	0.181	51.294 ***	0.200	50.997 ***	0.223
Average relationship quality	-0.141 **	0.047	-0.269 ***	0.042	-0.263 ***	0.041	-0.324 ***	0.039	-0.613 ***	0.036	-0.656 ***	0.044
Boy	-0.470	0.465	-0.705	0.451	-0.005	0.561	-0.770 *	0.376	-1.460 **	0.454	-1.392 ***	0.371
Race												
Black	-1.988 **	0.692	-1.849 *	0.892	-1.997 **	0.726	-1.195	0.835	2.969 ***	0.737	1.234 t	0.689
Other	-0.966	0.914	-1.399	0.963	-1.591 t	0.936	0.272	0.870	-1.423 t	0.771	-0.878	0.872
Hispanic	-0.714	0.982	-1.740 t	0.971	-1.822 t	1.005	0.139	0.788	0.266	0.704	0.456	0.774
Maternal age	-0.075	0.045	-0.082 t	0.048	-0.068	0.045	0.052	0.041	-0.027	0.041	-0.016	0.038
Maternal education												
Less than high school	-2.505 *	1.082	0.526	1.118	-1.389	1.284	0.977	1.015	1.431	1.128	1.995 t	0.993
High school	-1.016 t	0.547	0.571	0.513	-0.345	0.540	0.667	0.476	0.911 t	0.521	0.965 t	0.515
Average marital status	-0.446	0.732	0.741	0.844	0.289	0.679	-0.865	0.684	-0.638	0.665	-0.627	0.723
Average hours of employment	-0.012	0.015	0.003	0.015	-0.002	0.017	-0.019	0.011	0.014	0.013	0.001	0.011
Average income	-0.173 *	0.081	-0.156 *	0.073	-0.255 **	0.085	-0.095	0.065	0.041	0.069	-0.087	0.074
Average number of children	-0.664 **	0.235	-0.123	0.232	-0.523 *	0.257	-0.088	0.207	0.034	0.229	0.043	0.228
Average public assistance	1.796	1.358	1.835	1.309	1.286	1.365	1.532	1.355	1.133	1.195	1.517	1.133
Average quality of home environment	-0.403	0.407	-1.113 *	0.416	-0.887 **	0.325	-0.571 *	0.281	-0.308	0.350	-0.963 *	0.402
Average teaching experience	0.007	0.036	0.029	0.043	0.023	0.036	-0.077 t	0.043	-0.041	0.042	-0.082 *	0.037
Outcome 54 months	0.464 ***	0.024	0.474 ***	0.024	0.564 ***	0.022	0.060 t	0.031	0.177 ***	0.032	0.118 **	0.028

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| | Mother-report | | | | | | Teacher-report | | | | | |
| | Internalizing | | Externalizing | | Total Problems | | Internalizing | | Externalizing | | Total Problems | |
	Coefficient	SE	Coefficient	SE	Coefficient	SE	Coefficient	SE	Coefficient	SE	Coefficient	SE
Change in Academic Achievement - Between-child estimates												
Intercept	0.006	0.009	-0.066 ***	0.007	-0.052 ***	0.007	0.014	0.011	-0.015 **	0.006	-0.008	0.012
Average relationship quality	0.000	0.002	0.000	0.001	-0.001	0.001	-0.002	0.002	-0.001	0.002	-0.002	0.001
Boy	-0.004	0.017	-0.015	0.014	-0.003	0.017	-0.025	0.018	0.016	0.020	0.011	0.015
Race												
Black	-0.035	0.026	0.005	0.021	-0.033	0.029	0.016	0.031	0.057 *	0.026	0.039	0.031
Other	-0.021	0.029	-0.034	0.039	-0.044	0.035	0.036	0.040	0.018	0.031	-0.011	0.036
Hispanic	-0.016	0.027	-0.031	0.023	-0.037	0.024	-0.009	0.034	0.037	0.029	0.021	0.031
Maternal Age	-0.001	0.001	-0.002	0.001	-0.002	0.001	-0.001	0.002	0.000	0.001	-0.001	0.001
Maternal education												
Less than high school	-0.004	0.037	0.050	0.032	0.020	0.031	0.060	0.054	0.043	0.038	0.024	0.043
High school	-0.008	0.017	0.012	0.015	0.007	0.016	0.027	0.026	0.002	0.018	0.018	0.019
Average marital status	0.022	0.030	0.041 t	0.023	0.031	0.025	-0.029	0.030	0.004	0.028	-0.010	0.026
Average hours of employment	0.000	0.000	0.000	0.000	0.000	0.000	-0.001 t	0.001	0.000	0.000	0.000	0.000
Average income	-0.003	0.002	0.002	0.002	0.000	0.002	0.001	0.003	-0.002	0.003	0.000	0.003
Average number of children	-0.006	0.008	0.000	0.007	-0.005	0.006	-0.013	0.009	0.003	0.009	-0.006	0.007
Average public assistance	0.084 *	0.041	0.054	0.041	0.058	0.040	0.028	0.054	-0.005	0.047	-0.009	0.043
Average quality of home environment	0.007	0.013	0.001	0.012	0.002	0.011	0.008	0.015	0.003	0.011	0.002	0.012
Average teaching experience	-0.001	0.001	-0.001	0.001	-0.001	0.001	-0.001	0.002	0.000	0.001	0.000	0.001
Outcome 54 months	-0.002 **	0.001	-0.003 ***	0.001	-0.002 **	0.001	-0.002	0.001	-0.004 ***	0.001	-0.003 **	0.001

	Mother-report						Teacher-report					
	Internalizing		Externalizing		Total Problems		Internalizing		Externalizing		Total Problems	
	Coefficient	SE	Coefficient	SE	Coefficient	SE	Coefficient	SE	Coefficient	SE	Coefficient	SE
Within-child estimates												
Relationship quality	-0.044 *	0.022	-0.037	0.022	-0.049 *	0.020	-0.236 ***	0.029	-0.280 ***	0.019	-0.300 ***	0.022
Marital status	-0.586	0.578	-0.613	0.447	-0.728	0.468	-0.364	0.870	-0.602	0.519	-0.437	0.613
Hours of employment	0.001	0.011	0.005	0.010	-0.003	0.010	-0.195	0.358	-0.358	0.235	-0.371	0.304
Income	-0.016	0.081	0.014	0.060	-0.032	0.148	0.025	0.102	0.074	0.116	0.094	0.121
Number of children	-0.093	0.272	0.052	0.346	0.087	0.337	-0.172	0.434	-0.180	0.381	-0.368	0.344
Public assistance	0.827	1.112	-0.094	0.866	0.216	0.766	1.219	1.157	0.717	0.963	0.753	1.365
Quality of home environment	0.138	0.224	-0.167	0.204	0.078	0.221	0.000	0.020	0.015	0.013	0.005	0.014
Teaching experience	0.018	0.014	0.009	0.013	0.011	0.012	-0.049 *	0.021	-0.036 *	0.016	-0.042 **	0.016

Note. ***$p < .001$. **$p < .01$. * $p < .05$. $t < .10$.

3.9   DISCUSSION

Results of this study advance our understanding of the longitudinal connections between teacher-child relationships and academic and behavioral development during elementary school. Using a large and diverse database, this is the first study to examine both between- and within-child associations between teacher-child relationship quality and child's functioning beyond the early school years. By analyzing data from mothers, teachers and standardized assessments, this study allows for comparisons across informants.

Results indicate that relationship quality teachers report having with children is associated with trajectories of achievement and behavior problems from kindergarten through 5th grade. The observed associations were consistent across informants in the case of child behavior problems, whereas associations with academic achievement emerged only when both relationship quality and achievement were reported by the teacher. Finally, improvements in relationship quality were liked to improved child functioning, regardless of their socioeconomic background.

A strength of this study is that it tested within-child connections between relationship quality and children's development. By testing whether change in child functioning is associated with change in relationship quality, it is less likely that stable characteristics of children and families spuriously account for any associations found (Allison, 1990; Dearing et al, 2006; Singer & Willet, 2003). It is still possible, however, that the connections between relationship quality and children's functioning are biased by reciprocal causation (child functioning both affects and is affected by the relationship with the teacher) or by unobserved time-varying factors

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(e.g., endogenous changes in child learning rate, troubling events in the child's homelife at particular times, the presence of close friends in only some classrooms). But overall, this study provides a more rigorous approach to considering relations between teacher-child relationship quality and children's development.

3.9.1 Teacher-child relationships and achievement trajectories

Teacher-child relationship quality was associated with teacher report of academic skills. Between-child analyses indicated that children with whom teachers reported more positive relationships received higher average scores from teachers in language/literacy and mathematics during elementary school. However, the average quality of the relationship reported across teachers was not associated with gains in academic skills rated by different teachers from kindergarten through 5th grade. On the other hand, within-child improvements in relationship quality during elementary school were linked to improvements in academic skills in language/literacy and mathematics rated by teachers.

These results add to existing studies suggesting that teacher-child relationship quality is related to children's academic skills (Burchinal et al., 2002; Hamre & Pianta, 2001; Pianta & Stuhlman, 2004). One caveat when interpreting these results is that, contrary to the other models in this study, the ones examining teachers' reports of academic skills didn't include an early measure of this outcome because it was not available in the NICHD SECCYD data. Instead, an early achievement test score was added to the models as a control variable, which helps to insure that differences in academic achievement that were present before children started school are not responsible for observed associations between academic achievement and teacher-child relationship quality.

When it comes to standardized assessments of academic achievement, the results were quite different. Across both the between-child and within-child models, there were no significant associations between teacher-child relationship quality and standardized achievement scores. This result is not consistent with evidence from previous studies examining links between relationship quality and achievement assessed by standardized tests. However, some of these studies didn't include a control for initial differences in achievement scores (Burchinal et al., 2002; Pianta, et al., 1997; Pianta & Stulhman, 2004). One study found that when early measures of achievement were included in the models, teacher-child relationship quality no longer predicted children's academic performance in middle school (Hamre & Pianta, 2001). This suggests that observed associations between teacher-child relationship quality and achievement may be more of an artifact of a tendency for teachers to develop higher quality relationships with students who have better academic skills and less of an effect of teacher-child relationship quality on student achievement.

Several reasonable arguments could be made to explain why this study yields inconsistent results across teacher reports and standardized assessments of achievement. Perhaps the most obvious explanation for the discrepancy in these results is rater bias. Common source bias may play a substantial role in explaining the associations between teacher-child relationship quality and teacher-rated academic achievement. In other words, the association between teacher-child relationship quality and teacher-rated academic skills may be significant because teachers are rating both constructs. If that is the case, it is possible that teachers rate students with whom they have more positive relationships as stronger in academic skills, or vice versa.

On the other hand, teacher-child relationship quality may be related only to teacher's ratings of academic skills that reflect a combination of social competence, behavior and

performance in language and mathematics, whereas it is not associated with standardized test scores that more narrowly measure achievement in specific academic domains. The motivation literature has shown that children who have good relationships with teachers tend to privilege the pursuit of social goals. They are more likely to conform to classroom rules, be helpful to students and teachers, complete homework and engage in learning activities, and these goals are not necessarily related to better achievement (Ames, 1992; Wentzel, 1994, 1998). Other studies examining the relation between children's goals and achievement have also found discrepant results between teacher reports and standardized assessments of achievement. For example, Wentzel (1993) found that children's pursuit of social goals is associated with grade point averages, but not with achievement tests scores.

3.9.2 Teacher-child relationships and behavior problems trajectories

In this study, higher average teacher-child relationship quality was linked to lower average levels of internalizing, externalizing and total behavior problems from kindergarten through 5th grade as reported by mothers as well as teachers, but was not associated with growth in behavior problems during these years. However, these associations between average levels of teacher-child relationship quality and average levels of behavior problems across elementary school may be explained by omitted variables. For example, child temperament may lead children to exhibit behavior problems both at home and school, and simultaneously, to generate conflict in their relationships with teachers. Therefore, variables that were not measured in this study may explain the observed associations.

The within-child analyses, however, showed that improvements in relationship quality were linked to modest reductions in mother- and teacher-reported behavior problems across

elementary school. These results add to existing research (Birch & Ladd, 1998; Hamre & Pianta, 2001; Pianta & Stuhlman, 2004; Silver et al., 2005) by suggesting that improvements in the quality of the relationship that teachers form with students are associated with behavioral adjustment even beyond the early years of school. Although these findings are highly suggestive, it is important to recognize that, although this study is able to reduce concern related to potentially important time invariant omitted variables, time-varying omitted variables (e.g., distressing experiences at home, or conflict in relationships with parents) and reciprocal causation may still bias the results.

Associations between relationship quality and behavior problems were larger than associations between relationship quality and academic skills, but all were modest. This is consistent with the work of Hamre and Pianta (2001). This finding provides evidence to suggest that the quality of the teacher-child relationship is a better predictor of outcomes related to social competence because it is in part, a marker of social competence.

One of the advantages of the current study was the availability of both mother and teacher reports of behavior problems. Although this study concurs with a wealth of research (Achenbach, McConaughy, & Howell, 1987; De Los Reyes & Kazdin, 2005; Duhig, Renk, Epstein, & Phares, 2000) showing that mothers and teachers differ in their ratings of child behavior problems (correlations in this study ranged from .07 to .30), the associations between teacher-child relationship quality and behavior problems were mostly consistent across informants. This consistency suggests that the observed associations are not purely an artifact of rater bias. Apparently, children having better relationships with their teachers behave slightly better both at school and at home.

3.9.3 Family Risk Moderation

This study revealed that improvements in the quality of the teacher-child relationship from one grade to the next are related to increases in teacher-reported academic skills and decreases in both teacher and parent rating of behavior problems for all children, regardless of their socioeconomic risk status. Therefore, contrary to evidence from other studies, current findings suggest that relationship quality is not especially protective for African American children from disadvantaged households (Hamre & Pianta, 2001; Burchinal et al, 2002; Mehan et al., 2003). This discrepancy in findings may be due to the more stringent statistical controls that a within-child analysis provides. Or it may be that the NICHD SECCYD sample is not sufficiently disadvantaged to detect any such protective effect of teacher-child relationships quality.

3.9.4 Conclusion

This study suggests that relationships with teachers constitute an important context for children's development during the elementary school years. It demonstrates that the relations teachers and students forge each school year are linked to indicators of student competence and adjustment during that same span of time.

The finding that improvements in the quality of the teacher-child relationship are linked to improvements in teachers' reports of academic skills and reductions in behavior problems for all children regardless of their socioeconomic risk status, adds to existing studies by demonstrating that the observed associations are not the result of bias introduced by unobserved variables that are constant over time. Evidence from a few intervention studies in which teachers are provided with strategies to improve the emotional quality of their interactions with students

also suggests that the findings from this study are not spurious or the result of reciprocal causation. For example, Brock, Nishida, Chiong, Grimm and Rimm-Kaufman (2008) examined the effectiveness of the *Responsive Classroom Approach* which provides teachers with a set of practices designed to create a classroom in which both emotional and instructional support are available. They found that children had more favorable perceptions of school, and showed better academic and social behavior when their teachers used more Responsive Classroom practices. Similar evidence comes from The Child Development Program, an intervention designed to enhance social and intellectual development by creating a caring community in the classroom that provides students with opportunities to pursue common academic and social goals, provide and receive meaningful help, develop and practice social competences, and exercise autonomy, among others (Battistich, Solomon, Watson & Schaps, 1997). Research shows that the implementation of this program was related to better social competence, conflict resolution skills, achievement motivation and reading comprehension (Battistich et al., 1997; Solomon, Watson, Battistich, Schaps & Delucchi, 1996).

Future studies of children's adaptation over elementary school should take into account associations between teacher-child relationships and children's development. Furthermore, given the rise in attention to classroom level instructional practices in the wake of the implementation of No Child Left Behind, the results of this study –in conjunction with the experimental data from teacher interventions- suggest that policy makers and practitioners should be careful not to neglect relationships between teachers and students as one avenue for promoting academic success and behavioral competence among children.

4.0   CONCLUSIONS

The overarching aim of this dissertation was to advance knowledge about the nature and academic relevance of relationships between teachers and children across elementary school. By integrating two related studies using longitudinal data from the National Institute of Child Health and Human Development Study of Early Child Care (NICHD SECC, 1993), this investigation contributes to the literature by answering nuanced questions about the developmental pattern of teacher-child relationships and their association with children's school competence over time. This investigation also suggests new avenues for future research studies and provides potentially useful information for investigators and educators who are considering interventions aimed at strengthening teacher-child relationship quality in an effort to promote student academic or socioemotional development.

The first study sheds light on the developmental trajectories of teacher-child relationships from kindergarten through 5th grade. The results of this study showed that there are several distinct trajectories of teacher-reported relationship quality over time not been previously identified in the literature. Specifically, results suggest that the pattern of moderate decline in relationship quality across school years identified in prior studies only characterizes a portion of children's relationships with teachers (about one third of the sample). In this study another three groups were described, showing trajectories of marked decline, consistent improvement, and relative stability in the quality of the relationship across the elementary school years.

In addition, results demonstrated that child gender and race, child academic skills and behavior problems at kindergarten entry, and some indicators of family socioeconomic disadvantage distinguish teacher-child relationship trajectory groups. More specifically, boys, African Americans, children with higher levels of behavior problems or low academic skills and children from economically disadvantaged households were more likely to belong to groups with less positive teacher-child relationships across elementary school. Possible explanations for these associations were offered.

The second study explored links between teacher-child relationship quality and children's development throughout the elementary school years. Contrary to previous studies relying entirely upon between-child comparisons, this study also tested whether changes in teacher-child relationship quality are associated with changes in academic achievement and behavior problems. Results documented that higher average teacher-child relationship quality is linked to higher average teacher-rated academic skills, and lower average levels of child behavior problems reported by teachers and mothers during elementary school. Adding to existing evidence, this study also demonstrated that within-child improvements in relationship quality during elementary school are linked to improvements in teacher-rated academic skills, and to reductions in mother- and teacher-reported behavior problems across elementary school. The role of different sources of possible bias (e.g., omitted time-varying factors, common source bias) was described in detail. Finally, this second study provided evidence that associations between changes in teacher-child relationship quality and changes in child functioning were comparable for all children in the NICHD SECC sample, regardless of their socioeconomic risk status.

Taken together, results of this investigation support the idea that teacher-child relationships are relevant for children's development and constitute an important context for

children´s success in school. Evidence provided in this study suggests that close relationships with teachers are associated with children showing slightly fewer behavior problems, both at home and school, and scoring higher in teacher-rated academic achievement. These outcomes in turn may determine the development of competencies in other contexts and later in life. Therefore, added to experimental data from teacher interventions, this study suggests that improving the quality of relationships with teachers may be regarded as an avenue for promoting academic success and behavioral competence among children.

In addition, when the results of both studies are integrated, there are reasons to suggest that special attention should be paid to the quality of relationships that socioeconomically disadvantaged children form with their elementary school teachers. If, as was demonstrated in the first study, these children are at a disadvantage throughout elementary school as far as teacher-child relationships are concerned, and if grade-to-grade changes in teacher-child relationship quality are associated with modest changes in children's academic and behavioral competencies, disadvantaged children may be less likely to succeed in school by virtue of their relationships with teachers. Therefore, future studies should focus in disadvantaged children to explore if the development of close and warm relationships with teachers may buffer them children from the harmful consequences associated with difficult life circumstances.

Finally, this investigation shows that use of different analytic techniques –those allowing us to represent heterogeneity in children's experiences, and reduce the threat of different sources of bias- strengthens our knowledge about the nature and relevance of teacher-child relationships. Indeed, these analytic techniques lead to different conclusions from previous research on the same topic, including some using the very same NICHD sample. Furthermore, the inclusion of additional time points covering the entire range of elementary school years helped to shed light

on the potential importance of relationships between teachers and children during a period in which children experience important developmental changes, and transformations take place in the structure of classrooms and the role of teachers.

4.1 A GUIDING THEORETICAL FRAMEWORK FOR THE STUDY OF TEACHER-CHILD RELATIONSHIPS

From the onset of this investigation, it was clear that the conceptual model on which it is based is strongly rooted in attachment theory. From this theoretical framework, Pianta's conceptual model draws its assumptions about the relevance of relationships for children's development, the idea that relationship quality is in part determined by individuals' mental representations, and the definition of a good teacher-child relationship. However, results of this investigation invite questions about whether attachment theory does, in fact, constitute a useful framework for studying teacher-child relationships.

First of all, it is important to recognize that attachment theory is one of the strongest frameworks currently available to understand affective relationships. However, both Bowlby (1982) and Ainsworth (1989) clearly stated that not all relationships are attachment relationships. According to Ainsworth (1989), relationships differ from attachment bonds in at least two important ways: relationships may or may not endure, and they do not necessarily entail a representation in the internal organization of the individual. It is clear that children form relationships with several teachers throughout elementary school, with no single teacher being consistently involved in a child's life from year to year. Therefore, as opposed to attachment

relationships with parents which are enduring, relationships with teachers typically last no more than one, or in some cases two, years. Howes (1999) has proposed that young children do develop some type of internal model for teacher relationships, but that this may take the form of a generic template of "teachers" (Howes, 1999) or simply "non familial authority figures." This template may be based on the experience that children have with their *first* teacher, but it may be revised or fined tuned as children interact with subsequent teachers. This may not, however, represent an *attachment* model and may have limited impact on children's functioning outside the classroom.

It is potentially relevant that only one of four relationship groups identified in the first study showed a fairly stable trajectory of relationship quality. At least two conclusions can be derived from this finding. First, if as attachment theory suggests, children have a mental representation of relationships with teachers that determines any stability that exists in relationship quality, this finding suggests that the representation is open to revision across elementary school for a good portion of children when they interact with new teachers. Second, instead of being caused by the existence of an internal representation of relationships with teachers, it is also possible that stability and change in teacher-child relationship quality are determined by children's internal representation of themselves, and others derived from their attachment relationships with parents. In other words, children in the group with high and stable relationships with teachers across grades, who are the least disadvantaged in this sample, may have secure relationships with parents that allow them to adjust in school and adapt across contexts, forming good relationships with most teachers, regardless of the characteristics of the teacher and the particular classroom conditions that they encounter each year.

The use of attachment theory as a guiding framework for the study of teacher-child relationships can also be questioned when associations between teacher-child relationship quality and children's development are considered. According to attachment theory, parent-child attachment relationships are central for all children, and have a strong association with children's development of competence. However, the results of this study show that the associations between teacher-child relationship quality and children's behavioral and academic development are small in magnitude. There are, again, at least two possible explanations for this. First, it is possible that teacher-child relationships have little *additional* effect on children's development of behavior problems and academic skills above and beyond children's own characteristics and the influences that have shaped them prior to school entry. Second, it is possible that the associations are small in magnitude because relationships with teachers are not relevant for all children but only for a subset of them. Specifically, children in the three groups with changing levels of relationship quality across elementary school may benefit (or suffer) more from relationships with teachers, because they come from more disadvantaged households, with lower maternal sensitivity and a poorer quality home environment. Either of these two explanations suggest that teacher-child relationships are fundamentally different from and less relevant for children's development than parent-child attachment relationships.

In sum, if relationships with particular teachers are not enduring, if they don't entail an internal representation that explains stability in relationship quality, and if they are not strongly associated with the development of competencies in all children, it is plausible to conclude that children form relationships with teachers that do not necessarily constitute attachment relationships. As a consequence, future research about teacher-child relationships should look beyond attachment theory as a guiding theoretical framework.

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One direction would be to incorporate ideas from other theoretical frameworks that have attempted to explain the relationships that children develop with unfamiliar children and adults (Cassidy & Berlin, 1999; Dunn, 1993; Hartup & Rubin, 1986, Weber & Harvey, 1994). For example, it has been argued that interactions with unfamiliar children and adults are rooted in the sociability (affiliative) system and not in the attachment system (Cassidy & Berlin, 1999). If this is the case, relationships with teachers could be more strongly driven by children's sociability than by their internal working models about close relationships. Furthermore, studies about children's relationships with other children have captured different dimensions central to friendship such as affection and support, connectedness, shared fantasy, self-disclosure, and control (Dunn, 1993). In the same way, relationships with teachers may be characterized by several other dimensions in addition to closeness and conflict, which may be identified by using other assessment methods such as children's reports of relationships with teachers, and observations of teacher-child interactions by independent observers.

Yet another possibility would be to bring in elements from the parenting literature in an attempt to better describe and understand teacher-child relationships. Within this literature differences in child socialization are explained by the concept of parenting style which is based on two dimensions: responsiveness and demandingness (Baumrind, 1991; Maccoby & Martin, 1983). The first dimension involves warmth and care, and the second one involves firm behavioral control. Variations in these dimensions create different parenting styles that covary with children's social and academic development. Drawing from this literature, these two dimensions could be longitudinally evaluated in the classroom context to examine if changes in teaching styles are associated with children's changing competence. Extending this framework

to the classroom context could provide a better route for understanding differences in some children's development associated with interactions with teachers.

In sum, research on teacher-child relationships may benefit from incorporating ideas, constructs and methods from other theoretical frameworks beyond attachment theory. By doing so, future studies may represent a step forward in answering several questions concerning the nature and relevance of teacher-child relationships that have not been answered by studies from an attachment perspective (Davis, 2003). For example, future studies could identify additional dimensions to describe relationships between teachers and older students; provide evidence about characteristics of children and teachers linked to the quality of teacher-child relationships; and identify subgroups of children for whom relationships with teachers begin to alter trajectories of children's academic and behavioral development.

4.2   LIMITATIONS TO THE CURRENT STUDY

Although this investigation offers strengths over existing research, it is not without its limitations. First, as is the case with previous research based on Pianta's conceptual model, this investigation approaches teacher-child relationships strictly from the teachers' viewpoint. Teacher-child relationship quality was assessed in both studies using Pianta's teacher-rated *Student-Teacher Relationship Scale,* which provides information exclusively about teachers' perceptions of closeness and conflict in their relationships with individual children. Therefore, both children's and observers' views of the relationship, as well as their perceptions of the issues they consider important when assessing the quality of interactions with teachers have been

neglected. Future studies may benefit from multi-method, multi-informant designs in which both teacher and children perceptions of what constitute a good relationship are not only considered, but compared. In doing so, future studies may reveal new features of teacher-child relationships not yet uncovered, as well as differences in expectations about the relationships that both students and teachers hold as children progress through elementary school. For example, there is some evidence to suggest that students appreciate when teachers express concern not only over their intellectual outcomes but also over their social lives, and that caring teachers are described by students as those who don't give up easily when students don't try hard, and those who are kind and teach them to be kind (Wells, 1996).

Second, although the NICHD SECC sample is diverse and includes families from a relatively wide range of socioeconomic backgrounds, it is mostly middle-class with higher household incomes and levels of maternal education than the nation's average. Furthermore, although it is an ethnically diverse sample White, non-Hispanic children are overrepresented the groups of African American, Hispanic, Asian and Native American children are relatively small. Since the NICHD SECC sample is not nationally representative, the findings of this study cannot be generalized to the entire US elementary school population, and especially, to families from disadvantaged backgrounds. This is an important limitation given the results of the first study suggesting that children from socioeconomically disadvantaged backgrounds are more likely to have teacher-child relationships of lower quality when compared to their more advantaged peers. Future studies should address this sampling bias to be able to provide more conclusive evidence about the relevance of teacher-child relationships for children from disadvantaged households.

Finally, it is important to reiterate that in spite of the many advantages of the analytic techniques on which this investigation is based, they have limitations for demonstrating a causal

association between teacher-child relationship quality and children's development of academic and behavioral competencies. As was said before, the results of the within-child analyses presented in the second study are not biased by observed or unobserved time-invariant heterogeneity between children. However, the results are susceptible to bias from unobserved characteristics of children and families that change over time, as well as by processes of reciprocal causation among teacher-child relationship quality and children's outcomes. Although the results of a few existing intervention studies (Brock et al., 2008; Battistich et al., 1997) concur with the findings of this investigation suggesting that results are not affected by these sources of bias, causal relations between teacher-child relationship quality and children's development can only be demonstrated in such kinds of research design. Therefore research and theory on relationships between teachers and students would greatly benefit from experimental designs testing if child functioning can be enhanced by improving the quality of the relationships between children and their teachers. Equally important, experimental studies should rule out alternative causal models involving children's developing behavior and competencies and teacher-child relationship quality. Based on the results of the present investigation suggesting that the relevance of teacher-child relationship quality goes beyond the early years, these studies should include the later elementary school years.

4.3 FUTURE RESEARCH DIRECTIONS

This investigation contributes to a body of research that is based entirely on U.S. samples. The only evidence that we have about the way teacher-child relationships are configured in other cultures comes from qualitative studies grounded in social constructivist approaches. Based on extensive field observations and interviews, Lewis (1995) for example, suggested that Japan's academic advantage is rooted in the way preschool and elementary schools promote social, emotional and ethical development, in addition to academic competence. Among other things, she documented evidence that making strong connections of friendship between teacher and students is a central purpose of good teaching in Japan.

Thus, there is currently no evidence to suggest that the models of teacher-child relationship quality that have been developed in the U.S. are applicable to other cultural contexts. Child learning and development is cultural by nature and most of the developmental processes and goals that we assume to be universal vary according to the contexts and cultural practices of different communities (Rogoff, 2003). Therefore, our understanding of the features of teacher-child relationships that could be beneficial for children's academic and emotional development can be strengthened by studies examining these relationships within and across other cultures.

A next step that I would like to pursue within this area of research is to examine if American theories about the nature and function of teacher-child relationships are relevant in the Latin American context, particularly in Colombia. We know that the context in which teacher-child relationships take place in Latin America is significantly different from the one observed in the United States. Compared to developed countries, Latin American nations are characterized by higher levels of inequality and political instability, and lower levels of economic development. Within the region, Colombia faces one of the most dramatic social and political

circumstances due to high levels of wealth and educational inequality and the exacerbation of an internal political conflict. Children exposed to these, often dire, circumstances represent a challenge for teachers because they bring to the classroom the consequences of their experiences at home and in the community, making effective teaching and positive interactions in the classroom difficult to attain. Furthermore, classrooms are structured differently in Colombia. Classrooms are larger than in the U.S. (typically 30-35 students per classroom), and team teachers, aides and volunteers are not available. Nevertheless, dyadic interactions among students and between teachers and students are emphasized in Colombian classrooms, where children are allowed to move around the room to interact with each other, and work in small groups. This is in contrast to American classrooms, in which students are typically expected to sit at their desk throughout the day, talk to the teacher one at a time, and to each other only when permitted by the teacher (Rogoff, 2003).

If there are cultural differences in the context in which teacher-child relationships take place, it is important to test whether ideas about teacher-child relationships that have been developed in the U.S. are relevant for the early educational experiences of children in Colombia. By conducting a follow up to the present study using longitudinal data collected across the first two years of school in Colombia, I plan to open a new arena of empirical research in Colombia, providing a first exploration of teacher-child relationships and their potential to impact children's behavioral and academic outcomes. Doing so can open new dialog among local policymakers and teachers about whether interventions aimed at enhancing teacher-child relationship quality may be an effective avenue for promoting academic success and prosocial development for a greater proportion of children in Colombia. It will also contribute to the American literature by

testing cross-cultural differences and regularities in the nature of teacher-child relationships in elementary school.

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