

Teacher-child relationship and behavior problem trajectories in elementary school

Erin O'Connor
New York University

Eric Dearing
Boston College

Brian Collins
New York University

This project was funded by Grant HD25451 from the National Institute of Child Health and Human Development (NICHD). We thank the investigators in the NICHD Early Child Care Research Network for the data set, the site coordinators and research assistants for their data collection efforts, and the children and their families for their participation in this longitudinal study.

Correspondence concerning this article should be addressed to: Erin O'Connor, Steinhardt School of Culture, Education and Human Development, 665 Broadway, Suite 805, New York, NY 10013, USA; Email: eoc2@nyu.edu

Abstract

The present study examined associations between the quality of teacher-child relationships and behavior problems among elementary school students using data from the NICHD Study of Early Child Care and Youth Development, a study of 1,364 children from birth through adolescence. There were two main findings. First, high-quality teacher-child relationships predicted low levels of externalizing behaviors. Second, high-quality relationships acted as protective factors, helping to prevent children with high levels of internalizing behaviors in early childhood from developing trajectories of long-term internalizing behavior problems. Teacher-child relationships may be proximal phenomena that can be targeted in interventions to help prevent behavior problems in middle childhood.

Key words: behavior problems, teacher-child relationships, elementary school

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Associations between externalizing and internalizing behavior problems in childhood and long-term academic and behavioral maladjustment are two of the most consistent findings in developmental psychology (e.g. Caspi, Moffitt, Newman, & Silva, 1996). Children with externalizing behavior problems, which are manifest through overactive, impulsive or aggressive behaviors, tend to be less engaged in school, to do less well academically and to develop conduct problems (Barriga, et al., 2002). Children with internalizing behavior problems, which are manifest through depressive symptoms and social withdrawal (Baker, Grant, & Morlock, 2008), tend to evidence academic underachievement and deficient problem-solving skills (Kovacs & Devlin, 1998). The consequences of behavior problems in childhood can extend into adulthood with tremendous costs to the individual and society due to educational failure, unemployment, psychiatric problems and criminality (e.g., Cohen, 1998; Foster, Dodge, & Jones, 2003; Kazdin, 1997; Nock & Kazdin, 2002; Roza, Hofstra, van der Ende, & Verhulst, 2003).

Identifying contextual factors that help to prevent chronically high levels of behavior problems is important (Keiley, Bates, Dodge, & Pettit, 2000). Given the large amounts of time children spend in school and their important role in children's socialization, schools may be a normative context in which children have the opportunity to receive supports that help prevent the development of behavior problems (Baker, et al., 2008; Bronfenbrenner, 1979). Research suggests that high-quality teacher-child relationships may be such supports. Teacher-child relationships have, in fact, been recognized as important contributors to children's socio-emotional and behavioral development. Within teacher-child relationships, children may learn or continue to use adaptive or maladaptive inter and intra-personal strategies (Silver, Measelle,

Armstrong, & Essex, 2005). Moreover, high-quality relationships scaffold for children the formation of important social and behavioral skills (Baker, 2006).

The purpose of the current study was to examine associations between the quality of teacher-child relationships and externalizing and internalizing behavior problems during the elementary school years using relational and ecological models as theoretical frameworks. Two key premises are central to relational models of development. First, relationships are instrumental to socio-emotional development as within relationships individuals learn necessary skills for interacting with others, and develop attribution biases about the self and others (Collins, 1997; Hartup, 1986). Second, characteristics of individuals influence relationships overtime such that core elements of caregiving relationships may change as children gain new skills and competencies (e.g. Hartup & Laursen, 1993).

Ecological models posit that children develop within nested systems, which act in concert to influence development (Bronfenbrenner, 1979). Pianta and Walsh's (1996) Contextual Systems Model (CSM) provides an ecological model of factors that help determine students' developmental outcomes (Hamre, Pianta, Downer, & Mashburn, 2008; Pianta & Walsh, 1996, p. 76). Systems in the CSM include the family, family-school relationship, school and child. Teacher-child relationships are at the center of the CSM, and influence children's socio-emotional and behavioral development (Pianta & Walsh, 1996). However, according to the CSM, the influences of teacher-child relationships on children's development can only be accurately estimated when they are examined within models that account for the other systems within which children develop.

A Developmental Perspective on Behavior Problems during the Elementary School Years

A growing body of research indicates that behavior problems are dynamic during early and middle childhood. To identify contexts that support children's positive socio-emotional development we must first identify normative change in behavior problems. In several studies, researchers have used variable-centered analytic methods, which focus on group trends, and identified developmental change in average levels of externalizing and internalizing problems during childhood (e.g. NICHD ECCRN, 2005a; Pianta & Caldwell, 1990; Pianta & Castaldi, 1989; Silver, et al., 2005). In general, studies have reported decreases in average levels of externalizing behaviors and stability in internalizing behaviors (e.g. Garber & Hilsman, 1992; Keiley, Bates, Dodge, & Pettit, 2000; Rutter, 1986).

More recently, researchers have applied person-centered analytic techniques to the study of behavior problems in childhood. Person-centered analyses allow for the identification of subsets of individuals who evidence distinct developmental trajectories (Lacourse, et al., 2002). This research indicates the presence of several groups of children with varying developmental trajectories for specific types of externalizing behavior problems over the course of elementary school. The largest investigation of behavior problems using person-centered analyses was a six site, cross-national study of children's physical aggression in childhood (Broidy, et al., 2003). Among the majority of sites, three to four groups of children with specific trajectories for change in aggression were identified (Broidy, et al., 2003). In another study of children's aggression from 24 months through third grade, researchers identified five groups of children with specific trajectories (NICHD ECCRN, 2004). Similarly, in a study of overt antisocial behaviors among children from two to eight years of age, researchers identified four groups of children (Shaw, Lacourse, & Nagin, 2005). In all of these studies, some children evidenced consistently low-

levels of problems and others consistently elevated levels, and all groups demonstrated relative stability across levels of acting-out behaviors.

No study to date has used person-centered analytic techniques to identify groups of children with similar developmental trajectories for overall externalizing behaviors overtime. Previous research using person-centered analytic techniques to study specific subtypes of externalizing behavior problems suggests, however, that children can be placed into groups with similar levels and rates of change in externalizing behaviors overtime, and that groups will evidence a high degree of stability in relative position (Broidy, et al., 2003). No longitudinal studies of internalizing behavior problems using person-centered analytic strategies have been conducted.

The lack of research using person-centered analytic techniques to examine overall externalizing and internalizing behavior problems over the course of elementary school is a concern as it is the full array of externalizing and internalizing problems that create obstacles to learning. For example, a decrease in aggression may provide little benefit to a child if it occurs simultaneous to an increase in hyperactivity. A clearer understanding of the developmental trajectories of overall externalizing and internalizing behaviors can advance the development of interventions (Baker, 2006). If groups of children at-risk for high and/or increasing levels of behavior problems in childhood are identified, practitioners may be able to create preventive interventions that target the specific mechanisms that lead to elevated and sustained externalizing and internalizing behaviors. High-quality teacher-child relationships may be critical for such interventions.

Teacher-Child Relationships and Behavior Problems

In the CSM, teacher-child relationships are located in the school system. High-quality relationships are marked by high levels of closeness and low levels of conflict. On the other hand, low-quality relationships are characterized by low levels of closeness and high levels of conflict. High-quality relationships foster children's self-regulatory and social skill development (Pianta, 1999), and have been found to be related to lower levels of externalizing and internalizing behavior problems. Low-quality relationships, on the other hand, have been found to be associated with externalizing and internalizing behavior problems in early and middle childhood (e.g. Birch & Ladd, 1998; Henricsson & Rydell, 2004; Howes, 2000; Ladd & Burgess, 1999; Pianta & Nimetz, 1991).

Within high-quality relationships, children likely form positive working models of the social world that encourage their seeking out supportive interactions with others. Furthermore, within high-quality relationships, teachers may provide children with positive behavioral supports and teach appropriate coping skills that encourage children's development of emotion regulation skills (Doll, 1996; Howes & Hamilton, 1993; Howes, Matheson, & Hamilton, 1994; Pianta, 1997). Children may also be more motivated to engage in age appropriate behaviors when they have high-quality relationships with their teachers (Hamre & Pianta, 2001). On the other hand, a low-quality relationship may lead to teachers' attempts to control children's behavior and limit teachers' abilities to provide a supportive environment for children (Hamre & Pianta, 2001; Pianta, Steinberg, & Rollins, 1995).

The teacher-child relationship may also be an important determinant of change in behavior problems during the elementary school years. For example, in a study of children in kindergarten and first grade, relationships marked by high levels of conflict were associated with

a decrease in children's prosocial behavior and an increase in children's aggressive behavior over-time (Birch & Ladd, 1998). In another study, high levels of conflict and low levels of closeness in the kindergarten teacher-child relationship were associated with rapid increases in externalizing behavior problems from kindergarten through third grade (Silver, et al., 2005).

Our understanding of teacher-child relationships and behavior problems, however, is limited as relatively little is known regarding the nature and course of teacher-child relationships during elementary school (Baker, 2006). It would be expected, however, that teacher-child relationships would evidence predictable variation across the elementary school period due to changes in children's physical, social, emotional and cognitive development, as well as changes in the classroom environment. More specifically, the caregiving aspect of teacher-child relationships may decrease as children gain language skills, self-care competencies and self-control (Baker, 2006). Additionally, the overall quality of the relationship may decrease in the elementary school years as children's relationships with peers become more central, and as children spend less time with teachers. Changes in relationship quality may have consequences for children's socio-emotional and behavioral development. More specifically, an increase in relationship quality would be expected to support children's socio-emotional and behavioral development while a decrease would be expected to hinder positive development.

Research indicates that children's relationships with teachers are, indeed, dynamic and change in quality over-time, particularly when considering year-to-year variations in children's relationships with different teachers (Lynch & Cicchetti, 1992; Midgley, Eccles, & Feldlaufer, 1991). Results from studies using variable-centered techniques demonstrate a decline in the average quality of children's relationships with teachers across the elementary school years (Jerome, Hamre, & Pianta, in press; O'Connor, in press; O'Connor & McCartney, 2007; Pianta

& Stuhlman, 2004). However, these studies did not identify normative patterns of change, evidenced by the majority of children, over the entire course of elementary school. Research on parent-child relationships indicates normative change in relationship quality, as well as patterns of change indicative of problems in the relationship, during the elementary school years (see Bradley, et al., 2001; Collins, Harris, & Susman, 1995). Deviations from normative patterns of change in parent-child relationships are risk factors for children's socio-emotional and behavioral development. Normative patterns of change, as well as patterns reflective of problematic relationships would also be expected in the teacher-child relationship during this period. Identifying trajectories of change experienced by most children and those that are atypical and suggest dysfunction in the relationship is important for efforts aimed at sustaining children's socio-emotional adjustment through developmentally appropriate, supportive teacher-child relationships.

Previous research suggests that teacher-child relationships play an important role in children's socio-emotional and behavioral development. Few of these studies, however, have considered other factors that influence children's development. A relatively large literature indicates factors in each of the systems in the CSM associated with behavior problems. A brief review of relevant research on the family, family-school relationship, family and child systems and behavior problems follows.

The Family System

The majority of previous research linking developmental context and behavior problems has emphasized the importance of factors in the family system for children's socio-emotional and behavioral development. More specifically, associations have been identified between children's maternal attachments, family income, maternal education, amount of support and

stimulation at home and maternal depression and behavior problems. Children with insecure maternal attachments tend to evidence higher levels of externalizing and internalizing behaviors than their secure peers (Belsky & Fearon, 2002; Cicchetti & Toth, 1995; Dearing, McCartney, & Taylor, 2006; Dodge & Pettit, 2004; Evans, 2004; Greenberg, Speltz, Deklyen, & Jones, 2001; Hinshaw, 2002). Children with insecure/other maternal attachments, which are characterized by disjointed and unorganized working models of caregiving relationships, appear to demonstrate especially high levels of behavior problems (Goldberg, 1997).

Children whose families have lower incomes and/or whose mothers have fewer years of education tend to evidence higher levels of externalizing and internalizing behavior problems than their more affluent peers (Birch & Ladd, 1997; Keiley, Lofthouse, Bates, Dodge, & Pettit, 2003; Ladd, Birch, & Buhs, 1999; Nagin, 1999; Nagin & Tremblay, 2001; Pianta & Stuhlman, 2004). Additionally, children, whose parents provide them with lower levels of support and stimulation, often demonstrate higher levels of externalizing and internalizing behavior problems throughout childhood (Bradley, Corwyn, Burchinal, McAdoo, & Coll, 2001). Lastly, children whose mothers report higher levels of depression tend to show higher levels of externalizing and internalizing behaviors (e.g. Ashman, Dawson, & Panagiotides, 2008; Gross, Shaw, & Moilanen, 2008; McCartney, Owen, Booth, Clarke-Stewart, & Vandell, 2004).

The Family-School Relationship and School System

The family-school relationship, which is characterized by parental involvement and the quality of parent-school interactions, connects the family to the school system. Lower levels of parental involvement and lower quality interactions are associated with children's behavior problems (e.g. Domina, 2005). Factors in the school system, other than teacher-child relationships, are related to children's socio-emotional and behavioral development as well.

Children in less positive and emotionally supportive classrooms tend to evidence higher levels of externalizing and internalizing behaviors (NICHD ECCRN, 2003; Rimm-Kaufman, La Paro, Downer & Pianta, 2005). Additionally, teachers with lower levels of self-efficacy are more likely to report high levels of behavior problems among children in their classes (Mashburn, Hamre, Downer, & Pianta, 2006). Lastly, children in schools with higher percentages of children living below the poverty line tend to evidence higher levels of externalizing and internalizing behavior problems (Battistich, et al., 1995; Perry, Kusel, & Perry, 1988).

Child Characteristics

Factors in the child system, including gender and early behavior problems, are associated with behavior problems during the elementary school years. Boys tend to evidence higher levels of externalizing behaviors (Birch & Ladd, 1997; Bracken & Craine, 1994). Little research exists on gender and internalizing behaviors in middle childhood. In early adolescence, however, girls tend to evidence higher levels of internalizing behaviors (e.g. Fleming & Offord, 1990; Rutter, 1986; Walden & Garber, 1994).

High levels of externalizing and internalizing behaviors in early childhood appear to place children on developmental trajectories toward externalizing and internalizing behavior problems in elementary school (e.g. Campbell, Pierce, Moore, & Marakovitz, 1996; Keiley, et al., 2000b). Previous research, however, suggests that high-quality teacher-child relationships protect children at-risk for behavior problems in elementary school due to behavior problems in early childhood (Buyse, Verschueren, Doumen, Van Damme, & Maes, 2008; Hamre & Pianta, 2001; Hughes & Cavell, 1999; Silver et al., 2005).

The amount of time spent in child care prior to kindergarten and children's language abilities are associated with behavior problems as well. Children who experience 30 hours or

more per week in child care tend to show higher levels of externalizing behaviors than children in fewer hours of care (NICHD ECCRN, 2001). Lastly, children who evidence lower level language skills tend to demonstrate higher levels of externalizing and internalizing behavior problems during elementary school (Coie, Christopoulos, Terry, Dodge, & Lochman, 1989; Hamre & Pianta, 2001; Jimerson, Egeland, Sroufe, & Carlson, 2000).

The Present Study

Past research suggests that teacher-child relationships play an important role in children's socio-emotional and behavioral development. Yet, our understanding of teacher-child relationships and children's behavior problems in elementary school remains limited as previous research has been mostly cross-sectional examining associations between the quality of early teacher-child relationships and the extent of later behavior problems, and few studies have considered the multiple systems within which children develop (Howes, 2000). In the current study, relational and ecological models were applied to the study of behavior problems in elementary school to better understand the role of teacher-child relationships in children's development. The following three questions were investigated:

- 1) Do groups of children exist with distinct developmental trajectories for externalizing and internalizing behavior problems and teacher-child relationship quality from first through fifth?
- 2) Are there associations between teacher-child relationship quality and externalizing and internalizing behavior problems from first through fifth grade?

- 3) Do the effects of teacher-child relationship quality on externalizing and internalizing behavior problems in elementary school vary as a function of children's early externalizing and internalizing behaviors?

The current analyses extend the literature in at least five critical ways. First, an important issue for educators and developmentalists is the identification of children in elementary school with normative levels of externalizing and internalizing behavior problems, and those who evidence high levels of behavior problems. Second, the identification of normative patterns of change in teacher-child relationship quality in elementary school is important for efforts dedicated to supporting children's formation of developmentally-appropriate relationships. Third, to the extent that behavior problems and teacher-child relationships are dynamic developmental phenomena, examining their association overtime is likely to improve the ecological validity of research on teacher-child relationships and behavior problems. Fourth, by including variables from each of the systems in the CSM in statistical models examining associations between teacher-child relationships and behavior problems, it is possible to account for some potential omitted variable biases, and thus create a statistical model with relatively unbiased estimates of the effects of teacher-child relationships on behavior problems. Fifth, by investigating the moderating role of teacher-child relationships in associations between early behavior problems and children's behavior problems in elementary school, it is possible to identify those children who may benefit the most from preventive interventions focused on the teacher-child relationship.

Method

Participants

This study was conducted using data from the first three phases of the NICHD Study of Early Child Care and Youth Development (NICHD SECCYD), a prospective study of children from birth through adolescence. The original sample consisted of 1,364 mothers and children from ten different locations throughout the United States. Participants in the NICHD SECCYD were recruited through 1991 from 31 hospitals near the following sites: Little Rock, AR; Orange County, CA; Lawrence and Topeka, KS; Boston, MA; Philadelphia, PA; Pittsburgh, PA; Charlottesville, VA; Morganton and Hickory, NC; Seattle, WA; and Madison, WI. Potential participants were selected from 8,986 mothers giving birth during selected 24-hour sampling periods. Participants were chosen in accordance with a conditional random sampling plan that was designed to ensure that the recruited families reflected the demographic diversity (economic, educational, and ethnic) of the catchment area at each site. The demographic distribution of the entire sample is 24% ethnic minority (13% African-American, 6% Latino-American, 1.4% Asian-American and 3.4% of ethnic or racial backgrounds classified as other); 11% of the mothers did not have a high school education, and 14% were single at the birth of the child (NICHD ECCRN, 1997). The current sample consisted of 1033 children who had completed the 36-month modified Strange Situation, and were still in the study at fifth grade. At all three time points, the majority of the teachers were European-American with a masters degree and an average of 14 years of teaching experience.

In order to include all children who remained in the study at fifth grade, missing values for continuous variables were imputed using a Markov chain Monte Carlo (MCMC) method (Schafer, 1997). This was appropriate as the data were normally distributed (Graham &

Donaldson, 1993; Kellum, Rebok, Ialongo, & Mayer, 1994). The MCMC method uses simulation from a Bayesian prediction distribution. Rubin's relative efficiency calculations were used to determine the appropriate number of imputations (Rubin, 1978a, 1978b). Five imputations were performed with a burn-in period of 500. This burn-in period was used to prevent starting values for the imputation from effecting final parameter estimates (Pederson, et al., 2003). SAS PROC MIANALYZE was then used to calculate final parameter estimates (Schafer, 1997). SAS PROC MIANALYZE aggregates the results of the analyses performed on the data sets to arrive at precise parameter estimates. Descriptive statistics and multinomial logistic regression models estimated using only the original values were similar to those with the imputed values.

Overview of data collection

Participant families were seen when the children were 36 and 54 months, and in first, third and fifth grade. Mother-child attachment behaviors were observed at laboratory visits when children were 36- months old. Teacher questionnaires were completed when the children were in first, third and fifth grade, and classroom observations were conducted when the children were in first, third and fifth grade. All children in the current sample had different teachers at first, third and fifth grade.

Measures

Behavior Problems. Externalizing and internalizing behavior problems were assessed at 54 months, first, third and fifth grade using the parent version of the Child Behavior Checklist (CBCL; Achenbach, 1991). The CBCL contains 118 items that describe a broad range of child behavior problems. For each item, the respondent is asked to determine how well the item

describes the child currently or within the last 6 months: “0 (not true)”, “1 (somewhat or sometimes true)”, and “2 (very true or often true)”. Higher scores indicate more problems.

Raw scores can be converted to normalized *T* scores (based on a procedure provided by Abramowitz & Stegun, 1968) to provide a metric that is similar across ages to allow comparison of a child’s deviation from the norming sample (Achenbach, 1991). In the current study *T*-scores were used at 54 months to assess early behavior problems but raw scores were used to model change trajectories over time. Raw scores were used as in longitudinal data analyses standardized scores provide inaccurate estimates of effect as standardized scores are calculated with age-specific standard deviations. Consequently, equating scores across time is not possible with standardized scores (Singer & Willett, 2003).

Two broad band factors for externalizing and internalizing behavior problems exist in the CBCL (as outlined by Achenbach, 1992). Scores on the externalizing scale are created by summing parents’ responses to items on the Aggressive and Destructive/Delinquent Behaviors subscales, and measure the child’s antisocial and disruptive behavior. Scores on the internalizing scale are created by summing parents’ responses to items on the Withdrawn, Somatic, and Anxious/Depressed subscales, and measure the child’s social inhibition and anxiety. The CBCL is one of the most widely used measures of psychological well-being for children with well established psychometric qualifications, good test-retest reliability and concurrent and predictive validity (Achenbach, 1991).

Because teachers rated one of the key predictor variables—teacher-child relationship quality—parental ratings of behavior problems were used to avoid problems arising from shared-rater variance. Although parental ratings may not capture fully children’s behavior problems in the context of school, they likely reflect children’s behaviors across several contexts, owing to

the extensive periods of observation that parenting affords, as well as likely exchanges between teachers and parents.

Family environment

Maternal attachment. A modified Strange Situation procedure, based on recommendations by Cassidy and Marvin and the MacArthur Working Group on Attachment (1992), was used to assess attachment style at 36 months. In this procedure, designed to be moderately stressful for the child, the mother and child were invited to make themselves comfortable in a room. After three minutes, the mother was signaled to leave. The first separation lasted three minutes, unless the child was overly distressed. After a three-minute reunion, the mother left again. The second separation lasted for five minutes. The children's behaviors during the assessment were classified according to the system developed by Cassidy and Marvin and the MacArthur Working Group on Attachment (see Cassidy & Marvin, 1992).

A reliability estimate (RELTHAP) based upon repeated measures ANOVA provided an unbiased estimator of the reliability of the mean of $k=2$ measurements after taking into account differences in the raters (Winer, 1971). RELTHAP for ratings of the attachment categories was .83 indicating moderately high reliability. In the current analyses, two dummy coded variables to represent insecure and insecure/other attachment were created. Children were assigned a value of 1 for insecure if they demonstrated an insecure attachment pattern. Children were assigned a value of 1 for insecure/other if they exhibited an insecure/other attachment pattern. Secure attachment served as the comparison group, and was assigned a value of 0.

Maternal education. Level of education was obtained during interviews at time of recruitment into the study, and scored as: less than 12 = number of years in school, 12 = high school graduate or GED, 14 = some college, 16 = a bachelor's degree, 17 = some graduate

school experience, 18 = a master's degree, 19 = a law school degree and 21 = more than one master's degree or a doctoral degree.

Family income. At first, third and fifth grade, the ratio of family income-to-needs was computed by dividing total family income by the poverty threshold for the appropriate family size (U.S. Census, 1999).

Support and stimulation at home. At third and fifth grade, parental support and stimulation of children's cognitive and academic development were measured through the HOME Inventory (Caldwell & Bradley, 1984). The HOME Inventory consists of direct observation and a semi-structured interview with the mother, and is designed to measure the quality and quantity of support and stimulation available to a child at home. At third grade, the middle childhood version of the HOME was completed, and at fifth grade the early adolescent version of the HOME was completed.

The middle childhood version of the HOME consists of 59 items and includes seven subscales: Responsivity, Encouragement of Maturity, Acceptance, Learning Materials, Enrichment, Family Companionship and Physical Environment. The total score is computed as the sum of the items on the subscales with higher values denoting higher levels of child support and stimulation. The possible range of values is 0 to 59.

The early adolescent version of the HOME inventory consists of 44 items organized into 5 subscales: Physical Elements, Learning Materials, Modeling, Variety of Experiences and Acceptance and Responsivity. The total score is computed as the sum of the items on the subscales with higher values denoting higher levels of support and stimulation. The possible range of values on the early adolescent version of the HOME is 0 to 44. Values at third and fifth grade were averaged to create a mean HOME score. The HOME score at third grade was

weighted by .90 in calculation of the mean HOME score for third and fifth grade so that both HOME scores contributed equally to the average HOME score.

In the NICHD SECCYD, the items on the middle childhood and early adolescent versions of the HOME had moderately high internal reliability (Cronbach's alpha = .82 and .84 at third and fifth grades respectively). A robust body of literature indicates that HOME scores correlate with scores on other measures of family context as well as measures of children's cognitive and socio-emotional development across socio-cultural and socio-economic groups (e.g. Bradley, 1994; Bradley, Caldwell, Rock, Hamrick, & Harris, 1988; Bradley, et al., 2000; Wen-Jui, Leventhal, & Linver, 2004).

Maternal depression. Maternal reports of their own depressive symptoms were assessed at first, third, and fifth grade with the Center for Epidemiological Studies Depression scale (CES-D; Radloff, 1977). The CES-D is a short self-report form designed to measure depressive symptomatology in the general population. The CES-D includes statements that describe how people sometimes feel about themselves, and respondents are asked to circle one of four responses that best describes how they felt during the past week. The response categories range from "1 (rarely or none of the time)" to "4 (most or all of the time)". Cronbach's alphas were high at each assessment (range .88 to .91).

Family-School Relationship Variables

Family-school contact. Amount of contact between the family/parents and the school was assessed through an item from the Parent-Teacher Involvement Questionnaire-Teacher Version (PTIQ-T; Miller-Johnson, Maumary-Gremaud, & Conduct Disorders Research Group, 1995) at first, third and fifth grade. Teachers rated on a 5-point Likert scale from "1 (not at all)" to "5 (a great deal)" "how often the parent(s) volunteer(s) or visit(s) the school". Reports of family-

school contact on the PTIQ-T evidence discriminant validity and correlate with parent reports of attendance at school meetings and contact with teacher and school personnel (Conduct Problems Prevention Group, 1999; Kohl, Lengua, & McMahon, 2000; Malone & Tietjens, 2000).

Quality of parent-school interaction. The quality of parent-school interactions was measured through the 12-item Parent's Endorsement of Child's School subscale of the 26-item Parent-Teacher Involvement Questionnaire-Parent Version (PTIQ-P; Miller-Johnson, Maumary-Gremaud, & Conduct Disorders Research Group, 1995). The Parent's Endorsement of Child's School subscale assesses the extent to which parents feel comfortable at their child's school, have positive interactions with teachers and school personnel, and show positive attitudes towards their child's school. Higher scores indicate higher quality interactions between the parent and school personnel and the parent's more positive attitudes towards their child's school. The items on the scale had high internal reliability in the NICHD SECCYD study across all three time points (Cronbach's $\alpha = .89, .91,$ and $.91$ at first, third and fifth grade respectively). Subscale scores on the PTIQ-P for Endorsement of Child's School correlate positively with other parent, teacher and observational measures of quality of parent-school interactions and parent's attitudes towards their child's school (Miller-Johnson & Maumary-Gremaud, 1995).

School Characteristics

Quality of the teacher-child relationship. The fifteen item Student Teacher Relationship Scale (STRS; Pianta, 1992) was used to assess teacher perceptions of the quality of the teacher-child relationship at first, third and fifth grade. Items on the STRS were developed based on behaviors used in the classification of parent-child attachments and the Attachment Q-set (Waters & Deane, 1985), as well as through observations of teachers and children interacting in

the classroom and teachers' descriptions of children's behaviors towards them (Pianta & Nimetz, 1991).

Using a 5-point Likert scale that ranges from "1 (definitely does not apply)" to "5 (definitely applies)", teachers rate how applicable statements are to their current relationship with a particular child. Two features of the relationship are studied: closeness and conflict. The closeness subscale is an index of the amount of warmth and open communication present in the relationship (e.g. "I share an affectionate, warm relationship with this child"; α s in the NICHD SECCYD were .88, .85 and .91 at first, third and fifth grade respectively). The conflict subscale measures the extent to which the relationship is marked by antagonistic, disharmonious interactions (e.g. "This child and I always seem to be struggling with each other"; α in the NICHD SECCYD was .94 at all three time points). The overall quality of the relationship is determined by the amounts of closeness and conflict (reflected). Higher scores indicate higher quality relationships. The internal reliability for the overall score across all three time points in the NICHD SECCYD was moderately high (α =.86, .89 and .88 at first, third and fifth grade respectively). Teachers completed the STRS in the spring of each year.

The STRS evidences both convergent and discriminant validity (Pianta & Nimetz, 1991). Scores on the STRS correlate with observational measures of the quality of the teacher-child relationship (e.g., Birch & Ladd, 1997; Howes & Hamilton, 1992; Howes & Ritchie, 1999; Pianta & Nimetz, 1991). Additionally, STRS scores are associated with Attachment Q-Set ratings of teachers and students such that higher STRS scores correlate with more secure relationships (Howes & Ritchie, 1999).

Positive classroom environment. The Classroom Observation System (COS; NICHD ECCRN, 2001) was used to assess the positive emotional climate of the study child's classroom

at first, third, and fifth grade. All classroom observations occurred during the morning and began with the official start of the school day. Trained observers visited the child's classroom and observed both the classroom and the study child. Children were observed for two 44-minute cycles in first grade and eight 44-minute cycles in third and fifth grade. In each cycle observers made time-sampled recordings of discrete codes of 30-second "observe" and 30-second "record" intervals. In addition, teachers and children were observed for 5 minutes before and 10 minutes after the coding cycles.

Coders relied on these dedicated periods of observation to make global ratings of positive emotional climate using a 7-point rating scale. A rating of "1" was assigned when that code was "uncharacteristic," a "3" was assigned when the description was "minimally characteristic," a "5" was assigned when the description of the code was "very characteristic", and a "7" was assigned when the description was "extremely characteristic" of the observed classroom. A high rating for positive classroom environment denotes a classroom in which the teacher is responsive and sensitive to student needs and shows animated affect toward the children, and in which the children engage in sensitive interactions with one another.

Observers first trained on practice videotapes using a manual that gave detailed descriptions of codes and anchor points. They then attended a centralized training workshop. After the workshop, coders conducted pilot observations, and trained on one to two more videotaped cases. All observers had to pass a videotaped reliability test involving six cycles of qualitative ratings. Criteria for passing were at least an 80% match (within one scale point) on the global rating scales. All coders passed on a reliability test before being certified to conduct observations in the field. Observers each also conducted a minimum of two paired visits

scheduled randomly during the data collection period for the purposes of estimating live reliability.

The positive emotional climate scores had high reliability estimates. A reliability estimate (RELTHAP) based upon repeated measures (ANOVA) provided an unbiased estimator of the reliability of the mean of $k=2$ measurements after taking into account differences in the raters (Winer, 1971). RELTHAP for ratings of the positive classroom emotional climate were .88, .93 and .94 at first, third and fifth grade respectively. Scores on the COS correlate with observational reports of child and teacher classroom behaviors, as well as with standardized assessments of children's functioning (Love, Meckstroth, & Sprachman, 1997; NICHD ECCRN, 2002, 2003, 2005a, 2005b).

Teacher self-efficacy. At third and fifth grade, teachers completed the Teacher Self Efficacy Scale (Bandura, 1986). This questionnaire contains 21 items that measure teachers' beliefs regarding their ability to impact decision making, teach effectively, discipline effectively, and create a positive environment. Factor analysis with a varimax rotation demonstrated that the scale contains one factor that measures overall self-efficacy. In the NICHD SECCYD items had high internal reliability at third and fifth grade (Cronbach's $\alpha = .91$ and $.90$ at third and fifth grade respectively). Scores on this scale correlate with other measures of teacher self-efficacy and with observational measures of teacher behavior (Midgley, et al., 2000).

Percentage of students on free/reduced lunch. At first, third and fifth grade the percentage of students eligible for free lunch in the school was obtained through principal report.

Child characteristics

Male. Gender was dummy coded such that female was assigned a value of 0 and male a value of 1.

Hours in child care. Number of hours in non-maternal care was obtained from maternal reports at 6, 15, 24, 36 and 54 months. A variable for average number of hours in non-maternal care from 6 through 54 months was created.

Language ability. Children's language ability at first, third and fifth grade was assessed using the Picture Vocabulary subscale of the Woodcock Johnson Psycho-Educational Battery-Revised (WJR; Woodcock & Johnson, 1990). It assesses the ability to recognize or to name pictured objects, and is a measure of expressive vocabulary and oral language. Standard scores were used in the current study, with values above 100 indicating that the raw score was above the mean of similar students with whom the instrument was standardized. The items on this subscale had high internal reliability at all three time points in the NICHD SECCYD (Cronbach's $\alpha = .91$). The Picture Vocabulary subscale has excellent test-retest reliability and predictive validity regarding language ability across the lifespan (e.g. Breen, 1985). It also correlates with other measures of oral language and verbal comprehension (e.g. Breen, 1985; McGrew & Kopnick, 1993). Scores at first, third and fifth grade were averaged to create a mean language ability score.

Statistical Analyses

Initially, Nagin cluster analyses were performed to determine if children could be classified into groups based on similar developmental trajectories from first through fifth grade for externalizing and internalizing behavior problems. Nagin cluster analyses were then conducted to investigate whether children could be classified into groups based on similar trajectories for teacher-child relationship quality from first through fifth grade. Nagin cluster analysis uses a multinomial modeling strategy to identify groups of individuals based on developmental trajectories (see Nagin, 1999 for a complete description of Nagin analysis). Nagin

analysis is based on the assumption that the population consists of separate groups of individuals with distinct developmental trajectories (NICHD ECCRN, 1999).

As a first step in Nagin analysis, individual growth curves for each individual are estimated. The semi-parametric method in Nagin analysis uses a polynomial function to model the relationship between the dependent variable and age (see Nagin & Tremblay, 1999; Nagin, 1999 for a complete description). Maximum likelihood is used to estimate parameter trajectories (Shaw, Gilliom, Ingoldsby, & Nagin, 2003). Prototypic curves are then identified based on the individual curves (Nagin, 1999; NICHD ECCRN, 2005b). The group curves are chosen to represent developmental trajectories in a manner that best describes the data (NICHD ECCRN, 2005b). Parameters can vary across groups allowing for different shaped trajectories. The number of groups is determined by the Bayesian Information Criterion (BIC). A lower BIC statistic indicates a better fit. The posterior probability or the extent to which each individual's growth curve is similar to a group's prototypic growth curve is also estimated. These posterior probability estimates are used as a basis for classifying individuals into the trajectory group for which they have the highest probability of membership.

Nagin cluster analysis offers at least two advantages over other longitudinal techniques (NICHD ECCRN, 2005b). First, based on the data it selects the optimal number of groups necessary to describe various developmental trajectories (NICHD ECCRN, 2005b). Second, it does not make apriori assumptions about the shape, level and patterns of change within the population thereby providing a means to estimate these features of the trajectories from the data (NICHD ECCRN, 2005b).

In the current analyses, once the number of groups was finalized, based on comparisons of BIC statistics across numbers of groups, the order of the polynomial for the shape of each

group's trajectory (i.e., linear or quadratic) was determined. Because nonlinear functions such as logistic growth curves or higher order polynomial functions (e.g., cubic growth curves) require five or more repeated assessments, only linear and quadratic trajectories were tested (McCartney, Burchinal, & Bub, 2006). The model selection process was then conducted with an iterative, stepwise method in which the shape (i.e., linear or quadratic) of each group's trajectory was varied until parameter estimates yielded statistical significance. Model fit was also evaluated by individual's posterior probability estimates, which as previously noted, provide an indicator of how well individuals' growth curves resemble each of the identified trajectories.

The associations between each of four sets of predictor variables for the family, family-school relationship, school and child systems and behavior problem group membership were then examined in separate hierarchical multinomial logistic regression models predicting externalizing and internalizing behavior problem group membership. The family set included insecure and insecure/other maternal attachment, maternal education, family income, amount of support and stimulation at home and maternal depression. The family-school relationship set included variables for amount of family-school contact and quality of parent-school interaction. The school set included variables for quality of the teacher-child relationship, positive classroom environment, teacher self-efficacy and percentage of students on free or reduced lunch. The child set included gender, early externalizing behavior problems, early internalizing behavior problems, hours in child care prior to kindergarten and language ability. For variables for which values were available at multiple time points, an average value was used in the models as the average provides a representation of an individual's total experience over-time.

Multinomial logistic regression is appropriate for regression analyses when the dependent variable is categorical and has two or more values, in this case behavior problem trajectory group

membership. Additionally, it can be used to predict a dependent outcome on the basis of categorical predictors (such as teacher-child relationship group membership). In the case of categorical predictors, planned contrasts are used to compare estimates across levels of the dependent variable (trajectory group membership) to an omitted reference group. Interactions between each of the teacher-child relationship group membership variables and early externalizing and internalizing behavior problem variables were tested in the models predicting externalizing and internalizing behavior problem group membership. Interactions were examined to determine whether the influence of teacher-child relationship group membership varied as a function of early externalizing and internalizing behaviors. Interactions were tested in separate models to avoid problems of multicollinearity.

Results

Descriptive statistics

Descriptive statistics are located in Table 1. Means and standard deviations for continuous variables and percentages for dichotomous variables are presented. The mean value for the Woodcock Johnson test of language achievement approximated the normed mean. The distribution of attachment classifications was similar to those in a meta-analysis of attachment studies (Van Ijzendoorn, Goldberg, Kroonenberg, & Frenkel, 1992). The mean scores for mothers' ratings of children's externalizing and internalizing behaviors in early childhood on the CBCL approximated the normed mean of 50. Children tended to attend schools with relatively positive emotional environments.

Behavior Problem Groups

Separate Nagin cluster analyses for externalizing and internalizing behavior problems were performed. Models with three, four and five groups were examined based on previous work

applying Nagin analyses to the examination of problem behaviors (see Nagin & Tremblay, 1999). A zero-inflated Poisson distribution was indicated as the distribution of externalizing and internalizing scores was very skewed, and could be considered a count variable (i.e. a count of the number of behavior problems, weighted by the frequency of occurrence). Externalizing behavior problems were examined first. The BIC score was -9004 for the three-group model; -8792 for the four group model; -8710 for the five group model. Using the BIC score, a five-group model was best. The constant (intercept) parameter estimate was significant in all five groups and the linear term was significant in four of the groups. Therefore, a five-group model was selected in which one group was defined by a stable trajectory (i.e. a constant term) and four groups by a linear trajectory (i.e. a constant and a linear term). Model fit was also evaluated based on how well each child fit her/his assigned trajectory. The mean probability score for individuals in each of the trajectory groups ranged from .80 to .87 demonstrating that the model fit was good to excellent (NICHD ECCRN, 1999).

Results for externalizing behavior problems are presented in Figure 1. The groups were characterized as Very-low, Low, Moderate-low, Moderate and High. The Very-low group constituted 17% (n = 176) of the sample. Children in this group demonstrated very low levels of externalizing behaviors in first grade with a mean score of only 1.23. The children's scores decreased slightly, at a rate of approximately .19 points per year, from first through fifth grade such that by fifth grade children had a mean score of approximately 0 out of a possible 66.

The Low group constituted 27% (n=280) of the sample. Children in this group evidenced low levels of externalizing behaviors in first grade with a mean score of only 4.54. These children's scores also decreased slightly over the course of elementary school at a rate of approximately .36 points per year. The scores at all three time points for children in both the

Very-low and Low groups were slightly below or average in the norming population for the CBCL.

The Moderate-low group comprised 33% (n=339) of the sample. In first grade, children in this group demonstrated moderate levels of externalizing behaviors with a mean score of approximately 9 points, which is slightly above average in the norming population. However, these children evidenced a decline of .44 points per year in behavior problems during elementary school such that by fifth grade their scores were slightly below the mean in the norming population.

The Moderate group consisted 19% of the sample (n = 198). Children in this group demonstrated externalizing behaviors that were slightly above average in the norming population in first grade with scores of approximately 14. Despite a slight decline of .07 points per year during elementary school, these children continued to evidence scores for externalizing behaviors slightly above the norm by fifth grade. Lastly, the High group constituted 4% (n = 40) of the sample. Children in this group had scores of approximately 25, which were in the clinical range, at first grade and demonstrated no significant change in externalizing behaviors over the course of elementary school.

Internalizing behavior problems were examined next. Based on model BIC scores (i.e., -8056 for the three-group model; -7913 for the four group model; -7954 for the five group model), a four-group model was best. Inspection of the parameter estimates indicated that the constant (intercept) term was significant in all of the groups. The linear term was significant in two groups and the quadratic term was significant in one group. Therefore, a four-group model was estimated in which two groups were defined by a stable trajectory (i.e. a constant term), one group was defined by a linear trajectory (i.e. a constant and a linear term) and one group was

defined by a curvilinear trajectory (i.e. a constant, a linear and a quadratic term). Model fit was also evaluated based on how well each child fit his/her assigned trajectory. The mean probability scores for individual membership in each of the trajectory groups ranged from .80 to .91 demonstrating that the model fit was good to very good (NICHD ECCRN, 1999).

Results for internalizing behavior problems are presented in Figure 2. The groups were characterized as Very-low, Low, Moderate and High. The Very-low group constituted 31% (n = 351) of the sample. Children in this group demonstrated low levels of internalizing behaviors with scores of approximately 1.43 in first grade, and a slight non-linear change in scores of approximately .14 points year from first through fifth grade. By fifth grade these children had a mean score near 1 out of a possible 62.

The Low group was evident in approximately 43% (n = 439) of the sample. Children in this group demonstrated low levels of internalizing behavior problems with scores of approximately 4 points in first grade and a non-significant change in internalizing behaviors from first through fifth grade. In turn, the Moderate group was found in 20% (n = 204) of the sample. Children in this group demonstrated moderately high scores of approximately 8 points, which is slightly above average in the norming population, at first grade and non-significant change in behavior problems from first through fifth grade.

Lastly, the High group was found in approximately 6% (n=61) of the sample. Children in this group showed high scores for internalizing behaviors in first grade of approximately 18 points, which is substantially above average and close to clinical levels, and an increase of approximately 2 points per year. Similar to externalizing behaviors, the group analyses indicated substantial variation in patterns of change in internalizing behaviors across elementary school.

Group analyses for externalizing and internalizing behavior problems were also performed using hierarchical cluster analyses with similar results being obtained.

Teacher-Child Relationship Groups

Based on previous work applying Nagin cluster analyses to the study of teacher-child relationships over-time, three, four and five group models were examined (O'Connor & McCartney, 2007). A normal model was indicated as the distribution of teacher-child relationship scores was normal. According to the BIC score, both the five-group and four-group models were better than a three-group model (i.e., -10225 for the three-group model; -10189 for the four group model; -10188 for the five group model). However, there was only a very small difference between the BIC scores for the four- and five-group models. The four group model was therefore used for the sake of parsimony, and to retain power for subsequent analyses.

Inspection of the parameter estimates indicated that the constant and linear terms were significant in all four groups. The quadratic term was significant in two of the groups. Therefore, a four-group model was estimated in which two groups were defined by a linear pattern of change over time (i.e., constant and linear parameter estimates) and two groups by a curvilinear pattern of change (i.e., constant, linear and quadratic parameter estimates). Model fit was also evaluated based on how well each child fit his/her assigned trajectory. The mean probability scores for trajectory groups ranged from .80 to .87 indicating that the model fit was good to very good (Nagin, 1999; NICHD ECCRN, 1999).

The four resulting groups from the Nagin cluster analyses for teacher-child relationships are presented in Figure 3. The groups were characterized as Poor-worsening, Poor-improving, Strong-worsening and Strong. The Poor-worsening (n=40) group constituted 4% of the sample. Children in this group demonstrated low-quality relationships at first grade with an average score

of approximately 52 out of 75, and a linear decrease in the quality of their relationships from first through fifth grade with an average yearly decrease of 3.80 points. The Poor-improving group was evident in approximately 8% ($n = 82$) of the sample. Children in this group demonstrated low-quality relationships at first grade with an average score of approximately 53, and a linear increase of 2.25 points per year in the quality of their relationships from first through fifth grade. The Strong-worsening group represented 16% ($n = 161$) of the sample. These children evidenced high-quality relationships at first grade with an average score of approximately 63, and a curvilinear decrease in the quality of their relationships from first through fifth grade with an average change of 2.75 points per year. Lastly, the Strong group was found in 73% ($n = 750$) of the sample. Children in this group evidenced high-quality relationships at first grade with an average score of approximately 68, and a very slight curvilinear change in the quality of their relationships with an average change of approximately .50 points per year from first through fifth grade. Hierarchical cluster analyses yielded similar results.

Predictors of Externalizing Behavior Problems Group Membership

The coefficient estimates in Table 2 indicate the predictor variables that were significantly associated with externalizing behavior problem group membership (standard errors are in parentheses), with marginal effects presented. Each coefficient indicates the change in the probability that a child will be in a particular group for externalizing behavior problems given a change in the predictor variable. Very-low served as the reference group; therefore, negative coefficients demonstrate a greater likelihood of being in the Very-low group for externalizing behavior problems.

For continuous variables, marginal effects are based on a 1 standard deviation change where the value of the variable varies from 1 SD below its mean to 1 SD above. For dummy

variables, marginal effects are based on a change from 0 to 1. For teacher-child relationship group membership, indicator contrasts were used to compare categories of the dependent variable to the omitted reference trajectory group, which was Strong. Therefore, a positive coefficient for a teacher-child relationship group indicates that children in the group were more likely to be in a specific group for behavior problems than children in the Strong group.

After controlling for the effects of factors in the family, school and child systems, teacher-child relationship trajectories were associated with externalizing behavior trajectories. Children in the Strong-worsening, Poor-improving and Poor-worsening groups for teacher-child relationships were more likely than those in the Strong group to be in the Moderate-low, Moderate and High groups for externalizing behavior problems. Other factors were associated with externalizing behavior problem trajectories as well. Children who received greater levels of support and stimulation at home were less likely to be in the Low and High groups for externalizing behavior problems. Children whose mothers reported higher levels of depression were more likely to be in the Moderate-low, Moderate and High behavior problem groups. Additionally, males were more likely to be in the Moderate-low and High groups, and children with higher levels of early externalizing behaviors were more likely to be in the Low, Moderate-low, Moderate and High groups.

Predictors of Internalizing Behavior Problems Group Membership

The coefficient estimates in Table 3 demonstrate the predictor variables that were significantly associated with internalizing behavior problem group membership. Very-low served as the comparison group. Interestingly, there were no main effect associations between teacher-child relationship trajectories and internalizing problems. Associations were identified between factors in the other systems of the CSM and internalizing behaviors. Children whose mothers

reported higher levels of depression were more likely to be in the Low, Moderate and High groups. Additionally, children with higher levels of early externalizing and internalizing behavior problems were more likely to be in the Low, Moderate and High groups.

Teacher-Child Relationships as Moderators

Interactions between each of the teacher-child relationship group variables and early externalizing and internalizing behavior problems were estimated in the models predicting externalizing and internalizing behavior problem group membership. No significant interactions were found in models predicting externalizing behavior problem group membership. Three interactions between early internalizing behavior problems and teacher-child relationship group membership were significant in the model predicting internalizing behavior problem group membership, however. More specifically, significant interactions between early internalizing behaviors and membership in the Strong-worsening ($\beta = 2.54, p < .001$) and Poor-worsening ($\beta = 2.05, p < .05$) group for teacher-child relationships were found. Children with higher level internalizing behaviors in early childhood who were in the Strong-worsening and Poor-worsening groups for teacher-child relationships were more likely to be in the High than Very-low group for internalizing behavior problems than their peers in the Strong group for teacher-child relationships. Additionally, an interaction was found between early internalizing behaviors and membership in the Strong-worsening group ($\beta = .49, p < .05$) for teacher-child relationships. Children with higher levels of internalizing behaviors who were in the Strong-worsening group were more likely to be in the Moderate than Very-low group for internalizing behavior problems than their peers in the Strong group for teacher-child relationships.

In other words, the effects of internalizing behavior problems varied as a function of teacher-child relationship group membership. Children with high levels of internalizing

behaviors in early childhood who were in the Strong-worsening, Poor-improving, and Poor-worsening groups for teacher-child relationships evidenced higher levels of internalizing behaviors throughout elementary school. On the other hand, children with early internalizing behaviors who were in the strong group for teacher-child relationships evidenced levels of internalizing behaviors in fifth grade comparable to those of their peers with low levels of internalizing behaviors in early childhood. High-quality teacher-child relationships appeared to buffer children from the risks normally associated with early internalizing behavior problems.

Discussion

The overall purpose of the current study was to apply relational and ecological models to the study of behavior problems in elementary school to examine associations between teacher-child relationships and behavior problems over-time. In past research, the developmental trajectories of behavior problems and teacher-child relationships over the course of elementary school have not been investigated, and few studies of teacher-child relationships and behavior problems have considered the multiple other contexts within which children develop. More extensive studies of teacher-child relationships and behavior problems over-time have been needed, and the NICHD SECCYD data set provides a means to conduct such a study. Findings suggest that teacher-child relationships play a crucial role in children's development. Teacher-child relationships were the only factors in the school system related to behavior problems. High-quality relationships appeared to provide children with supports for their socio-emotional and behavioral development, and to disrupt associations between internalizing behavior problems in early and middle childhood.

Behavior Problem Trajectories

Using a growth curve technique, the current study identified five groups of children with developmental trajectories for externalizing behavior problems from first through fifth grade: the Very-low group, the Low group, the Moderate-low group, the Moderate group and the High group. Children in the Very-low and Low groups demonstrated below-average levels of externalizing behaviors throughout elementary school. Children in the Moderate-low and Moderate groups showed moderate levels of behavior problems, which were above average in the population on which the measure was normed, at one or more points during elementary school. Children in the High group evidenced levels of externalizing behaviors near the clinical range beginning in first grade, which remained elevated throughout elementary school. The trajectories did not cross one another indicating that even when children's externalizing behaviors change over time, their comparative ranking within the population is constant (Broidy et al., 2003; Nagin & Tremblay, 1999; Shaw, et al., 2003). The identified patterns of overall externalizing behaviors are similar to those of previous research on physical aggression, and suggest a model of socio-emotional development in which a child's generalized tendencies to partake in early disruptive behaviors influence later behavior (Broidy, et al., 2003; Nagin & Tremblay, 1999; Shaw et al., 2003).

Approximately half of the children were in the Moderate-low and Moderate groups. The majority of these children evidenced moderate levels of behavior problems in first grade that desisted during elementary school, and were below average by fifth grade. This is in contrast to research with higher risk samples in which children who demonstrated moderate levels of behavior problems in early childhood tended to show moderate to high levels of behavior problems in later elementary school (Conduct Problems Prevention Research Group, 1992). In

the current sample of children, among whom most had supportive school environments, even those children with higher-levels of behavior problems in first grade tended to have below-average levels of behavior problems by fifth grade. This finding points to the potential importance of supportive environments for children's socio-emotional and behavioral development.

A small percentage of children (5%) were in the High group. This finding is similar to that of research on physical aggression, which demonstrated that between 3 and 5% of children demonstrate clinical levels of aggression in early and middle childhood (e.g. Broidy, et al., 2003; Moffitt, Caspi, Dickson, Silva, & Stanton, 1996; NICHD ECCRN, 2004; Shaw, et al., 2003). Screening strategies that focus on children's overall externalizing behaviors in early childhood may increase predictive accuracy for all types of antisocial behaviors in later childhood (Broidy et al., 2003). Early interventions with this group of children may be especially important to help prevent their developing chronic high-levels of externalizing behaviors.

Consistent with prior research, less variability was evident among children in internalizing than externalizing behaviors. More specifically, four groups of children were identified: Very-low, Low, Moderate and High. Children in the Very-low and Low groups evidenced below average levels of internalizing behaviors throughout elementary school. Approximately, 74% of children were in the Very-low and Low groups. Children in the Moderate group demonstrated internalizing behaviors that were slightly above average throughout elementary school. Children in the High group showed levels of internalizing behaviors that were above the mean and close to clinical levels throughout elementary school. Only 6% of children were in the High group.

The relatively low and stable levels of internalizing behavior problems evidenced by the majority of children in the current sample is in-line with previous research, which found that in middle childhood children tend to evidence low and stable levels of internalizing behaviors (Keiley, et al., 2000). However, more than a quarter of children in the present study evidenced moderate or high levels of problems. This finding is important because it indicates that not all children follow the average trajectory of low-levels of internalizing behaviors in elementary school. Furthermore, children with high levels of internalizing behaviors evidenced a marked increase in internalizing symptoms over the course of elementary school. Research with adolescents indicates that internalizing problems tend to peak between 15 and 16 years of age (e.g., Broberg et al., 2001; Walker, Nishioka, Zeller, Severson, & Feil, 2000). The present study suggests that children who evidence spikes in internalizing behaviors in adolescence have similar tendencies in middle childhood. Internalizing behaviors may continue to increase in later middle childhood and early adolescence as these are challenging and stressful transition points of development. Teachers and school psychologists must be attuned to identifying children with higher levels of internalizing behaviors in early elementary school, and intervening with this group of children to prevent their evidencing extremely high levels of behavior problems in middle childhood and adolescence.

Teacher-Child Relationship Trajectories

Person-centered analytic analyses also identified subgroups of children with distinct developmental trajectories for teacher-child relationship quality from first through fifth grade. Specifically, children were in one of four groups: Poor-worsening, Poor-improving, Strong-worsening or Strong. Children in the Poor-worsening and Poor-improving groups demonstrated low-quality relationships in first grade, however, those in the Poor-improving group showed

relatively high-quality relationships by fifth grade. Children in the Strong-worsening and Strong groups both had high-quality relationships in first grade yet those in the Strong-worsening group had moderately low-quality relationships by fifth grade.

Encouragingly, the majority of children (72%) evidenced high-quality relationships with teachers in first grade and across the elementary school years. This is a noteworthy finding as research that has investigated the average quality of teacher-child relationships over the course of elementary school has demonstrated a decrease in quality. Examination of individual variation in the current sample, however, shows that the majority of children evidence high-quality relationships throughout elementary school suggesting that elementary school teachers and students continue to place an emphasis on relational aspects of interactions throughout the later elementary school years. Students may seek out positive relationships with teachers as supports as they confront additional academic and social pressures in the later elementary school years. These students high-quality relationships with teachers in later elementary school are also of note given research showing that the quality of teacher-child relationships tends to decrease rapidly in the transition to junior high school (Midgley, et al., 1991). Research is necessary to identify those aspects of the classroom and teacher-child interactions that support high-quality relationships in later elementary school but that are not present following the transition to junior high school.

Factors Associated with Behavior Problems

Teacher-child relationships were among the strongest predictors of externalizing behaviors. High-quality relationships were negatively associated with children's externalizing behavior problems throughout elementary school. Specifically, children in the Strong group for teacher-child relationships were less likely than children in the Poor-improving, Poor-worsening

and Strong-worsening groups to be in the Moderate-low, Moderate and High groups for externalizing behavior problems. In general, children in the Strong group for teacher-child relationships demonstrated extremely low-levels of externalizing behaviors during the elementary school years.

The association between teacher-child relationships was robust given the number of controls in the models, including early behavior problems. Teacher-child relationships may be one of the proximal environmental processes through which children's risk trajectories are altered (Baker, 2006). High-quality teacher-child relationships appear to provide a developmental context that supports positive socio-emotional and behavioral development while low-quality relationships appear to provide a context that hinders development. The current findings provide some empirical support for theories that within high-quality relationships children develop more positive working models of the social world and better self-regulatory skills that foster their socio-emotional and behavioral development (e.g. Doll, 1996; Howes & Hamilton, 1993; Howes, Matheson, & Hamilton, 1994; Pianta, 1997). Results also further research in developmental psychopathology as the identification of environmental factors associated with elevated levels of behavior problems has been necessary given that genetic influences tend to be relatively modest (Plomin, DeFries, McClearn, & Rutter, 1997).

Similar to previous research, the current findings also indicate associations between factors in the family and child systems and behavior problems. More specifically, support and stimulation at home, maternal depression and externalizing behaviors in early childhood were related to externalizing behavior problems in elementary school. Children who received lower levels of support and stimulation at home tended to evidence higher levels of externalizing behaviors. Additionally, children whose mothers reported greater depressive symptoms and who

had higher levels of externalizing behaviors in early childhood demonstrated higher levels of externalizing behaviors. These findings were in-line with expectations. Support and stimulation at home fosters children's development of self-regulatory skills while maternal depression interferes with mothers' abilities to provide the support and psychological resources children need to learn appropriate behavior (Shaw et al., 2003). Children with early behavior problems may not be able to garner positive exchanges with others that support normative socio-emotional growth in turn leading to acting-out behaviors (Berry & O'Connor, in press).

Various risk factors were identified for elevated levels of internalizing behavior problems as well. Children whose mothers reported higher levels of depression demonstrated higher levels of internalizing behaviors. Additionally, children with higher levels of internalizing and externalizing behaviors in early childhood evidenced higher levels of internalizing behaviors in elementary school. Early behavior problems may result in children engaging in maladaptive recursive cycles with adults and other children, which may lead to internalizing behavior problems in the elementary school years. More specifically, adults and children may limit their contact with children who evidence behavior problems leading to their alienation and withdrawal. For example, researchers have found that five-year-olds with behavior problems experience peer victimization, which in turn leads to increased internalizing behaviors in childhood (Snyder, et al., 2003).

No main effect of teacher-child relationship quality on internalizing behavior problems was identified for the sample as a whole. This finding is similar to that of previous research, which has demonstrated more robust associations between teacher-child and parent-child relationships and externalizing than internalizing behavior problems (e.g. Baker, et al., 2008, Birch & Ladd, 1998; Howes, 2000; Howes & Ritchie, 2002; Meehan, Hughes, & Cavell, 2003).

The greater direct effect of relationships on externalizing than internalizing behaviors may be attributable to the role of relationships in children's development of emotional regulation and effortful control. A relatively robust literature indicates that children who experience greater warmth in caregiving relationships are better able to deal with negative emotions, better able to take the perspective of others, to modulate internal arousal and to down-regulate when required, which is manifest predominately through lower levels of externalizing behaviors (Cummings & Davies, 1996; Gottman, Katz, & Hooven, 1997).

For children with high levels of internalizing behavior problems in early childhood, however, low-quality teacher-child relationships that declined in quality over-time, were risk factors for high levels of internalizing behavior problems in elementary school. On the other hand, high-quality teacher-child relationships were protective factors such that children with early internalizing behaviors that developed high-quality relationships with their teachers evidenced levels of internalizing behaviors in fifth grade comparable to those of their peers with low-levels of internalizing behaviors in early childhood. The influence of teacher-child relationships on internalizing behavior problems in middle childhood for those who had internalizing behavior problems in early childhood is in-line with previous research that has shown that children with socio-emotional and behavioral challenges are the most vulnerable to classroom influences (Buyse, et al., 2008; Entwisle & Alexander, 1988; Morrison & McDonald Connor, 2002; Rimm-Kaufman, et al., 2002; Rutter & Maughan, 2002).

Children with higher levels of internalizing behavior problems may be in need of emotional support to handle challenging environments in a less avoidant manner (Burgess, et al., 2006; Buyse, et al., 2008; Selman, 1987). More specifically, socially withdrawn children are less likely to take another's perspective, and tend to withdraw from others due to negative

perceptions of their own social competence (Burgess, et al., 2006; LeMare & Rubin, 1987; Rubin, Chen, McDougall, Bowker, & McKinnon, 1995; Rubin, Daniels-Beirness, & Bream, 1984). Children with internalizing behaviors are also more likely to ask an adult for help when confronted with social dilemmas (Burgess, et al., 2006; Rubin, Chen, McDougall, Bowker, & McKinnon, 1995). Children with high levels of internalizing problems who develop low-quality relationships with teachers that decrease in quality over-time may form increasingly negative beliefs about the self and their social competence, and lack adult support for social interactions (Burgess, et al., 2006; Dodge, 1993; Wichmann, Coplan, & Daniels, 2004; Zahn–Waxler, Klimes–Dougan, & Slattery, 2000). On the other hand, children with high levels of internalizing problems who develop high-quality relationships may develop more positive beliefs about the self, be less likely to attribute negative intent to others, and may be able to garner support from teachers in their interactions with peers.

Interestingly, high-quality relationships did not buffer children from the risks of early externalizing behavior problems for later behavior problems. High-quality teacher-child relationships may not have functioned as protective factors for children with early externalizing behaviors due to negative attribution biases associated with externalizing behaviors. Children with high levels of externalizing behavior problems may attribute negative intentions to teachers even within relationships rated as high-quality by the teacher. These perceived negative intentions may inhibit children from garnering support from the relationship, leading to their inability to use the teacher as a source of emotional regulation.

Future Directions

Additional work is needed to better understand associations between teacher-child relationships and behavior problems. First, these findings at best provide some indication that

there are meaningful associations between teacher-child relationships and behavior problems. It is important to consider that the direction of effects between teacher-child relationships and behavior problems is not clear. It is necessary to conduct further studies to examine in more depth the direction of effects between teacher-child relationships and behavior problems. For example, intervention studies and random control trials may begin to answer questions regarding direction of effects. Second, it is essential to examine associations between teacher-child relationships and behavior problems among higher risk samples. There are certain limitations to our findings as a result of recruitment and enrollment methods of the NICHD SECCYD. Specifically, children with disabilities, children who lived in dangerous areas, and children whose mothers did not speak English were excluded. The current sample may contain relatively few high-risk children, thus reducing the magnitude of associations between teacher-child relationships and behavior problems.

Third, it is important to examine the quality of teacher-child relationships and behavior problems using observational measures. The majority of measures in the current study were teacher and parent report. The use of teacher reports for relationship quality and maternal reports for behavior problems provided a fairly stringent control over rater bias. Furthermore, previous research has shown that teacher reports of relationship quality and that of independent observers are correlated (Howes & Ritchie, 1999). Additionally, even when teacher and observational reports of relationship quality are not highly correlated, teachers' perceptions of relationship quality influence teachers' behaviors towards students, indicating the importance of teacher-perceived relationship quality for children's development (Howes & Ritchie, 1999). The use of parent reports of behavior problems, however, may have reduced the strength of association between relationship quality and behavior problems as children may engage in different

behaviors in the classroom than in the home. Fourth, it is important to investigate associations between closeness and conflict in the teacher-child relationship and behavior problems. Studies on the effects of closeness vs. conflict in the teacher-child relationship may provide a more nuanced understanding of how relationships influence the developmental trajectories of externalizing and internalizing behavior problems. Fifth, it is critical to examine the mechanisms through which teacher-child relationships influence behavior problems.

Implications

The present study extends previous research by identifying specific factors associated with elevated levels of externalizing and internalizing behaviors in middle childhood. The results suggest that teachers can function as an intervening force for children who display early behavior problems, redirecting their developmental trajectories towards healthier outcomes (e.g. Baker, 2006; Shores, et al., 1993; Van Acker, Grant, & Henry, 1996). As such, these findings have implications for preventive intervention programs, as well as in-service and pre-service teacher education programs. Preventive intervention programs focused on high-quality teacher-child relationships for all children, and interventions focused on improving specific teacher-child relationships may help to prevent children from developing high levels of externalizing and internalizing behaviors in elementary school (e.g. Cowen, Hightower, Work, Pedro-Carroll, & Wyman, 1996; Hughes & Cavell, 1999; Pianta & Hamre, 2001). Furthermore, interventions targeted at children with early internalizing behaviors may focus on the provision of high-quality teacher-child relationships as supports to alter the internalizing behavior trajectories of at-risk children.

In regards to teacher education, the current study demonstrates the importance of fostering elementary school teachers' awareness of the role of their relationships with students in

children's socio-emotional and behavioral development, and in providing teachers with information as to how to support high-quality relationships with their students. Early-education teachers are often informed as to ways to foster high-quality relationships with students. Elementary school teachers, in comparison, are often educated as to how to foster effective instructional interactions, rather than relationships, with students (Howes & Hamilton, 1993). Results, however, demonstrate the importance of educating elementary school teachers as to how to develop high-quality relationships with students. Providing teachers with information regarding the protective role of high-quality teacher-child relationships for children with early internalizing behavior problems may be especially important in preventing these children from engaging in maladaptive recursive cycles with their teachers.

Table 1

Descriptive Statistics (n = 1033)

| | Mean (SD) | % |
|----------------------------------------------------------|----------------|-------|
| Insecure maternal attachment | | 31.30 |
| Insecure/other maternal attachment | | 7.10 |
| Maternal education | 14.45 (2.50) | |
| Family income | 3.53 (2.60) | |
| Support and stimulation at home | 43.34 (5.20) | |
| Maternal depression | 8.25 (8.31) | |
| Family-school contact | 2.51 (1.29) | |
| Quality of parent-school interaction | 3.67 (.71) | |
| Positive classroom environment | 5.18 (.64) | |
| Teacher self-efficacy | 132.98 (15.15) | |
| Percentage of students on free or reduced price lunch | .26 (.20) | |
| Male | | 49.70 |

| | |
|---------------------|----------------|
| Early externalizing | 51.72 (9.22) |
| Early internalizing | 47.23 (8.64) |
| Hours in child care | 28.68 (14.07) |
| Language ability | 101.03 (14.73) |

Table 2. *Multinomial logistic regression predicting externalizing behavior problem group membership (n = 1033)*

| | Low | Moderate-low | Moderate | High |
|---------------------------------------|----------------|----------------|---------------|-----------------|
| <u>Set 1-Family environment</u> | | | | |
| Insecure | -.57 (.25) | .34 (.27) | .13~ (.32) | -.48~ (.64) |
| Insecure/other | .17 (.51) | .32~ (.54) | .01~ (.62) | .99~ (.91) |
| Maternal Education | .01 (.06) | .01 (.07) | .11 (.08) | .39 (.16) |
| Family income | -.11 (.12) | -.20 (.14) | -.39 (.20) | -.39 (.49) |
| Support and stimulation at home | -.52* (.19) | -.36 (.20) | -.31 (.24) | -1.15* (.43) |
| Maternal depression | .04 (.15) | .50** (.15) | .41* (.17) | .59* (.26) |

Set 2-Family-school relationship

| | | | | |
|-----------------------|---------------|--------------|--------------|---------------|
| Family-school contact | -.07 (.15) | .05 (.16) | .12 (.15) | -.26 (.42) |
|-----------------------|---------------|--------------|--------------|---------------|

| | | | | |
|--------------------------------------|---------------|---------------|---------------|---------------|
| Quality of parent-school interaction | -.12 (.20) | -.10 (.21) | -.21 (.20) | -.36 (.42) |
|--------------------------------------|---------------|---------------|---------------|---------------|

Set 3-School environment

| | | | | |
|------------------|--------------|-----------------|------------------|------------------|
| Strong-worsening | .75 (.41) | 1.11** (.42) | 1.71*** (.47) | 3.49*** (.75) |
|------------------|--------------|-----------------|------------------|------------------|

| | | | | |
|----------------|--------------|----------------|----------------|-----------------|
| Poor-improving | .66 (.56) | 1.26* (.58) | 1.26* (.65) | 2.44** (.88) |
|----------------|--------------|----------------|----------------|-----------------|

| | | | | |
|----------------|----------------|-----------------|-----------------|----------------|
| Poor-worsening | 1.01 (1.22) | 2.37* (1.11) | 3.61** (.91) | 3.02* (.90) |
|----------------|----------------|-----------------|-----------------|----------------|

| | | | | |
|--------------------------------|---------------|---------------|---------------|---------------|
| Positive classroom environment | -.01 (.13) | -.04 (.14) | -.07 (.16) | -.38 (.30) |
|--------------------------------|---------------|---------------|---------------|---------------|

| | | | | |
|-----------------------|--------------|--------------|---------------|--------------|
| Teacher self-efficacy | .08 (.12) | .10 (.13) | -.05 (.15) | .05 (.29) |
|-----------------------|--------------|--------------|---------------|--------------|

| | | | | |
|-------------------------------------|-------|-------|-------|-------|
| Percentage of | .06 | -.02 | .09 | .45 |
| students on free | (.16) | (.17) | (.20) | (.29) |
| lunch | | | | |
| <u>Set 4- Child characteristics</u> | | | | |
| Male | .27 | .59* | .54 | 1.00~ |
| | (.23) | (.25) | (.30) | (.58) |
| Early externalizing | 1.24* | 2.22* | 3.40* | 5.37* |
| problems | (.18) | (.20) | (.18) | (.49) |
| Early internalizing | .03 | .04 | -.03 | -.36 |
| problems | (.14) | (.15) | (.14) | (.32) |
| Hours in child care | -.10 | -.04 | .10 | -.15 |
| | (.12) | (.13) | (.16) | (.30) |
| Language ability | .38 | .17 | .37 | -.31 |
| | (.14) | (.15) | (.18) | (.33) |

Table 3. *Multinomial logistic regression predicting internalizing behavior problem group membership (n = 1033).*

| | Low | Moderate | High |
|---------------------------------------|-----------------|----------------|-----------------|
| <u>Set 1-Family environment</u> | | | |
| Insecure | .39 (.25) | .31 (.19) | .16 (.39) |
| Insecure/other | .77 (.47) | .16 (.42) | .20 (.73) |
| Maternal education | .09 (.07) | .03 (.12) | .03 (.06) |
| Family income | -.26 (.14) | -.39 (.11) | -.63 (.31) |
| Support and stimulation at home | -.06 (.18) | .08 (.14) | -.18 (.27) |
| Maternal depression | .55*** (.13) | .30** (.11) | .79*** (.18) |

Set 2-Family-school relationship

| | | | |
|-----------------------|-------|-------|-------|
| Family-school contact | -.18 | -.04 | -.11 |
| | (.15) | (.12) | (.26) |

| | | | |
|-----------------------------------------|-------|-------|-------|
| Quality of parent-school interaction | .01 | -.01 | .01 |
| | (.18) | (.14) | (.28) |

Set 3-School environment

| | | | |
|------------------------------------------------|-------|-------|-------|
| Strong-worsening teacher-child relationship | .18 | .46 | .74 |
| | (.34) | (.25) | (.51) |

| | | | |
|----------------------------------------------|-------|-------|-------|
| Poor-improving teacher-child relationship | .31 | .14 | .64 |
| | (.46) | (.35) | (.71) |

| | | | |
|----------------------------------------------|-------|-------|-------|
| Poor-worsening teacher-child relationship | 1.03 | .52 | 1.02 |
| | (.66) | (.55) | (.95) |

| | | | |
|-----------------------------------|-------|-------|-------|
| Positive classroom environment | .17 | .05 | -.14 |
| | (.13) | (.10) | (.20) |

| | | | |
|-----------------------|-------|-------|-------|
| Teacher self-efficacy | .01 | -.02 | .06 |
| | (.12) | (.09) | (.20) |

| | | | |
|-----------------------------------------|------------------|-----------------|------------------|
| Percentage of students on free lunch | -.08 (.15) | -.03 (.12) | -.40 (.23) |
| <u>Set 4- Child characteristics</u> | | | |
| Male | .68 (.24) | .49 (.18) | .91 (.39) |
| Early externalizing problems | .71*** (.14) | .53*** (.11) | 1.93*** (.23) |
| Early internalizing problems | 1.42*** (.15) | .70*** (.12) | 2.07*** (.24) |
| Hours in child care | .03 (.12) | -.01 (.09) | .09 (.19) |
| Language ability | .30 (.14) | .18 (.11) | .35 (.22) |

Figure 1.

Externalizing behavior problem group trajectories

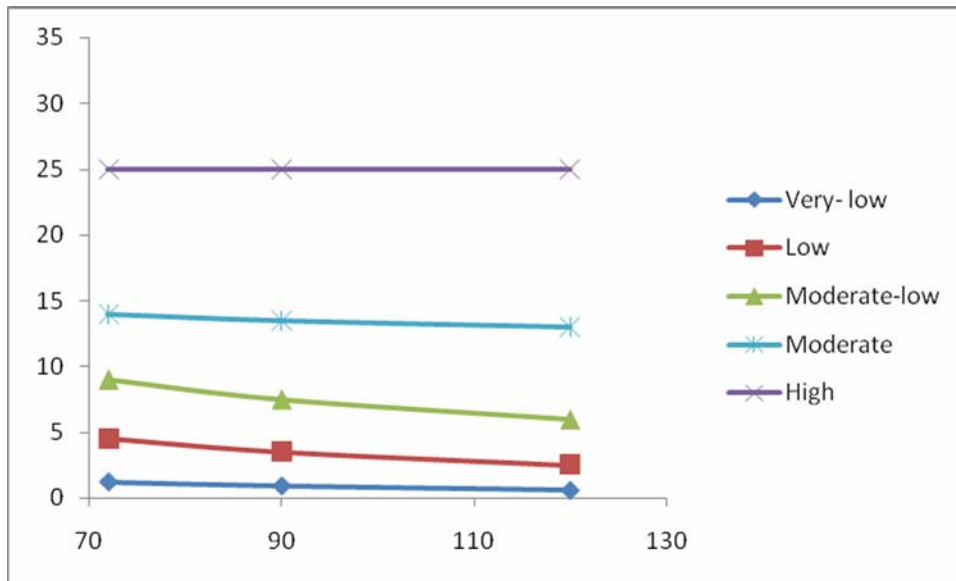


Figure 2.

Internalizing behavior problem group trajectories

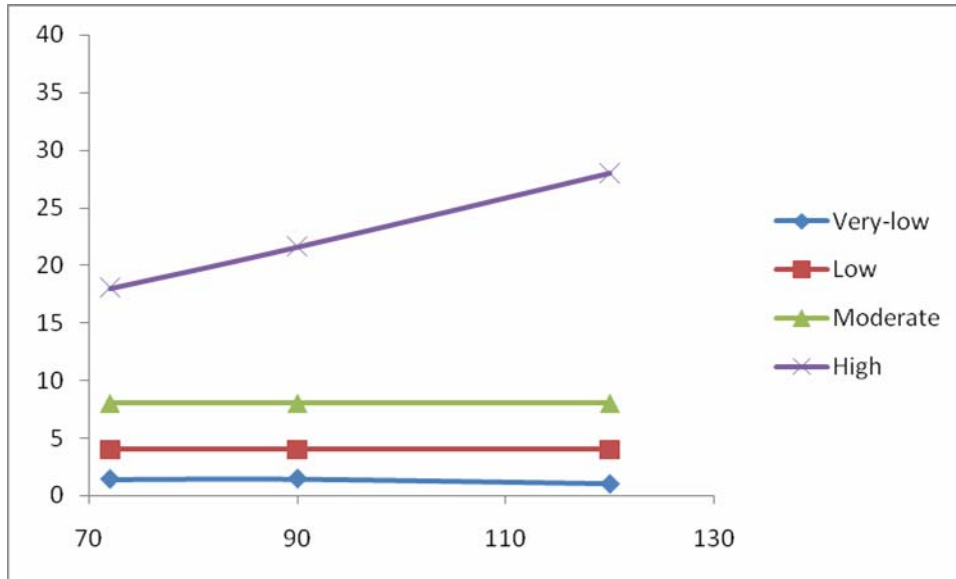
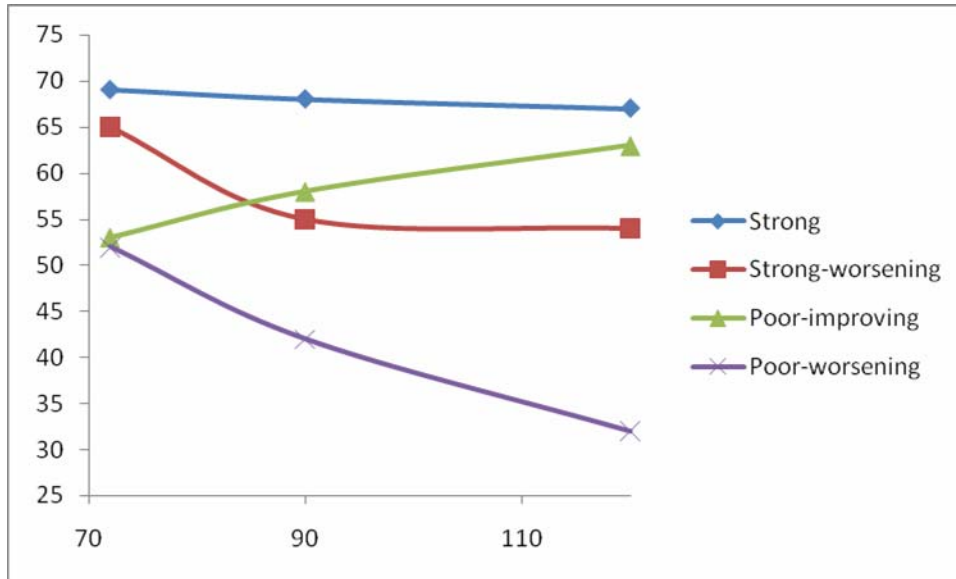


Figure 3.

Teacher-child relationship group trajectories



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