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Dynamics of Teacher-Student Relationships: Stability and Change across Elementary School and the Influence on Children's Academic Success

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Abstract

This study modeled teacher-student relationship trajectories throughout elementary school to predict gains in achievement in an ethnic-diverse sample of 657 academically at-risk students. Teacher reports of Warmth and Conflict were collected in grades 1 to 5. Achievement was tested in grade 1 and 6. For Conflict, low-stable (normative), low-increasing, high-declining, and high-stable trajectories were found. For Warmth, high-declining (normative) and low-increasing patterns were found. Children with early behavioral, academic, or social risks were under-represented in the normative trajectory groups. Chronic conflict was most strongly associated with under achievement. Rising Conflict but not declining Conflict coincided with underachievement. The probability of school failure increased as a function of the timing and length of time children were exposed to relational adversity.

Keywords

Teacher-student relationships; academic achievement; gender differences; ethnicity; growth mixture models; elementary grades

The affective bond between teachers and students has received gradually more attention in the last two decades. Supportive relationships with teachers are believed to foster students' engagement in learning activities and progress in academic achievement (Hughes, Luo, Kwok, & Loyd, 2008; Ladd, Birch, & Buhs, 1999). The majority of longitudinal studies have examined teacher-student relationship quality (TSRQ) at one point in time as a predictor of students' subsequent school adjustment. Drawing from research on peer rejection and chronic stress models, however, *continued* exposure to interpersonal adversity appears a far more powerful predictor of children's maladjustment than episodic periods of adversity (Ladd & Burgess, 2001; Ladd, Herald-Brown, & Reiser, 2008). Thus, in contrast to temporary difficulties with one teacher in a certain school year, cumulative experiences of relational troubles may have a lasting impact on children's development and academic achievement. On the other hand, in particular for at-risk students, continuous teacher support

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could counteract or neutralize risk factors, leading to lasting positive effects on children's development that cannot be attained by one or two years of a supportive relationship. Therefore, in the current study, we examined patterns of TSRQ across elementary school in order to predict achievement in middle school outcomes.

Theoretical Perspectives on Teacher-Student Relationships

The assertion that learning is a socially-mediated process is a central assumption of multiple theoretical perspectives on teacher-student relationships. The extended attachment perspective postulates that poor relationships with teachers evoke feelings of insecurity and distress, which limit children's ability to devote energy to academic and social learning activities (Pianta, 1992). According to self-system motivational theory (Connell & Wellborn, 1991), poor relationships with teachers thwart children's basic need for relatedness and diminish children's feelings of belonging at school and perceived academic competence, thereby obstructing motivational processes that drive academic achievement. Conversely, children who perceive their teacher as caring and accepting are likely to internalize academic and prosocial goals valued by their teacher (Wentzel, 1999).

In line with these perspectives, there is ample evidence from longitudinal research that TSRQ, and especially teacher-child conflict, is a significant albeit modest predictor of children's achievement even when prelevels of TSRQ and academic ability are controlled for (e.g., Hamre & Pianta, 2001; Mercer & De Rosier, 2008) Importantly, these effects seem stronger for behaviourally and academically at-risk children and ethnic minority children than for low risk children (Hughes et al., 2008; Liew, Chen, & Hughes, 2010; Ladd & Burgess, 2001; Meehan, Hughes, & Cavell, 2003; Pianta et al., 2008).

The bioecological model (Bronfenbrenner & Morris, 2006) provides a useful conceptual framework for understanding changes in TSRQ across time as well as the impact of these relationships on students' achievement (Curby, Rimm-Kaufman, & Ponitz, 2009). The bioecological model posits four properties of development: process, person, contexts, and time. Students' interactions with their teachers are proximal processes, and these recurring interactions are more predictive of growth in achievement than are more distal influences, such as teachers' level of education (Early et al., 2006). The power of proximal processes to influence development depends on person, context, and time. These other three components "constrain and influence the proximal processes that take place and, therefore, influence development indirectly" (Curby et al., 2009, p.913). When considering teacher-student relationships as proximal processes, the person component encompasses student characteristics (e.g., behavioral dispositions, IQ, and internalized models of relationships) that the student brings to the relationship. These student characteristics may contribute to stability in TSRQ across years. Context refers to characteristics of the teacher as well as broader aspects of the classroom context (e.g., number of students, social-emotional climate) that afford both opportunities and constraints on TSRQ. Changes in context are expected to contribute to changes in relationships. Indeed, studies examining stability in TSRQ have generally found moderate year-to-year stability (Hughes et al., 2008; Jerome, Hamre, & Pianta, 2008; O'Connor, 2010), indicating dynamic influences of both stable student characteristics and changing context on TSRQ. The property of "time" is particularly relevant to the current study. Processes that occur repeatedly over broader time intervals are thought to have a greater impact on development than processes that are episodic or inconsistent. Moreover, over time problems in one domain augment and spread to affect later development through cascading and transactional effects (Masten, Burt, & Coatsworth, 2006). Furthermore, the effect of a given process on development may differ at different periods of development. For example, the long-term effects of TSRQ on achievement may be stronger in the early school years than in later years (Hughes et al., 2008; Hamre &

Pianta, 2001). This finding may be due to the increasing stability of achievement beyond grade 3 (Pianta, Belsky, Vandergrift, Houts, & Morrison, 2008) or to the "carry forward" aspects of early mental representations of the teacher-student relationship. Also, with increasing years, students may decrease their dependence on support from teachers (Buhrmester & Furman, 1987). Taken together these findings underscore the need to study TSRQ over longer periods of time to understand children's progress throughout elementary school.

Change and Continuity in Teacher-Student Relationships

Recently a few studies have examined longitudinal growth trajectories for TSRQ. Average levels of overall relationship quality tend to decrease across the elementary grades (O'Connor & McCartney, 2007; O'Connor, 2010). When closeness and conflict in relationships were examined separately, a decrease in closeness and an increase in conflict were found from kindergarten to sixth grade (Jerome et al., 2008). It should be noted that most studies describe general trends in conflict and closeness, whereas there could be unidentified subgroups of children that follow different patterns. Detecting groups of children that follow atypical trajectories likely contributes to the identification of students who face increased academic risks.

O'Connor and McCartney (2007) identified subgroups of children that followed different growth trajectories for TSRQ from preschool to third grade in a sample of predominantly White children whose mothers were relatively highly educated. The majority of children evidenced high-quality relationships with teachers in preschool and experienced modest increases in TSRQ. About a quarter of the children had moderately good relationships with their teachers across grades. A suboptimal pattern was found for approximately 13% of the children. These children had poor relationships throughout early grade school and experienced declining relationship quality from year to year. This subgroup showed diminished engagement and had the lowest achievement scores at grade 3. Interestingly, children experiencing moderately positive relationships with teachers achieved equally well as children with high-quality relationships.

O'Connor and McCartney (2007) used a measure of TSRQ that aggregated closeness and conflict. Therefore, the degree of change in which dimension of relationship quality that accounts for their findings is unknown. For instance, the children with progressively poorer relationships may have shown increases in conflict but stable patterns of closeness. Furthermore, it is not known if the underachievement can be ascribed to deteriorations in closeness or conflict, or both. There is evidence that relational stressors affect school adjustment more than relational supports (Ladd et al., 1999; Hamre & Pianta, 2001). In addition, scholars debate about the differential meaning of conflict and closeness as indicators of affective relationship quality. It has been argued that conflict is a largely child-driven characteristic of the teacher-child relationship (Silver, Measelle, Armstrong, & Essex, 2005). Common findings indicate higher year-to-year stability, less between-teacher variance, and higher correlations with child characteristics such as externalizing behavior for conflict than for closeness (Jerome et al., 2008; Justice, Cottone, Mashburn, & Rimm-Kaufman, 2008). In contrast, closeness may be more a dyadic construct reflecting both the teacher and child's ability to emotionally connect with each other. Closeness appears only moderately related to child characteristics, and estimations of between-teacher variance indicate that about one-third of the variance can be attributed to context (Mashburn, Hamre, Downer, & Pianta, 2006). We therefore argue for separate analyses of closeness and conflict to understand the differential effects that those relational qualities may have on children's achievement.

Gender Differences in Teacher-Student Relationships

Gender differences in TSRQ are well documented. Relative to their relationships with girls, teachers rate their relationships with boys as higher in conflict and lower in closeness from preschool through middle school (Hamre & Pianta, 2001; Jerome et al., 2008; O'Connor, 2010; Saft & Pianta, 2001). However, relatively few studies have investigated gender differences in patterns of change in TSRQ during the elementary grades. Ewing (2009) reported stable patterns of conflict for both boys and girls. However, Jerome et al. (2008) reported that boys and girls increased in conflict from kindergarten to sixth grade at comparable rates but that boys experienced greater year-to-year stability for conflict than girls. Gender differences are also found in research of developmental trajectories of related constructs such as aggression and conduct problems. For boys, generally 3 or 4 different trajectory classes are reported including high stable, low stable, declining, and increasing patterns, whereas for girls, mostly 2 or 3 classes are found including low stable and high stable patterns in antisocial behavior but also low stable and rising patterns when relational aggression is studied (e.g., Nagin & Tremblay, 2005; Ocirc et al., 2007; Schaeffer et al., 2006).

For Closeness, both boys and girls seem to decline in teacher-reported closeness across elementary grades (Ewing, 2009; Jerome et al., 2008). In contrast to Ewing (2009), Jerome et al. (2008) reported steeper declines for boys. Comparable results are found in research on trajectories across elementary school grades for prosocial behavior, a correlate of teacher-child closeness (Ladd et al., 1999). This research has identified 2 or 3 subgroups including declining patterns for both boys and girls as well as a high stable pattern that is more characteristic of girls (Côté, Tremblay, Nagin, Zoccolillo, & Vitaro, 2002; Kokko, Tremblay, Lacourse, Nagin, & Vitaro, 2006).

Thus, in addition to consistent differences in mean levels of closeness and conflict across elementary grades, the extant literature points to gender differences in trajectories over time as well. Therefore, we explored growth trajectories in TSRQ separately for boys and girls.

We also examined the associations between growth trajectories and gains in achievement separately across gender based on two partly competing, theories that have received mixed support in the literature (Ewing, 2009; Ewing & Taylor, 2009; Hamre & Pianta, 2001). The gender socialization theory predicts that TSRQ has a stronger effect on girls' behavioral adjustment and achievement because girls are more socialized than boys to value and nurture emotionally-close relationships (Ewing & Taylor, 2009). Conversely, the vulnerability hypothesis postulates that children at risk of school failure are more affected by school experiences than low-risk children (Entwisle & Alexander, 1988; Hamre & Pianta, 2005). Because boys fare worse than girls behaviorally and academically throughout elementary school, boys are expected to be hindered more by poor TSRQ than girls (Ewing & Taylor, 2009; Hamre & Pianta, 2001).

Ethnic and Income Group Differences in Teacher –Student Relationships

The influence of race and socioeconomic background on social interactions is pervasive in an economically and racially stratified society (Alexander, Entwisle, & Thompson,1987). A substantial literature attests to the validity of this statement as it applies to interactions between teachers and students in US schools. Teachers report less affectively positive relationships with African American than with Hispanic and White students (Hamre & Pianta, 2001; Ladd et al., 1999; Wehlage & Rutter, 1986; Hughes & Kwok, 2007). Educators have explained this disparity as a result, in part, of the mis-match between the social backgrounds of the teacher workforce in US schools and that of pupils. Indeed, teacher-student race or ethnic match is associated with more positive teacher ratings of the

relationship (Murray, Murray, & Waas, 2008; Saft & Pianta, 2001; Zimmerman, Khoury, Vega, Gil, & Warheit, 1995).

The reasons for ethnic differences in relationships with teachers are not clear. African American children, relative to White students, have more behavior problems and lower levels of positive social and emotional skills at school entrance (Hudley, 1993; Matthews, Kizzie, Rowley, & Cortina, 2010), which may contribute to increased levels of teacher conflict and lower levels of teacher support. Another possibility is that teachers are more attuned to children who share their ethnic background and are, therefore, more responsive to their needs. Or perhaps teachers endorse ethnic or racial stereotypes about children which may influence their feelings toward and perceptions of students (Thijs, Westhof, & Koomen, submitted). Little or no research has examined racial and ethnic differences in trajectories of teacher-student conflict and closeness across the elementary grades. Because African American boys are at the interface of the race and gender divide in both teacher-student relationships and educational attainment (Matthews et al., 2010), they warrant special attention. A finding that African American boys are more likely than Hispanic and White students to experience chronic high conflict or increasing conflict in the elementary grades might contribute to an understanding of the slower growth in achievement from kindergarten to 5th grade for African American boys relative to African American girls as well as Hispanic and White students of both gender (Matthews et al., 2010; Sonnenschein, Stapleton, & Benson, 2010).

Current Study

In the present study, we sought to establish support for relationship patterns in both conflict and warmth across elementary school as predictors of achievement in middle school. The study extended prior work of O'Connor and McCartney (2007) in several important ways. Children's growth trajectories were examined from grade 1 to 5. We tested separate models for conflict and warmth. Also, we examined trajectories for boys and girls separately because the number and types of trajectory classes may differ for boys and girls as is seen in research on related constructs. Instead of latent class growth analysis, we analyzed growth mixture models (GMM); thus instead of assuming that "individuals within a class are treated as homogenous with respect to their development" (p.349–350; Muthén, 2004), the individual variation around the growth curve in each class was captured. Lastly, we examined relationship patterns in a sample of ethnically-diverse children who entered public school with low literacy skills. These children not only face academic risk but are also prone to have less positive relationships with teachers (Jerome et al., 2008

To afford a stringent test of TSRQ as a predictor of academic achievement, we controlled for first grade levels of achievement and IQ. Also, because externalizing behaviors are related to both TSRQ and achievement (e.g., Stipek & Miles, 2008), we controlled for baseline levels of externalizing behavior. Furthermore, we used individually administered measures of math and reading with strong psychometric properties. As non-dependency in the data could yield biased results, we accounted for the nested structure of the data. Based on previous research on growth patterns for TSRQ and related constructs, several hypotheses were formulated:

1. Moderately high year-to-year stability for conflict and modest stability for warmth were expected.
2. Based on the lack of prior research on trajectory classes for conflict, we made no prediction regarding the number of classes for boys or girls. However, based on research into antisocial behavior and aggression, we expected a small class of boys and girls who have chronically high conflict and a larger class of boys and girls

who have low-stable conflict. Based on the finding that average levels of teacher-student conflict increases across elementary school years (Jerome et al., 2008) and research on aggression, we also expected one or more increasing conflict classes. In addition, boys were expected to have higher intercept levels of conflict across trajectories than girls. Economically disadvantaged and African American children were predicted to be over-represented in the expected higher conflict trajectories. Furthermore, based on the assumption that chronic conflict is harmful, we expected the high-stable trajectory group would gain the least in achievement, whereas the low-stable group would gain the most.

3. Based on the limited research on trajectories of prosocial behavior reviewed above, and on findings that average levels of warmth decline across the elementary grades, and higher levels of warmth for girls than for boys across the elementary grades, we expected one or two declining groups for boys and girls as well as a stable-high group for girls. In addition, boys were expected to have lower intercept levels of warmth across trajectories than girls. Economically disadvantaged and African American children were predicted to be over-represented in the expected lower warmth trajectories. For boys and girls, higher trajectories for warmth were expected to gain more in achievement than lower trajectories.

4. Considering that relational stressors have stronger effects than relational supports, we predicted stronger effects of conflict than warmth on achievement.

Method

Sample, Selection, and Attrition

Participants—Participants for the current study were 657 students (46.7% girls) with below-average literacy skills in grade 1 from 35 different schools (Mean number of students per school =18.8; SD = 12.7). The ethnic composition was 39% Hispanic, 34% White Non-Hispanic, 23% African American, and 4% Other among boys and 39%, 31%, 25%, and 5%, respectively, among girls. 63% of the boys and 61% of the girls came from economically disadvantaged families. The teachers of these 657 children in grades 1–6 were predominantly women (86% to 96% across grades) and White (73% to 84%). Across grades, between 10.9% and 17% of the teachers identified themselves as Hispanic; between 2.2% and 9% of teachers described themselves as African American.

Recruitment of the sample—Participants were drawn from a larger sample of children participating in a longitudinal study examining the impact of grade retention. The research was approved by the Institutional Review Board of Texas A&M University and each school district's research advisory committee. Participants were recruited from three school districts in Texas (1 urban and 2 small city districts) across two sequential cohorts in first-grade during the fall of 2001 and 2002. Children were eligible to participate in the longitudinal study if they scored *below the median* on a state- approved, district-administered measure of literacy, spoke either English or Spanish, were not receiving special education services, and had not previously been retained in first grade. A total of 784 parents (65%) provided consent and 416 declined. Analyses of a broad array of archival variables including performance on the district-administered test of literacy, age, gender, ethnicity, eligibility for free or reduced-price lunch, bilingual class placement, cohort, and school variables did not indicate any differences between children with and without consent. More details on recruitment are reported in Hughes et al (2008).

Inclusion criteria—From the total sample, 657 (84%) children were included who met the following inclusionary criteria: a) were active in the study five years after recruitment; b)

attended public school; c) lived within 200 miles of one of the three recruitment school districts; d) had data on at least two assessments on the measure of TSRQ and data on achievement at both Time 1 (first grade) and Time 6. The mean proportion of missing values for the included children was 12.8%. Differences between the 657 included and 127 excluded children were tested using independent t-tests and chi-square difference testing ($p<.01$). No differences were found on baseline demographic or analysis variables.

Design Overview

Assessments were conducted annually for 6 years, beginning in grade 1. Teacher questionnaires of TSRQ were administered in the spring of each year at Time 1 to 5. Teachers received $25.00 for completing the questionnaires. Measures of achievement were individually administered at school at Time 1 and 6; externalizing behavior and IQ were assessed at Time 1 only.

Measures

Teacher-student relationship quality—The 22 items on the child version of the Network of Relationships Inventory (NRI; Furman & Buhrmester, 1985) were modified so that teachers reported their provision of social support (16 items; $\alpha=.95$) and conflict (6 items; $\alpha=.91$) in the relationship with the child on a 5-point scale ([1] "Not at All True"; [5] "Very True"). Example Warmth Scale items include "I enjoy being with this child" and "I find I am able to nurture this child". Example Conflict items are "This child and I often argue or get upset with each other" and "I often need to discipline this child." The teacher report NRI has demonstrated good construct and predictive validity (Meehan et al., 2003; Hughes & Kwok, 2007; Hughes et al. 2008).

Academic achievement—The *WJ-III Tests of Achievement* (Woodcock et al., 2001) is an individually administered measure of academic achievement for individuals of 2 years of age to adulthood. The WJ-III Broad Reading W Scores (Letter-Word Identification, Reading Fluency, and Passage Comprehension subtests) and the WJ-III Broad Math Age W Scores (Calculations, Math Fluency, and Math Calculation Skills subtests) were used. Extensive research documents the reliability and construct validity of scores on the WJ-III and its predecessor (Woodcock & Johnson, 1989; Woodcock, McGrew, & Mather, 2001). The *Batería Woodcock-Muñoz: Pruebas de aprovechamiento – Revisada* (Woodcock & Munoz-Sandoval, 1996) is the comparable Spanish version of the *Woodcock-Johnson Tests of Achievement—Revised* (*WJ-R*; Woodcock & Johnson, 1989), the precursor of the *WJ-III.* If children or their parents spoke any Spanish or were in bilingual classrooms, children were administered the *Woodcock- Muñoz Language Test* (Woodcock & Munoz-Sandoval, 1993) by a Spanish-English bilingual examiner to determine the child's language proficiency in English and Spanish. Based on the language in which the child exhibited greater proficiency, children were administered either the *WJ-III* (N= 172) or the *Bateria-R (N= 84)* to assess achievement. The Woodcock Compuscore (Woodcock & Munoz-Sandoval, 2001) program yields scores for the *Bateria-R* that are comparable to scores on the *WJ-R*. The Broad Reading and Broad Mathematics W Scores were used in this study. Based on the moderately high correlation between Reading and Math scores ($r = .39$ and .69 at Times 1 and 6, respectively), these scores were standardized and averaged to create an aggregated measure of achievement.

Externalizing behavior—A composite of teacher- and peer-reported antisocial behavior was used to assess Externalizing Behavior at Time 1. Teachers rated children's externalizing behaviors on the 5-item Conduct Problems Scale ($\alpha=.83$) of the Strengths and Difficulties Questionnaire (Goodman, 1997, 2001). Each item is rated on a three-point scale (0 = not true; 2 = certainly true). Example items include "often fights with other children or bullies

them" and "often loses temper." Peer reports of externalizing problems were obtained via classroom peer nomination procedures. Following procedures widely recommended in the peer assessment literature (Cillessen & Bukowski, 2000), individual interviews students were asked to nominate as few or as many classmates as they wished who fit each of several behavioral descriptors. The aggression item read: "Some kids start fights, say mean things, or hit others." Scores were standardized within classrooms. For additional detail on the sociometric procedure see Hughes et al., 2008. A composite measure was obtained by averaging the standardized scores of the peer and teacher ratings (r=.51).

Cognitive ability (IQ)—The Universal Nonverbal Intelligence Test (UNIT; Bracken & McCallum, 1998) is a nationally standardized non-verbal test of the general intelligence and cognitive abilities of children. The UNIT measures complex memory and reasoning abilities using culturally and linguistically universal hand and body gestures rather than receptive or expressive language. The Abbreviated version of the UNIT yields a full scale IQ, which is highly correlated with scores obtained with the full battery (r=.91) and has demonstrated good reliability and construct validity (Hooper, 2003; Bracken & McCallum, 1998).

Demographic variables—The schools provided information on ethnicity, gender, and eligibility for free or reduced lunch, which served as an index of SES.

Statistical Analyses

Growth mixture models (GMM) were examined using the Mplus program (Muthén & Muthén, 1998–2006). Latent trajectory classes correspond to different growth curve patterns for a dependent variable measured at multiple time points. To determine the number of classes, models estimating different k (classes) are run that are not nested within $k + 1$ class models.

For non-nested models, generally the Bayesian information criteria (BIC) value is chosen as the index for model selection because the BIC takes model uncertainty into consideration and favors parsimonious models (Raftery, 1995). There are no set cut-off criteria to guide the determination of the number of classes. Recommendations for model selection are: a) the best model fit as indicated by the smallest absolute BIC value; and b) the overall quality of class membership selection as indicated by a reasonably high entropy value (near 1.0) and posterior probabilities (near 1.0), and a reasonable total count in a class (Jung & Wickrama, 2008). These criteria were considered in combination with theoretical justification, parsimony, and interpretability.

Both linear and quadratic growth was explored but results indicated linear growth only. The nested structure of the data was taking into account using the cluster option of Mplus with TYPE=Complex routine. School was used as the cluster variable. The SAS program was used to obtain 10 imputed datasets that were analyzed simultaneously.

Results

Data were screened for outliers and normal distribution. All variables appeared fairly normally distributed (Skewness < 2; Kurtosis < 3). Table 1 presents the means, standard deviations, and correlations for all continuous variables. All correlations are in the expected directions. Higher cross-year correlations were found for Conflict than Warmth.

Warmth

One to three-class solutions were estimated successively. For boys, the two-class solution yielded the best model fit (one-class BIC = 4283; two-class BIC = 4267; three-class BIC =

4284). Classification quality was adequate as shown by the entropy (.77) and highest posterior probabilities scores (.87–.92). The large majority of boys (n=312) followed a slightly-decreasing trajectory with an intercept (I) of 4.02 and a slope (S) of −.07, $p < .05$. The second class consisted of boys (n=38) starting with relatively low levels of Warmth (I=2.69) but showing significant increases in Warmth across years (S=.14, $p < .05$). For girls, a similar two-class solution was selected (one-class BIC = 3488; two-class BIC = 3457; three-class BIC = 3467). Compared to boys, all intercept levels were higher for girls. Figure 1 presents the trajectories.

Conflict

For boys, the results suggested a four-class solution (three-class BIC = 4327; four-class BIC = 4320; five-class BIC = 4355) with an reasonable entropy (.84) and posterior probability values (.78–.93). The majority of boys (201) showed low-stable levels of Conflict (I=1.89; S=−.06, *ns*). Sixty-one boys experienced moderate levels of Conflict (I=2.38) in grade 1 followed by modest increases across grades. Though this increase did not reach conventional levels of significance (β = .18, *SE* = .129), Monte Carlo simulations indicated limited power (0.315) due to the small number of boys in this particular class. Seventy-one boys started with high levels of Conflict but evidenced substantial declines in Conflict (I=3.65; S=−.28, $p < .05$). A minority of 17 boys showed high stable patterns of Conflict (I=3.55; S=.07, *ns*). The trajectories are depicted in Figure 2.

For girls, a three-class solution was selected. The BIC of the three and four-class models were very similar (two-class BIC = 3097; three-class BIC = 3042; four-class BIC = 3041). The three-class model was chosen for reasons of parsimony and because this model showed best fit when estimated in each dataset separately. Entropy (.80) and posterior probability values were adequate (.83–.92). The majority of girls (n=212) followed a low-stable trajectory of Conflict (I=1.76; S=−.07, *ns*). Fifty-four girls started with high levels, showing however a steep decline in Conflict afterwards (I=3.21; S=−.37, $p < .05$). Forty-one girls, in contrast, started with relatively low levels of Conflict (I=1.91) but experienced increases across years. This increase did not reach conventional levels of significance (β =.201, *SE* = .226) but Monte Carlo simulations indicated that this could be attributed to limited power (0.406) due to the small number of girls in this particular class. The trajectories are depicted in Figure 2.

The differences between the boys and girls models were tested using multiple group analyses. Freely estimated models across gender showed a significant better fit than fixed models for Warmth (Δ_{BIC}=36, Δ_{df}=4, $p < .001$) and Conflict (Δ_{BIC}=248, Δ_{df}=8, $p < .001$). Thus we concluded that trajectory patterns for Warmth and Conflict differed for boys and girls.

Characteristics of Trajectory Classes

For each latent trajectory class, the descriptives of the child and family characteristics are presented in Table 2.

Warmth trajectories—Boys and girls in the high declining warmth group had lower Externalizing behavior (t_{348}=15.91, $p < .001$; t_{305}=16.63, $p < .001$, boys and girls, respectively), and higher IQ (t_{348}=2.72, $p < .01$; t_{305}=4.68, $p < .001$, boys and girls, respectively) than students in the low increasing group. The difference in socioeconomic background was marginally significant for boys only (χ^2_1=3.67, p =.06; χ^2_1=1.58, p =.21, boys and girls, respectively) .Warmth trajectory classes also differed in ethnic composition (χ^2_2=31.66, $p < .001$; χ^2_2=14.25, $p < .001$, boys and girls, respectively). African American

students were less likely than White and Hispanic students to be in the high declining warmth group.

Conflict trajectories for boys—The four conflict classes differed on Externalizing behavior ($F_{3, 346}$=261.45, $p < .001$), IQ ($F_{3, 346}$=11.58, $p < .001$), the likelihood of being economically disadvantaged (χ^2_3=59.37, $p < .001$), and ethnic membership (χ^2_6=111.56, $p < .001$). The low stable conflict class had the lowest level of Externalizing behavior, followed by the low increasing class. The high declining and high stable classes did not differ in baseline Externalizing behavior. With respect to IQ, children in the low stable and high stable classes had higher IQ than did children in the low increasing and high declining classes, which did not differ from each other. A higher percentage of economically disadvantaged children were in the low increasing and high declining classes relative to the low stable class, which had a higher percentage of economically disadvantaged children than the high stable class. African American children were over-represented in the low increasing and high declining conflict classes. White children were over-represented in the high stable group, whereas Hispanic and African American children were under-represented in the high stable class.

Conflict trajectories for girls—The three conflict trajectory classes differed on Externalizing problems ($F_{2, 304}$=281.24, $p < .001$) and IQ ($F_{2, 304}$=14.26, $p < .001$), with the low stable class having the lowest Externalizing behaviors and highest IQ and the high declining class having the highest Externalizing behaviors and the low increasing class having the lowest IQ. Conflict trajectory classes also differed in economic disadvantaged status composition (χ^2_2=10.73, $p < .01$) as well as ethnicity (χ^2_4=42.21, $p < .001$). Economically disadvantaged and African American children were over-represented in the low increasing trajectory group.

Prediction of Achievement

Due to the restriction of the Mplus GMM routine, the target distal outcome (i.e., achievement at Time 6) could not be directly regressed on the Time 1 covariates within the same model. Therefore, Time 6 Achievement was regressed on IQ, Externalizing Behavior. and Achievement in grade 1 to obtain residual achievement scores. The residual scores were then included as distal outcomes in the class models. Thus, mean scores reported in Table 2 that are significantly below zero indicate that achievement scores are lower than expected based on Time 1 covariates, whereas scores above zero reflect outcomes higher than expected. The Fisher Least Significant Difference test ($p \leq .05$; one-tailed) was used to examine significant differences between classes.

Warmth—Boys with low-increasing levels of Warmth obtained substantially lower Achievement scores than boys following a high-declining trajectory (Table 2). Trajectory classes of Warmth did not predict girls' gains in Achievement.

Conflict—Significant differences were found between trajectory classes of Conflict on Achievement for boys and girls (Table 2). For boys, the subgroup with high-stable patterns had much lower Achievement scores than the other subgroups. Children with low-increasing trajectories performed significantly worse than the low-stable and high-declining groups. Children with high-declining patterns did not differ from children with low-stable patterns.

Discussion

Whereas the majority of research has focused on relationships in early primary school, the current study modeled *trajectories of change* in teacher-student relationship qualities

(TSRQ) throughout elementary school and the impact on the school performance of academically at-risk children in middle school. The trajectories were generally consistent with the predictions based on previous research on similar and related constructs and were predictive of academic achievement above academic and behavioral risk status of the students. Low warmth was associated with lower academic gains for boys but not girls. In addition, increases in conflict over time were significantly related to less academic growth. Worst performance was found in a small subgroup of boys with chronic conflict. Thus, in convergence with peer research and chronic stress models, and consistent with the importance of recurrent versus episodic proximal processes emphasized in bioecologocial models (Bronfenbrenner & Morris, 2006), the probability of school failure appears to increase as a function to the timing and length of time children are exposed to relational stress (Ladd et al., 2008). Furthermore, African American children, economically disadvantaged children, children with low IQ or initial behavior problems were generally more likely to be in the relationship trajectories that predicted diminished academic growth. These children appear to face increased risks of academic failure.

Relationship Trajectories throughout Elementary School

The first aim was to model growth patterns in TSRQ across elementary school. Unlike previous research, distinct trajectories for closeness and conflict were examined, and trajectory classes were modeled separately for boys and girls. As predicted, low year-to-year stability was found for warmth, which substantiates the proposition that teacher-child closeness is a dyadic construct that is related to both teacher and child characteristics (Mashburn et al., 2006; Silver et al., 2005). Yet, as seen in the trajectory results, year-to-year changes can occur within a downward or upward pattern. In line with previous research, normative levels of warmth seemed to decline somewhat as children grew older (Jerome et al., 2008; O'Connor & McCartney, 2007). This could reflect a change in classroom organization and learning goals (i.e., less emphasis on developing social emotional bonds with students) as well as a developmental pattern of children growing more independent from adult caregivers and a shift to reliance on peers for social support (Buhrmester & Furman, 1987). African American children, children with early behavior problems, and children with low IQ were more likely to experience low warmth throughout elementary school. Contrary to our expectations, these children with relatively non-warm relationships experienced slight improvement in warmth, though their levels of warmth remained moderate. This increase may reflect decreases across grades in teachers' expectations for warmth and affection as children grow more independent rather than an absolute increase in teacher-student warmth. It is also possible that these children have experienced little support from adults when they enter school but over time do learn to use the teacher as a source of support.

In accord with the proposition that conflict is largely a child-driven characteristic of TSRQ (e.g., Justice et al., 2008; Silver et al., 2005), moderately high year-to-year stability was found. As predicted, stable-low trajectories were found for the majority of boys and girls. Largely consistent with aggression research (Nagin & Tremblay, 2005), subgroups of boys and girls were detected that followed high-declining trajectories of conflict and a small minority of only boys with chronically high levels of conflict. The detection of increasing conflict trajectory classes seems to converge with the research of Jerome and colleagues (2008) that demonstrated an overall increase in conflict across elementary school. The current findings indicate, however, that increases in conflict across elementary school are not typical for all children but experienced by smaller subgroups of boys and girls only, in particular by children with a low IQ, early behavior problems, African American membership, or disadvantaged socioeconomic status. Overall, study findings revealed that trajectories of conflict are not fixed but rather that about 30% of girls and 40% of boys

experience increasing or decreasing patterns of conflict. Intriguingly, the declining and rising groups did not differ much in their risk profile in terms of socioeconomic status, IQ, and race.

The results are different in important ways from those found by O'Connor and McCartney (2007), who used an aggregated measure of closeness and conflict. We found limited evidence for improvements in relationships quality. Only smaller subgroups starting with relatively poor relationship quality showed moderate improvement. Moreover, a significant decline was observed in warmth for the majority of children. Both differences in statistical analyses, separate analyses of warmth and conflict, and across gender as well as differences in risk status, ethnic diversity, and age range of the selected sample could account for these differences.

Unlike previous research, this study examined relationship trajectories for boys and girls separately. As expected, boys evidenced lower overall mean levels of warmth and more conflict in comparison to girls, the trajectories of warmth and conflict were highly similar for boys and girls. The only difference was the high-stable trajectory of conflict that was found for boys only. Other researchers also report finding a small, high stable class of externalizing behaviors only among boys (van Lier, Vitaro, Wanner, Vuijk, & Crijnen, 2005).

Relationship Between Trajectories and Achievement

In accordance with theories that highlight learning as a socially-mediated process, it was found that growth patterns of TSRQ across elementary school predicted gains in academic achievement over a 6 year period. Though it was intended to predict achievement in middle school, it needs to be noted that 36% of the students were still in elementary school at Time 6.

Consistent with chronic stress models and peer research, worst underachievement concurred with high and stable levels of conflict for boys. These boys gained much less in achievement at Time 6 than was expected based on their IQ, baseline levels of externalizing behavior, and grade 1 achievement, and the level of underachievement appeared much larger than in the three other subgroups. Significant under-achievement was also observed for children with increasing patterns of conflict. However, declining patterns of conflict did not seem to coincide with under-achievement.

It is intriguing that children in the high-declining groups appear to escape the negative consequences of early conflict. Child and demographic differences provide some clues to understand this finding. For girls, declining levels of conflict were associated with fewer risk factors than rising levels of conflict. The decline in conflict may be associated with weak or non-existent additional risk factors or the prevalence of protective factors (e.g., relatively high SES and ethnic majority membership).

Surprisingly, boys with declining conflict had the least favorable risk profile among the four trajectory groups. These boys had the lowest IQ, highest level of externalizing behaviors, and highest likelihood of being from a poor and minority (predominantly African American) family. In contrast, boys in the chronic group have highest cognitive readiness, and almost none of the boys in this group are from poor or minority families. For these boys, early conflict with teachers may be due to an antisocial orientation to others that is the result of the combination of biological disposition and coercive parenting (Hartup, 2005). Similar to chronic aggressive boys, as they continue in school, they may continue to aggress against others, to oppose authority, and to be peer-rejected (Hartup, 2005). In contrast, boys in the high declining group seemed poorly prepared for the academic and behavioral expectations

of first grade, perhaps due to low self-regulatory skills. As their self-regulatory skills develop over time, they may experience less conflict with teachers. Furthermore, primary grade teachers may correctly attribute these children's early adjustment problems to individual, developmental differences in self-regulatory abilities rather than to antisocial intent. Because teachers are less likely to respond with harshness and more likely to provide instructional assistance when they attribute problem behaviors to ability than to hostile intent (Medway, 1979; Poulou & Norwich, 2002), boys in the high-declining conflict group may be buffered from the negative effects of early conflict on achievement.

Overall, different relationship trajectories were associated with different levels of academic growth. These associations were small to large and even very large in case of chronic conflict. The large differences between boys' trajectory groups (e.g., up to almost two standard deviations for high-stable group of boys relative to low-stable conflict group) are much larger than any previously reported effects of poor TSRQ at one time on future achievement (cf. Roorda, Koomen, Spilt, & Oort, submitted). Considering that academic achievement is highly stable from the early elementary grades forward (Entwisle & Alexander, 1988; Pianta et al., 2008), these findings indicate substantial underachievement. In addition, despite the increased stability of achievement, rising conflict was more strongly associated with students' academic skills than early conflict. This finding converges with cascade models of development that proposes that problems augment and spread as children grow older (Masten et al., 2006). In accord with research suggesting that relational stressors are stronger risk factors than absence of relational supports (Ladd et al., 1999), mostly larger effects were found for conflict. In sum, though causal inferences cannot be made based on this study, the results suggest highly deleterious effects of cumulative relational adversity on academic achievement.

Girls had overall more supportive and less conflictual relationships with teachers than boys. However, conflict seemed somewhat more detrimental to girls' than boys' achievement when we compare the rising conflict trajectories. In contrast, low achievement of boys but not girls was associated with low warmth. These findings are consistent with previous research that reports stronger effects of closeness on boys' achievement, and conflict on girls' achievement (Ewing, 2009). In line with the socialization hypothesis, Ewing (2009) reasoned that conflict is less harmful for boys than girls because interpersonal conflict may reflect stereotypical male traits as independence and power. Also, teachers are prone to reinforce gender stereotypical behavior and are more likely to respond negative to conflict with girls than boys. The finding that boys are more dependent on relational supports confirms the vulnerability hypothesis (Ewing & Taylor, 2009; Hamre & Pianta, 2001). It is not consistent, however, with the notion that girls are more socialized to seek affiliation from teachers and are therefore more hindered by lack of warmth than boys.

Racial and Ethnic Differences

As expected, African American children were under-represented in both the normative low stable conflict and high declining warmth trajectories. For African American boys only, the experience of low warmth relationships predicted lower levels of achievement at time 6, above time 1 covariates. African American boys and girls were more likely to be in the rising conflict groups, which were more strongly associated with diminished academic growth than any group except the chronic conflict group. These findings are consistent with the vulnerability hypothesis for TSRQ, given that African American children are a vulnerable population in US schools (Matthews et al., 2010; Sonnenschein, Stapleton, & Benson, 2010). The current investigation is limited in its capacity to explain the over-representation of African American children in the low increasing class. Possible explanations to be investigated in future research include a de-identification with school resulting from the effects of early academic failure on one's self-esteem (Graham, Taylor, &

Hudley, 1998; Taylor & Graham, 2007), low levels of learning related skills (Matthews et al., 2010), and ethnic or racial stereotyping by their predominantly White teachers.

Implications, Limitations, and Directions for Future Research

Importantly, the research involved a sample of ethnically-diverse children that is deemed academically at-risk due to low literacy skills in first grade. The results indicate that, for these children and especially African American children, conflictual relationships with teachers create a dual risk of academic failure. Teacher-child conflict may cause emotional distress, which constrains a child's psychological resources and energy to be devoted to learning activities (Pianta, 1992). Low-conflict relationships with teachers across elementary school thus are vital to prevent underachievement. Boys, and especially African American boys, with low literacy skills seemed to need relational support from teachers as well to secure a positive learning trajectory. Warm relationships afford children emotional security, which supports positive self views, makes them confident to face academic challenges, and promotes engagement and performance (e.g., Furrer & Skinner, 2003). In addition, a teacher may be less influenced by (harmful) racial stereotypes when he or she has an emotionally warm relationships with an African American student. Overall, the findings indicate that relationships with teachers could either narrow or enlarge the achievement gap between risk and nonrisk students (Hamre & Pianta, 2005). Therefore, it is crucially important not only to focus intervention efforts on children's academic abilities or teachers' instructional practices but also to attend to the teacher-child relationship as a key social context in which teaching and learning occurs.

Several limitations should be considered. First, caution is warranted to draw causal inferences based on this non-experimental data. Second, the results confirm the need of separate analyses of TSRQ trajectories across gender, but this reduced statistical power to detect significant differences in achievement between classes due to limited class sizes. Third, though standardized and well-validated assessment battery of achievement was employed, these tests may not align with specific curricula of each school and therefore could underestimate effects (Pianta et al., 2008). Fourth, the sample involved ethnically-diverse children with below-average literacy skills, which limits the generalizibility of the findings to other populations. Lastly, though a number of key covariates were included, there could have been other unmeasured factors that have driven the results such as attachment to parents or self-regulatory skills (cf. O'Connor & McCartney, 2007). Also, future research could consider the inclusion of externalizing child behavior as a *time-variant* covariate. Externalizing behavior and relational conflict likely influence each other in a reciprocal manner. Therefore, externalizing behavior is one mechanism by which conflict affects achievement (cf. Stipek & Miles, 2008)

It should be noted that the analytic method to identify latent trajectory classes was data-driven. Future research is needed to replicate our findings. An important step forward would be to model relationship trajectories from preschool onwards. Also, it is of primary interest to understand *why* groups of children follow atypical teacher-student relationship trajectories. Of particular importance will be identifying resiliency factors within the high declining conflict group that protect children with both demographic and child risks from continued conflict with teachers in school and diminished achievement. For example, African American boys in the high declining conflict group may be more likely to experience classroom environments that accommodate more expressive and communal learning styles (Boykin & Cunningham, 2001; Hurley, Boykin, & Allen, 2005).

In conclusion, this study was among the first to study teacher-student relationships throughout elementary school and to model latent trajectory classes in warmth and conflict across gender in an academically at-risk and ethnically-diverse sample. The results are in

line with chronic stress models and bioecological models of development that posit that teacher-student relationships are proximal processes that are significantly associated with children's long-term growth in academic achievement. The degree of underachievement manifested after a six-year period coincided with the length and timing that children were exposed to relational stress and lacked social support from primary school teachers.

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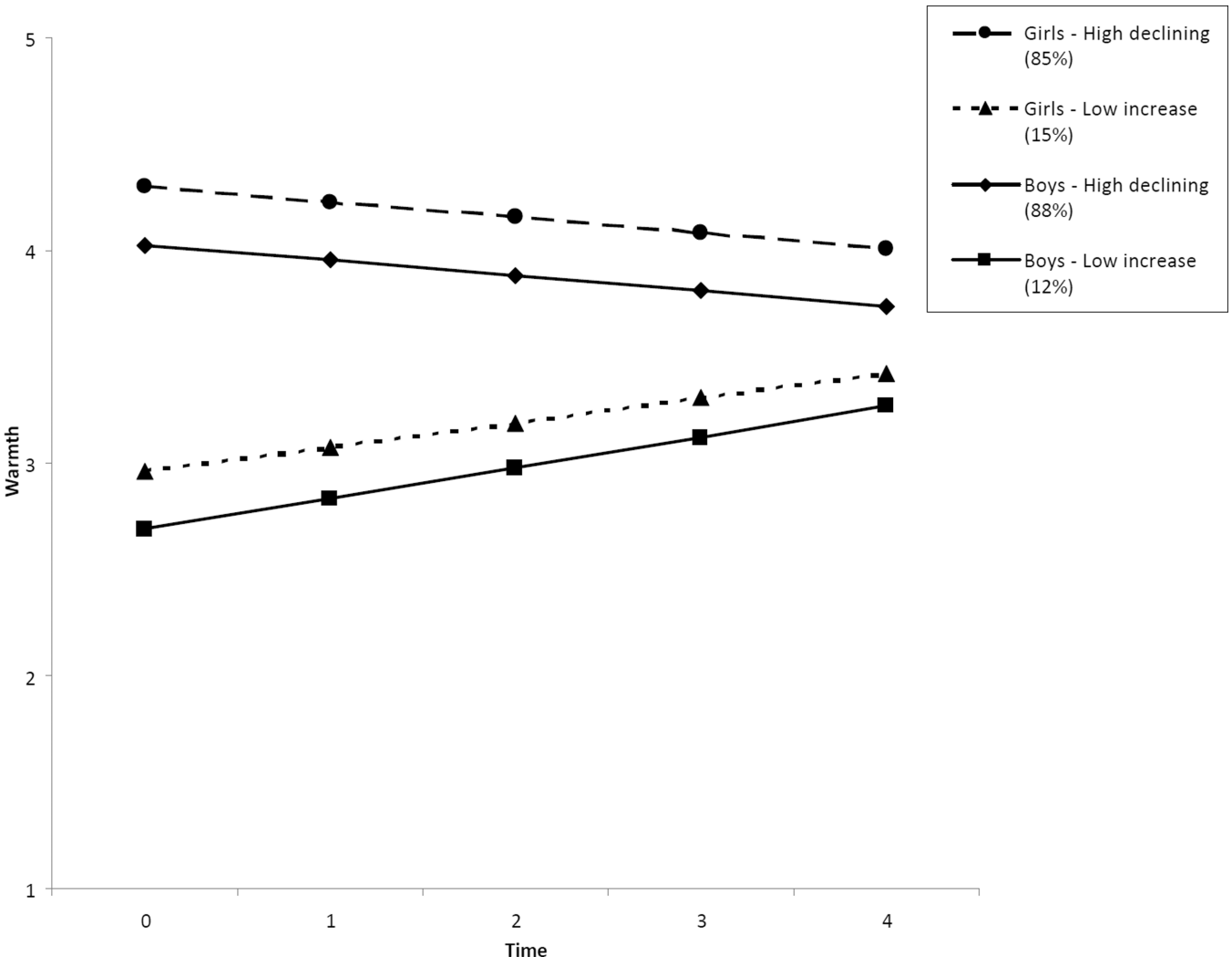

Figure 1.
Latent growth trajectory classes for Warmth

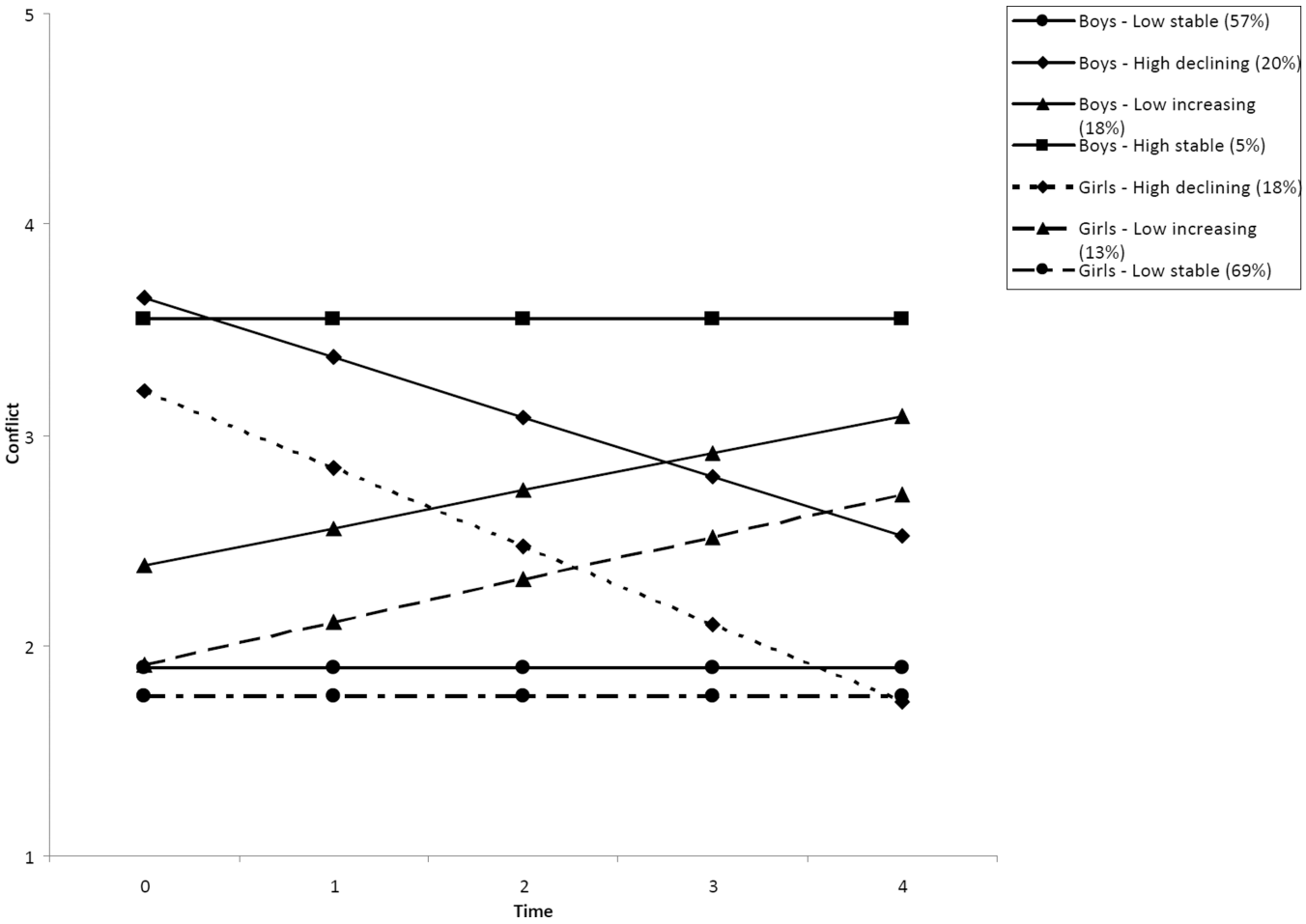

Figure 2.
Latent growth trajectory classes for Conflict

Table 1

Means, Standard Deviations, and Correlations Between Study Variables for Boys (n=350) and Girls (n=307)

															Boys	Girls
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**M (SD)**	**M(SD**
1.Warmth1	-	.46	.35	.22	.31	−.63	−.48	−.40	−.32	−.34	−.56	.21	.20	.20	3.85 (0.80)	4.10 (0.77)
2.Warmth2	.35	-	.33	.26	.21	−.32	−.66	−.36	−.41	−.34	−.38	**.09**	.25	.20	3.79 (0.85)	4.01 (0.78)
3.Warmth3	.20	.34	-	.28	.36	−.37	−.36	−.58	−.36	−.36	−.39	.18	.20	.14	3.76 (0.84)	4.02 (0.82)
4.Warmth4	.17	.27	.26	-	.30	−.24	−.26	−.34	−.50	−.31	−.21	.15	.19	**.13**	3.71 (0.89)	3.98 (0.97)
5.Warmth5	.27	.21	.28	.27	-	−.34	−.31	−.31	−.26	−.54	−.30	.16	.17	.22	3.67 (0.87)	3.90 (0.81)
6.Conflict1	−.62	−.35	−.23	−.26	−.27	-	.52	.51	.41	.46	.67	−.17	**−.08**	−.15	2.16 (1.06)	1.71 (0.85)
7.Conflict2	−.37	−.65	−.35	−.31	−.24	.57	-	.55	.50	.50	.52	−.13	−.16	−.20	2.06 (1.04)	1.70 (0.84)
8.Conflict3	−.28	−.34	−.53	−.30	−.21	.44	.51	-	.53	.49	.48	−.17	−.15	−.17	2.09 (0.95)	1.62 (0.79)
9.Conflict4	−.20	−.38	−.41	−.58	−.23	.44	.53	.58	-	.44	.42	−.15	−.19	−.21	2.02 (0.96)	1.61 (0.71)
10.Conflict5	−.25	−.29	−.32	−.40	−.56	.43	.50	.45	.53	-	.44	−.14	−.14	−.21	1.99 (0.95)	1.57 (0.75)
11.Zext1	−.49	−.35	−.30	−.23	−.28	.73	.56	.47	.48	.38	-	−.21	−.16	−.18	0.24 (0.98)	−0.22 (0.65)
12.IQ1	**.04**	**.07**	.12	**.09**	**.07**	−.16	−.16	−.18	−.13	−.13	−.18	-	.36	.38	93.4 (14.4)	91.7 (14.3)
13.Zach1	**.10**	.18	.16	.12	.13	−.13	−.15	−.22	−.14	−.15	−.21	.31	-	.56	0.00 (0.84)	0.00 (0.83)
14.Zach6	.16	.19	.17	.17	**.12**	−.24	−.21	−.20	−.23	−.26	−.26	.33	.57	-	0.00 (0.96)	0.00 (0.86)

Note 1: 1–6 = Grades 1–6; Zext = standardized score of Externalizing Behavior; Zach = standardized score of Achievement

Note 2: Correlations for boys and girls are reported below and above diagonal respectively

Note 3: All correlations are significant at $p < .05$ (two-tailed) except bold entries

Table 2

Differences Between Latent Classes

	Warmth trajectories				Conflict trajectories						
	Boys		Girls		Boys				Girls		
	High Declining	Low Increasing	High Declining	Low Increasing	Low Stable	Low Increasing	High Declining	High Stable	Low Stable	Low Increasing	High Declining
Ext	$-.13_a$	1.63_b	$-.50_a$	$.62_b$	$-.28_a$	0.46_b	1.83_c	1.12_c	-0.52_a	0.51_b	0.84_c
IQ	94.70_a	88.10_b	94.00_a	83.61_b	95.70_a	88.16_b	86.35_b	99.94_a	93.69_a	81.78_b	88.16_c
Low SES (%)	60_a	76_a	59_a	69_a	57_a	80_b	88_b	0_c	58_a	84_b	55_a
A/H/C (%)	$15/43/38_a$	$52/24/18_b$	$21/42/32_a$	$48/26/23_b$	$9/46/40_a$	$52/28/17_b$	$55/35/8_b$	$4/0/78_c$	$19/43/32_a$	$66/21/8_b$	$33/28/39_c$
Ach	0.036_a	-0.236_b	0.009_a	-0.044_a	0.078_a	-0.244_b	0.147_a	-1.814_c	0.044_a	-0.366_b	-0.061_a

Note 1. Outcomes in the same row that do not share subscripts (a/b/c) differ significantly within sex groups

Note 2. Ext=Externalizing Behavior (std), Ach=Achievement (std. residual); A=African American, H=Hispanic, C=Caucasian