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Links with children's observed interactions

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Teachers' Perceptions of Teacher–Child Relationships: Links With Children's Observed Interactions

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ABSTRACT

Research Findings: The present study examined associations between children's classroom interactions and teachers' perceptions of teacher–child relationships during 1 year of preschool. Teachers ($n = 223$) reported their perceptions of closeness and conflict in their teacher–child relationships in the fall and spring. Children's ($n = 895$) positive classroom interactions with teachers, peers, and learning activities and their negative interactions were observed midyear. Children's positive interactions with teachers and learning activities predicted teachers' perceptions of more closeness in the spring when we accounted for fall closeness. Children's negative interactions predicted teachers' perceptions of more relational conflict in the spring when we accounted for fall conflict. Children's positive peer interactions did not predict spring closeness or conflict. Implications regarding teachers' perceptions of teacher–child relationships and children's independently observed classroom interactions are discussed. *Practice or Policy:* Findings provide empirical evidence for an aspect of Pianta, Hamre, and Stuhlman's (2003) conceptual model of teacher–child relationships. Results indicate that children's classroom interactions may be a factor related to how teachers report on their relationships with children across 1 year of preschool. Findings point to links between a range of children's positive and negative interactions during typical instruction and teachers' relationship perceptions.

Teachers' reports of teacher–child relationship quality are key predictors of children's academic, social, and behavioral outcomes (Hamre & Pianta, 2001; Hughes, 2011; Roorda, Koomen, Spilt, & Oort, 2011). According to Pianta, Hamre, and Stuhlman's (2003) model, teacher–child relationships are dynamic systems composed of multiple components, including characteristics of both the teacher and the child; processes by which information is exchanged between the teacher and child, such as classroom interactions; the teacher's and the child's representational models; and the broader classroom characteristics and school environment in which the relationship occurs (Pianta, 1999). The present study examined one component of this comprehensive conceptual model of the teacher–child relationship: a child's behavioral interactions in the classroom, one process through which information is exchanged between a child and a teacher. We explored how a child's classroom interactions relate to a teacher's report of relationship quality with that child during 1 year of preschool. The frequency and quality of interactions occurring over time are conceptualized to be fundamental contributors to the quality of a teacher–child relationship, although not the sole determinants (Pianta et al., 2003). Both a teacher's direct interactions with a child and the teacher's observation of a child's interactions with his or her peers and learning activities throughout typical classroom instruction may inform the teacher's

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perception of the relationship, as reflected in his or her report on relationship quality. Over time, in part through these behavioral interactions, a teacher's perception of the relationship may be modified or may be confirmed. Previous research focused on understanding the relation between children's behavior and teacher-child relationship quality has been limited by (a) a focus on children's behavior problems and (b) a reliance on teacher reports of both relationship quality and children's behavior (e.g., Birch & Ladd, 1998; Doumen et al., 2008; Ladd & Burgess, 1999; Roorda, Verschueren, Vancraeyveldt, Van Craeyveldt, & Colpin, 2014; Zhang & Sun, 2011). To address these gaps in the literature we (a) comprehensively examined children's behavioral interactions during typical classroom instruction and (b) used independent observations of children's classroom behavioral interactions. The goals of this study were thus twofold: (a) to explore a novel research question informed by Pianta et al.'s (2003) conceptual model, that is, how a comprehensive set of children's behavioral interactions relate to teacher-child relationship quality during 1 year of preschool; and (b) to address methodological limitations of prior work, that is, the reliance on teacher report of both children's behavior and teacher-child relationship quality.

The Importance of Teachers' Perceptions of Teacher-Child Relationship Quality

As the primary adult-child relationship that children have in preschool settings, the teacher-child relationship is a central factor in children's development (Pianta et al., 2003). The preschool years represent a period of considerable development in children's social, emotional, and behavioral development as well as the beginning of an important developmental transition to formal schooling (Rimm-Kaufman & Pianta, 2000). The relationships that preschool children have with their teachers can either support or constrain their development of social skills and emotional and behavioral regulation (Pianta, 1999). Furthermore, teachers assign grades, recommend grade retention or promotion, and refer children for school services such as special education. And when teachers report negative relationships with their students, they tend to rate children's academic competence lower even when students' measured ability is controlled (Hughes, Gleason, & Zhang, 2005). Thus, teachers' reports of relationship quality with children have important implications for children's school success and academic and behavioral competence.

Indeed, the quality of teachers' relationships with children in their classroom, as measured by teachers' reports, predicts children's academic, behavioral, and social outcomes both concurrently and longitudinally (Baker, 2006; Birch & Ladd, 1997; Hamre & Pianta, 2001; Hughes, 2011; Hughes, Cavell, & Jackson, 1999; Palermo, Hanish, Martin, Fabes, & Reiser, 2007; Roorda et al., 2011). A teacher's report of conflict in his or her relationship with a child is consistently linked with maladaptive child outcomes, including escalating behavior problems, lower academic achievement, lower school liking, and more school avoidance (Birch & Ladd, 1997; Doumen et al., 2008; O'Connor & McCartney, 2007). Particularly for young children, when teachers characterize their relationship with a child as tense, negative, and conflictual, this relationship perception predicts lower academic achievement and less school engagement (Roorda et al., 2011). To a lesser extent, a teacher's report of relational closeness, characterized by warmth, connection, and openness with a particular child, has been linked to that child perceiving and demonstrating higher academic competence and to that child's greater academic school readiness and school liking (Birch & Ladd, 1997; Hughes, 2011; Hughes & Kwok, 2007; Maldonado-Carreño & Votruba-Drzal, 2011; Palermo et al., 2007). In addition, Driscoll and Pianta (2010) found that when preschool teachers participated in an intervention designed to improve teacher-child relationship quality, teachers reported both improved relationship quality (increased relational closeness) and increased child emotional and behavioral regulation (increased child frustration tolerance and task orientation and fewer child behavior problems).

The importance of teacher-child relationships is underscored by the protective influence a supportive and responsive relationship can have in the early school years for children who are at risk for poor school outcomes because of early behavior or academic problems and demographic or family characteristics (Baker, 2006; Burchinal, Peisner-Feinberg, Pianta, & Howes, 2002; Buyse, Verschueren, & Doumen, 2011; Hughes et al., 2005; Silver, Measelle, Armstrong, & Essex, 2005).

For instance, Baker (2006) found that for children with early behavioral problems, a close teacher–child relationship protected against the poor academic and school adjustment outcomes for which they were at risk. Children from families of low socioeconomic status are disproportionately at risk for early school problems, including behavior problems (Bradley & Corwyn, 2002), and have less favorable trajectories of externalizing behavior problems in the early school years than their peers from families of higher socioeconomic status (Silver et al., 2005). In the present study, we examined teachers’ reports of their relationships with preschool children during one school year in a sample of preschool children who were at risk for negative school outcomes because they came from low-income households.

Teacher–child relationship quality when measured through teacher report, as it frequently is, reflects a teacher’s view or perception of the relationship. Teachers’ reports of relationship quality are not completely aligned with other approaches measuring this relationship, such as children’s reports of relationship quality (e.g., Hughes, 2011; Murray, Murray, & Waas, 2008; Rey, Smith, Yoon, Somers, & Barnett, 2007). This discordance highlights the fact that teacher-reported relationship quality represents one perspective on the relationship as well as that relationship perceptions are complex and informed by many factors. Nonetheless, teachers’ reports of relationship quality have proven to be highly influential for children and are linked with important developmental outcomes, as outlined previously. Thus, it is essential to understand the factors associated with how teachers perceive the quality of their relationships with children.

Children’s Observed Classroom Behavioral Interactions

A considerable body of work has identified an array of child attributes that affect teachers’ reports of the teacher–child relationship, including age, gender, language abilities, and temperament (Birch & Ladd, 1998; Ewing & Taylor, 2009; Hamre, Pianta, Downer, & Mashburn, 2008; Ladd & Burgess, 1999; Murray & Murray, 2004; Nurmi, 2012; Rudasill, Rimm-Kaufman, Justice, & Pence, 2006; Saft & Pianta, 2001). Beyond the demographic attributes of children that contribute to teachers’ reports of relationship quality, the behavioral interactions a child has with a teacher on a regular basis are thought to inform that teacher’s perceptions of the relationship with that child (Pianta, 1999; Pianta et al., 2003). For instance, when children often display proximity-seeking behavior toward their teacher, participate in joint experiences, share positive affect, attend to and track their teacher, and initiate conversation with their teacher, these behavioral interactions over time are thought to contribute to teachers reporting a warm, close, affectively positive relationship. In contrast, when a child’s interactions with the teacher are frequently characterized by negative affect, disobeying the teacher, frequent attention seeking and aggressive behavior, and limited attention and behavioral control, teachers may be likely to report more relational conflict. Although a child’s interactions with a teacher are likely to be most directly linked to that teacher’s relationship perceptions, a teacher’s observations of a child interacting throughout the classroom with peers and learning activities may also contribute to the teacher’s perceptions of relationship quality. Peer and learning interactions may lead to a child’s subsequent interactions with the teacher if the teacher responds or intervenes as well as contribute to a teacher’s knowledge and beliefs about a child. As a teacher experiences a variety of direct and observed interactions throughout the classroom, the teacher’s perceptions of the relationship with that child may be reinforced or may be altered. Although these links are supported conceptually, relatively little work has examined whether in fact children’s independently observed behavior in their daily interactions with teachers, peers, and learning activities in the classroom is linked with teacher-reported relationship quality.

Researchers have often approached the question of how children’s behavior in the classroom informs teachers’ relationship perceptions by examining relations between children’s display of behavior problems in the classroom and teacher-reported relationship quality (e.g., Birch & Ladd, 1998; Doumen et al., 2008; Ladd & Burgess, 1999; Roorda et al., 2014; Zhang & Sun, 2011). Although children’s displays of behavior problems are salient predictors of teacher-reported relationship

quality (e.g., Hamre & Pianta, 2001), examining problem behaviors does not necessarily provide a comprehensive understanding of the behavioral interactions in the classroom that may contribute to how teachers perceive teacher–child relationship quality. Preliminary work using observations of children’s behavior in their daily interactions with teachers, peers, and learning activities in the classroom indicates that preschool children’s positive interactions with their teachers and their task orientation are associated with teachers’ reports of greater relational closeness in the fall of the preschool year (Downer, Booren, Lima, Luckner, & Pianta, 2010). In addition, children’s positive peer interactions and greater conflict in the classroom were associated with more teacher-reported relational conflict (Downer et al., 2010). We build on this work identifying associations between children’s classroom interactions and teachers’ reports of relationship quality by using a multilevel framework to predict teacher-reported relationship quality in the spring of the preschool year when accounting for initial (fall) relationship quality as well as for child, teacher, and classroom covariates. In addition, we extend prior work, which has focused on children’s behavior problems, by utilizing comprehensive observations of children’s behavioral exchanges with their teachers and peers as well as of their attention and behavioral control during classroom activities.

The Measurement of Teacher–Child Relationships and Children’s Behavior

Examinations of children’s classroom behavior as a predictor of teachers’ reports of relationship quality have primarily used teachers’ reports of both the relationship (outcome) and behavior (predictor; Baker, Grant, & Morlock, 2008; Birch & Ladd, 1997; Doumen et al., 2008; Ewing & Taylor, 2009; Ladd & Burgess, 1999). The frequent use of teacher report to measure multiple constructs has been a limitation of this body of research (Sabol & Pianta, 2012). Teachers’ view of children is likely to influence their reports of both relationship quality and children’s behavior, thereby introducing a problem with shared method variance. Some authors have used parent reports of behavior problems to avoid using the same rater (e.g., National Institute of Child Health and Human Development Early Child Care Research Network, 2003); however, parent reports of child behavior may not reflect the behavior that the child displays in the classroom setting. Another approach to measuring children’s behavior in the classroom is to independently observe children’s interactions during a typical school day. Naturalistic observations in the classroom can provide an assessment of children’s behavior that is relevant for teachers’ perceptions and is not confounded by teachers’ perceptions, thus providing stronger evidence of the association between children’s behavior and teachers’ perceptions of relationship quality. Yet relatively little work has examined whether in fact children’s independently observed behavior in their daily interactions with teachers, peers, and learning activities in the classroom is linked with teachers’ perceptions of their relationships with children. The present study addressed these limitations by using independent observations of children’s classroom interactions to predict teachers’ reports of teacher–child relationships during 1 year of preschool.

The Present Study

The present study addressed the following research question: To what extent do children’s observed behavioral interactions with their teacher, peers, and learning activities predict their teachers’ reports of closeness and conflict in the teacher–child relationship in the spring of the preschool year when teachers’ reports of closeness and conflict in the fall are accounted for? We hypothesized that children’s positive interactions with their teacher, learning activities, and peers would be linked with teachers’ perceptions of more closeness and less conflict. Conversely, we expected that children’s negative classroom interactions would predict teachers’ perceptions of more conflict and less closeness. This research question addressed the two aims of the present study: (a) to examine the relation between a comprehensive set of children’s behavioral interactions and teacher-reported

relationship quality and (b) to address methodological limitations of prior work by utilizing independent observations of children's behavioral interactions in the classroom.

Method

Participants and Selection

Data were collected as part of the National Center for Research on Early Childhood Education's (NCRECE) Professional Development Study, an 18-month study testing the combination of two forms of professional development aimed at improving teacher-child and instructional interactions focused on promoting children's language and literacy skills: (a) a 14-week course (Phase I); and/or (b) yearlong coaching using the MyTeachingPartner approach, which includes individualized, Web-mediated coaching (Phase II). Four groups were created by crossing the Phase I course/control groups with the Phase II coaching/control groups (course/coaching, course only, coaching only, no intervention). Before Phase I, teachers were randomized into the course or control group. After Phase I, remaining Phase I teachers and newly recruited teachers were randomized into coaching or control group conditions for Phase II. Teachers were followed with the new students in their classroom the year after their participation in the intervention phase of the Professional Development Study (Phase III). The intervention was not of interest in the present study but was controlled for in analyses with dichotomous variables for both intervention phases.

The NCRECE Professional Development Study targeted large community preschool and Head Start programs in 10 sites in eight states across the country. Teachers were eligible for participation in the study if they were the lead teacher in a classroom in which the majority of children were eligible for kindergarten the following school year. Eligible teachers also conducted instruction in English for the majority of the school day and had high-speed Internet access available for their use. Teachers were randomized to intervention and control conditions, described previously, within each site at the classroom level. Full descriptions of the intervention, study design, sample, and results can be found in Hamre et al. (2012) and Downer et al. (2013).

Participants in the present study included the teachers and children who participated in the follow-up year of the Professional Development Study (Phase III). A total of 223 teachers were eligible, agreed to participate, and had at least one child in their classroom selected to participate in Phase III. The majority of the teachers were female (92%; male = 4%, missing = 4%), and teachers had a mean age of 42.56 ($SD = 10.55$). Almost half of the teachers were African American (47%), about one third were Caucasian (33%), 12% were Hispanic, 4% were Asian, and 5% were multiracial or of another racial/ethnic background. Teachers had an average of 15.81 years of education ($SD = 1.62$). Just more than half of the teachers taught in Head Start classrooms (55%), and on average 87% of children in the classroom had an income-to-needs ratio of less than 2.0, indicating that on average classrooms contained a high percentage of children living in poverty.

During Phase III, four children, two boys and two girls when possible, were randomly selected from each classroom to participate in the study ($M = 4.01$, range = 1–6). Children were eligible to be selected if they did not have an individualized education program, if they had a primary language of English or Spanish, and if they had not been in the teacher's classroom the prior year (during Phase II); thus, children in the present study were not in their teachers' classrooms during the intervention phases. A total of 895 children (443 female) participated in Phase III of the NCRECE Professional Development Study and the present study. On average children were 4.12 years old ($SD = 0.50$ years) at the beginning of the school year. Children were ethnically diverse, with the majority of children being African American (42%) or Hispanic (35%) and the remainder Caucasian (14%), Asian (4%), or multiracial or of another race/ethnicity (5%). On average children's mothers had 12.70 years of education ($SD = 2.35$). Please see Table 1 for a summary of child, teacher, and classroom demographic information.

Table 1. Teacher, classroom, and child demographics.

<i>Characteristic</i>	<i>N</i>	<i>%</i>	<i>M</i>	<i>SD</i>	<i>Min</i>	<i>Max</i>
Teacher demographics						
Male	214	4				
White	214	33				
Black	214	47				
Hispanic	214	12				
Asian	214	4				
Multiethnic	214	5				
Age	214		42.56	10.55	22	69
Total years of teaching experience	211		14.55	9.14	0	47
Years of education	214		15.81	1.62	12	20
Classroom demographics						
Head Start	213	55				
Proportion of classroom in poverty	222		0.87	0.23	0	1
Child demographics						
Male	895	51				
White	872	14				
Black	872	42				
Hispanic	872	35				
Asian	872	4				
Native American	872	0.1				
Other	872	0.3				
Multiethnic	872	4				
Age (in years)	895		4.12	0.50	2.26	5.36
Income-to-needs ratio	773		1.07	1.04	0.05	5.07
Maternal education	854		12.70	2.35	8	20

Note. The current study sample included 895 children and 223 teachers.

Procedures

Data Collection

In the fall of Phase III, teachers completed a demographic questionnaire about their classroom and parents completed a demographic survey about their child and family. In the fall and at the end of the school year, teachers completed a series of questionnaires about each child, including their perception of the teacher–child relationship. Children were observed in the classroom in the middle of the school year. Teachers completed a series of questionnaires, including demographic information (i.e., age, gender, race/ethnicity, income, and education), at the beginning of Phase I. This information was only collected once during the study in an effort not to overburden teachers.

Observations of Children in the Classroom

Data collectors participated in a 2-day training on a measure of children’s classroom behavior, the Individualized Classroom Assessment Scoring System (inCLASS; Downer, Booren, Hamre, Pianta, & Williford, 2011), followed by a reliability assessment. Training included instruction in the content of the inCLASS and the observation protocol, in addition to watching, coding, and discussing five 10-min training video segments. At the end of training, data collectors completed a reliability assessment that consisted of independently watching and coding five master-coded video segments. Data collectors were considered reliable if 80% of their codes were within 1 point of the master code across the five assessment segments. If they were not initially reliable, data collectors received individual feedback and coded another set of five video segments. All data collectors ($N = 16$) became reliable on the inCLASS, with final reliability scores ranging from 90% to 94%. The last step of training was a live classroom observation with an inCLASS master coder. Data collectors maintained reliability via weekly calibration meetings in which they independently watched and coded inCLASS video segments and discussed how their scores compared with master codes.

inCLASS observations were conducted during one visit in the winter during the middle of the school year. Observations occurred in the morning and typically lasted 2.5 to 4 hr across almost all

classroom settings and activities. Data collectors observed selected children in the classroom on alternating cycles. An inCLASS cycle consisted of 10 min of observation followed by 5 min of coding each dimension on a 7-point scale using a detailed manual. These cycles alternated between observation of the selected children with the inCLASS and with an additional observation tool, the Classroom Assessment Scoring System (Pianta, La Paro, & Hamre, 2008). Data collectors completed an average of 3.16 cycles per child (range = 1–6) during Phase III.

Measures

Children's Demographic Characteristics

Parents reported on children's age, gender, and ethnicity along with parents' education levels on a demographic questionnaire. These demographic characteristics have previously been found to relate to teachers' perceptions of the teacher–child relationship and were therefore included in the analyses as control variables (Hamre & Pianta, 2001; Hamre et al., 2008; Murray & Murray, 2004).

Teachers' Perceptions of the Teacher–Child Relationship

Teachers' perceptions of the teacher–child relationship were measured through their reports on the Student–Teacher Relationship Scale (STRS; Pianta, 2001). In the present study, the STRS consisted of 15 items (Hamre et al., 2008; Mashburn, Hamre, Downer, & Pianta, 2006) about a teacher's relationship with a particular child that the teacher rated on a 5-point scale from 1 (*definitely does not apply*) to 5 (*definitely applies*). The items comprised two scales: closeness, which reflects the warmth, affection, and openness the teacher perceives in the relationship (e.g., “I share an affectionate, warm relationship with this child”); and conflict, which reflects the negativity that a teacher perceives in the relationship (e.g., “This child remains angry or is resistant after being disciplined”). The STRS is a widely used measure of the teacher–child relationship that has demonstrated good internal consistency for both scales (e.g., Koomen, Verschueren, van Schooten, Jak, & Pianta, 2012; Silver et al., 2005). In line with previous studies, the internal consistency for closeness ($\alpha = .84$ and $.88$) and conflict ($\alpha = .81$ and $.88$) in the present study were high when assessed in both the fall and spring, respectively. In addition, teachers' ratings of closeness and conflict on the STRS consistently predict children's outcomes concurrently and longitudinally, including their behavior, social-emotional skills, and academic achievement (Hamre & Pianta, 2001; Pianta & Stuhlman, 2004).

Children's Behavioral Interactions in the Classroom

The quality of children's interactions in the classroom was observed with the inCLASS (Downer et al., 2011). The inCLASS consists of 10 dimensions of children's behavioral interactions with teachers, with peers, and during learning activities: Positive Engagement With Teacher (attunement to the teacher, proximity seeking to the teacher, and shares positive affect with the teacher), Teacher Communication (initiates conversations, sustains conversations, and uses varied purposes of speech when talking with the teacher), Teacher Conflict (aggression, noncompliance, negative affect, and/or attention-seeking behaviors directed toward the teacher), Peer Sociability (proximity seeking to peers, shared positive affect with peers, popularity with peers, and cooperation when playing with peers), Peer Assertiveness (positive initiations with peers, leadership and self-advocacy when interacting with peers), Peer Communication (initiates conversations with peers, sustains conversations with peers, and uses varied purposes of speech when talking with peers), Peer Conflict (aggression, confrontation, negative affect, and attention-seeking behaviors directed toward peers), Engagement With Tasks (sustained attention and active engagement when participating in a task or activity), Self-Reliance (the extent to which the child shows behaviors indicating personal initiative and independence), and Behavior Control (behavioral displays of patience, ability to match classroom expectations, and showing physical awareness during classroom tasks and activities). These 10 dimensions in turn make up four domains of classroom interactions empirically derived through factor analysis: Positive Teacher Interactions (Positive Engagement With Teacher, Teacher Communication),

Positive Peer Interactions (Peer Sociability, Peer Communication, Peer Assertiveness), Positive Task Interactions (Engagement With Tasks, Self-Reliance), and Negative Classroom Interactions (Teacher Conflict, Peer Conflict, Behavior Control—reversed; Downer et al., 2010; Vitiello, Booren, Downer, & Williford, 2012). This four-factor structure was replicated in this sample, which was more at risk than the sample included in the original validation (please see Bohlmann, Downer, Booren, Maier, & Williford, 2012).

Higher codes indicate higher quality and/or more frequent positive interactions for most dimensions. Teacher Conflict and Peer Conflict codes indicate the reverse, with higher ratings indicating more negative interactions in the classroom. The four domain scores are calculated by averaging the dimension scores that make up the domain. In the present study, for each dimension, the codes assigned during the observation cycles across one morning ($M = 3.16$ cycles, range = 1–6) were averaged to create an estimate of children's interactions across the observation. Two observers double-coded approximately 20% of observation cycles, and their interrater reliability was high for Positive Teacher Interactions (intraclass correlation coefficient [ICC] = .93) and Positive Peer Interactions (ICC = .91) and good for Positive Task Interactions (ICC = .78) and Negative Classroom Interactions (ICC = .76). The construct and criterion-related validity of the inCLASS were demonstrated in a validation paper of the measure (Downer et al., 2010). Children's classroom-based interactions, as measured by the inCLASS, are also predictive of children's gains in social-emotional skills (e.g., self-regulation, social skills, emotion regulation) over 1 year of preschool (Downer et al., 2011; Williford, Whittaker, Vitiello, & Downer, 2013).

Data Analysis Plan

Missing Data

All 223 teachers and 895 children selected to participate in the present study were included in the analyses. Of the 895 children selected to participate in Phase III, 714 were observed using the inCLASS, 703 had teacher ratings of the teacher–child relationship in the fall, and 749 had teacher ratings in the spring. Missing data occurred if a selected child was absent on the date of observation, the child moved, or teachers' questionnaires were not completed. Missing rates for variables included in our analyses ranged from 0% to 21.5%. In order to make use of all available data and handle missing data, we used maximum likelihood estimation with robust standard errors. This method of handling missing data makes use of all available data and is considered preferable to listwise or pairwise deletion because of its more efficient and unbiased parameter estimates (Enders & Bandalos, 2001).

Multilevel Models

First descriptive statistics were examined using SPSS Version 22. Regression analyses were conducted in a multilevel framework using Mplus Version 7.1 (Muthén & Muthén, 1998–2012) in order to account for the nesting of children within teachers/classrooms. We tested the main effects of children's classroom interactions (teachers, peers, task, negative) on changes in teachers' perceptions of the teacher–child relationship (closeness and conflict) from the beginning to the end of the school year.

The outcomes of interest were teachers' perceptions of closeness and conflict in their relationship with a particular child in the spring of preschool, with their perceptions of closeness and conflict, respectively, in the fall controlled; therefore, results reflect change in teachers' perceptions of closeness and conflict across the preschool year. For each outcome (closeness and conflict) we fit an unconditional model and a multilevel regression model. The unconditional models estimated the variance in the outcomes occurring at the within and between levels and determined the ICCs, or the proportion of the variance in the outcomes occurring at the between level (across teachers/classrooms). Categorical variables were recoded into indicator variables. For these dichotomous variables, 1 = yes and 0 = no; for gender, male = 1 and female = 0. For regression models, within (child) level predictor variables were group mean centered, given that our primary research questions were at

within (child) level, in order to obtain unbiased parameter estimates for within-level predictors (Enders & Tofghi, 2007; Peugh, 2010). Regression models included the following key teacher and classroom predictors as control variables at the between (teacher/classroom) level: classroom in poverty (percentage of children), teacher's education (years), Head Start classroom (yes/no), professional development course intervention participation (yes/no), professional development consultancy intervention participation (yes/no), and indicator variables for the geographic location of the preschool center. Covariates at the within (child) level include the child's age, gender, and ethnicity (indicators for Black, Hispanic, or other ethnicity) and maternal education (years). The predictors of interest at the child (within) level were the four domains of children's classroom interactions (Positive Teacher Interactions, Positive Peer Interactions, Positive Task Interactions, and Negative Classroom Interactions).

Results

Preliminary Analyses

See Table 2 for descriptive statistics for predictors and outcomes. The correlations between teachers' fall ratings of the teacher-child relationship and spring ratings were moderate for closeness and conflict ($r_s = .53$ and $.62$, respectively). See Table 3 for a correlation summary. An examination of skewness and kurtosis for our outcome variables, teacher-reported closeness and conflict in the spring, indicated that these variables were adequately distributed and thus did not require transformations to be used as continuous variables in the analyses (Westfall & Henning, 2013). Change in the teacher-child relationship over the preschool year was also examined descriptively. Considerable variability was observed in teacher-child relationship change during the school year. On average, closeness increased ($M = 0.17$, $SD = 0.61$; range = -2.38 to 3.25). Although the average change in conflict was close to zero, there was variability in the change in teachers' conflict perceptions ($M = 0.02$, $SD = 0.72$; range = -3.29 to 2.71). In the unconditional

Table 2. Descriptive statistics: Teacher-child relationship, child classroom interactions.

Variable	N	Min	Max	M	SD
Teacher perceptions of the teacher-child relationship					
Fall closeness (STRS)	703	1.13	5.00	4.29	0.68
Fall conflict (STRS)	703	1.00	4.71	1.68	0.82
Spring closeness (STRS)	749	2.13	5.00	4.45	0.57
Spring conflict (STRS)	749	1.00	5.00	1.69	0.85
Child classroom interactions					
Teacher interactions (inCLASS)	714	1.00	6.17	2.21	0.84
Peer interactions (inCLASS)	714	1.00	6.56	2.50	0.88
Task interactions (inCLASS)	714	1.83	6.50	4.26	0.81
Negative interactions (inCLASS)	714	1.00	3.67	1.37	0.38

Note. Theoretical ranges: STRS = 1–5, inCLASS = 1–7. STRS = Student-Teacher Relationship Scale; inCLASS = Individualized Classroom Assessment Scoring System.

Table 3. Correlations between teachers' perceptions of teacher-child relationships and children's classroom interactions.

Variable	1	2	3	4	5	6	7	8
1. Fall closeness	—	-.27***	.53***	-.08*	.21***	.20***	.16***	-.01
2. Fall conflict		—	-.17***	.62***	.05	-.08*	-.19***	.38***
3. Spring closeness			—	-.24***	.15***	.19***	.21***	-.01
4. Spring conflict				—	.03	-.03	-.15***	.38***
5. Teacher interactions					—	.19***	.30***	.06
6. Peer interactions						—	.53***	.04
7. Task interactions							—	-.31***
8. Negative interactions								—

* $p < .05$. *** $p < .001$.

model, the ICCs for spring closeness and conflict were .28 and .24, respectively. The average cluster size for children nested within classrooms was 4.01.

Children's Behavioral Interactions and the Teacher-Child Relationship

Table 4 presents a summary of the standardized main effects of the multilevel models predicting teachers' reports of the teacher-child relationship. An examination of the within (child) level predictors indicated that children's observed behavioral interactions in the classroom predicted teachers' perceptions of relationship quality at the end of the preschool year when we controlled for initial (fall) relationship quality and for child demographic factors related to teacher-reported relationship quality. Specifically, when children were observed interacting positively with their teachers, their teachers reported more closeness at the end of the year; however, children's positive interactions with their teachers did not predict teachers' perceptions of conflict. When children interacted proactively with classroom tasks, their teachers reported more closeness at the end of the year. Children's positive task interactions did not predict teachers' perceptions of conflict. Children's positive interactions with their peers did not predict teachers' perceptions of closeness or conflict. When children were observed having more negative interactions in the classroom, their teachers reported experiencing more conflict in the teacher-child relationship at the end of the school year. Children's negative classroom interactions did not predict teachers' reports of relational closeness with children. Within (child) level predictors accounted for a significant proportion of the variance in teacher-reported relationship closeness and conflict. An examination of the between

Table 4. Regression analyses predicting teachers' perceptions of teacher-child relationships.

Predictor	Closeness		Conflict	
	β	SE	β	SE
Within model				
Child age	0.03	0.04	0.00	0.04
Male	-0.19*	0.08	0.14*	0.06
Black	-0.10	0.07	0.11*	0.05
Hispanic	-0.06	0.07	0.03	0.06
Other ethnicity	-0.07	0.05	0.01	0.04
Maternal education	0.04	0.05	0.01	0.03
Fall closeness	0.35***	0.05		
Fall conflict			0.46***	0.04
Teacher interactions	0.07*	0.03	0.03	0.04
Peer interactions	0.03	0.05	0.03	0.04
Task interactions	0.15*	0.06	-0.01	0.05
Negative interactions	0.04	0.04	0.23***	0.05
R^2	.18***		.29***	
Between model				
Percentage of class in poverty	-0.12	0.09	0.14	0.08
Teacher years of education	-0.21	0.12	0.02	0.13
Head Start classroom	-0.10	0.12	-0.02	0.10
Course intervention	0.03	0.09	0.04	0.08
Consultancy intervention	-0.04	0.09	0.00	0.09
Site 2	0.03	0.47	-0.19	0.38
Site 3	-0.51	0.40	-0.45	0.41
Site 6	-0.34	0.35	0.12	0.45
Site 7	0.01	0.41	0.03	0.54
Site 8	0.16	0.27	-0.66*	0.32
Site 9	-0.32	0.36	-0.25	0.41
Site 10	0.52	0.37	-0.10	0.41
Site 11	-0.91*	0.38	0.30	0.49
Site 12	0.20	0.42	0.27	0.48
R^2	.17		.12	

* $p \leq .05$. *** $p < .001$.

(teacher/classroom) level predictors revealed that one study site predicted less teacher-reported conflict and another study site predicted less teacher-reported closeness.

Discussion

Teachers' perceptions of the teacher–child relationship are important for children's school adjustment and academic success (Hamre & Pianta, 2001). The present study aimed to better understand how children's classroom interactions are related to teachers' relationship perceptions. We did this by examining how children's observed behavioral interactions were related to teachers' perceptions of closeness and conflict in their relationship with a particular child in the spring of the preschool year when we accounted for teachers' relationship perceptions in the fall.

The present study has several strengths. First, by using independent observers' ratings of children's classroom behavior rather than teacher ratings for both predictors and outcomes, this study addressed a key limitation in the literature and direction for future work identified by Sabol and Pianta (2012). That is, research that examines associations between children's behavior and teacher–child relationships often suffers from primarily using a single rater (teachers) rather than multiple independent raters of each construct (Sabol & Pianta, 2012). Second, we comprehensively examined children's behavioral interactions rather than looking only at children's behavior problems. We assessed positive classroom behavior with teachers, peers, and learning activities, including the extent to which children displayed behaviors indicating shared positive affect, proximity seeking, and effective communication with peers and teachers and their active participation and sustained attention in learning activities. We also assessed negative classroom behavior, including children's behavioral displays of aggression, noncompliance, negative affect, and limited behavioral regulation. Finally, the present study benefited from using a diverse sample of preschool children from families of low socioeconomic status who were at risk for difficulty in school (Ryan, Fauth, & Brooks-Gunn, 2006) and their teachers.

Consistent with our hypotheses and Pianta's conceptual model of teacher–child relationships (Pianta, 1999; Pianta et al., 2003), we found that children's observed classroom behavioral interactions were related to teachers' relationship perceptions at the end of 1 year of preschool when we accounted for teachers' relationship perceptions at the beginning of the year. When the quality of a child's classroom behavioral interactions was characterized by frequent attunement to the teacher, proximity seeking, shared positive affect, and initiating and sustaining conversation with the teacher, that teacher tended to report more closeness in his or her relationship with that child at the end of the preschool year. These findings provide empirical support for an element of the conceptual model of teacher–child relationships that informed the hypotheses for this article (Pianta, 1999; Pianta et al., 2003). Specifically, the observed behavioral interactions between a child and his or her teacher were related to how that teacher viewed the quality of his or her relationship with that child. According to Pianta and colleagues' (2003) conceptual model, the exchange of information occurring in these interactions is thought to contribute to teachers' perspective on the relationship (p. 206). As one would expect based on this theoretical work, teachers' perceptions of a warm, supportive relationship with a child were related to the child's shared experiences, positivity, and attunement with the teacher (Pianta, 1999; Verschueren & Koomen, 2012).

In addition to the behavioral interactions between a child and his or her teacher, we found that children's proactive behavioral interactions with learning opportunities in the classroom were associated with teachers' perceptions of more closeness. These findings indicate that in addition to their direct interactions with children, teachers' view of their relationship with a child may also be informed by the child's behavior, which teachers may observe or be involved with indirectly. Teachers tended to report a more affectively positive, close relationship with a child when the child's behavioral interactions with classroom tasks were defined by active participation, enthusiasm, following directions, staying focused, and self-reliance. Preschool children's self-reliant behavior is characterized by being independent, taking learning into their own hands, persisting with difficult

tasks, and using classroom resources (including the teacher) when needed (Downer et al., 2010; Pianta, 1999). Our finding that children's proactive behavior with classroom learning activities was related to teachers' perceptions of more closeness points to teachers' values regarding both their relationships with children and their beliefs about their role in the classroom. Our result is consistent with Stuhlman and Pianta's (2002) finding that teachers were more positive in their narratives about a relationship with a child when that child was observed being more self-reliant and compliant in the classroom. Preschool teachers value children's developmentally appropriate autonomy and see their role in part as supporting children's growing independence (Killen, Ardila-Rey, Barakkatz, & Wang, 2000). Particularly with the current policy focus on children's academic performance, teachers feel increased pressure for children to be competent, engaged learners who can meet academic standards (Stipek, 2006). Therefore, when children demonstrate active participation and appropriate independence with learning opportunities in the classroom, teachers may view students more positively overall and in turn report feeling increasingly close to them. It may also be that children's proactive interactions in classroom learning activities and closeness in the teacher-child relationship both reflect characteristics or competencies of the child. For example, a child's overall social competence may contribute both to following directions and actively participating in learning activities as well as to establishing a warm, positive relationship with a teacher.

We also found that when children's classroom interactions included higher levels of aggressive behaviors, negative affect, attention-seeking behavior, noncompliance, and confrontation with teachers and peers and impulsive, disruptive behavior, teachers perceived more conflict during the school year. Children's lack of behavioral control may have been related to increases in teachers' perceptions of conflict because when children have difficulty regulating their behavior in the classroom, this may lead to more interpersonal conflict with the teacher (Eisenhower, Baker, & Blacher, 2007; Rudasill & Rimm-Kaufman, 2009; Silva et al., 2011). For instance, when a child is consistently matching the expectations set by the teacher, being patient (i.e., walking, waiting his or her turn), and respecting others' personal space, the teacher may need to correct that child's behavior less often, feel less drained, and feel less like the child is disobeying his or her classroom rules. Teachers may also perceive less conflict in the relationship when they observe that children are accomplishing the developmental task of self-regulating their emotions and behaviors, which are skills valued by teachers as important for success in kindergarten (Kowalski, Pretti-Frontczak, & Johnson, 2001; Rimm-Kaufman, Pianta, & Cox, 2000).

We found that a child's displays shared positive affect, proximity seeking, and cooperation with his or her peers were not uniquely related to a teacher's perceptions of the relationship with that child. It may be that children's positive interactions with their teachers and learning opportunities as well as children's negative classroom interactions are more salient for how teachers view their relationship with a child than are children's positive peer interactions. It may also be that it is the quality of the teacher-child relationship that supports children's positive peer interactions, rather than children's positive peer interactions contributing to teachers' reports of teacher-child relationship quality. A considerable body of work has shown that when children have a sensitive, responsive teacher with whom they have a secure attachment, they tend to engage in competent, positive behavior with their peers (Curby et al., 2009; Howes, 1997; Howes, Hamilton, & Matheson, 1994; Howes, Matheson, & Hamilton, 1994). However, it is also important to note that all four domains of children's classroom interactions that were observed in the present study were entered into the same regression model. Thus, we found that positive peer interactions did not uniquely predict teachers' reports of relationship quality when we accounted for multiple other domains of children's classroom interactions.

Taken together, our findings have several implications for understanding teacher-child relationships. First, our findings provide support for the conceptual model of teacher-child relationships outlined by Pianta and colleagues (2003), as we found evidence of the link between a child's observed behavioral interactions in the classroom and a teacher's perceptions of the quality of his or her relationship with that child. Our study's methodology of using independent observations of

children's classroom behavioral interactions strengthens the support for this link. Our findings suggest that continued use of multiple reporters and independent observations of classrooms in future research can help separate individual perceptions judged from a teacher's perspective inside the classroom from observations of what is happening in the classroom from an independent, outside perspective. Second, our findings highlight the importance of considering a full range of children's behavior in the classroom, as children's positive and negative behavior across their interactions with teachers, peers, and learning activities predicted teacher-reported relationship quality. Our findings provide further evidence of the dyadic and dynamic nature of teacher-child relationships (Pianta, 1999). The results of this study contribute to increasing evidence that children's interactions in the classroom (Downer et al., 2010; Pianta, 1999; Pianta et al., 2003) contribute to the course and quality of the teacher-child relationship.

This study has several limitations. This was a correlational study, and therefore we cannot infer causation in terms of the relations between children's interactions and changes in teachers' perceptions of the teacher-child relationship. To address this limitation, future research could use experimental study designs to test the causality of the correlational associations observed in the present study between children's classroom behavior and teachers' reports of teacher-child relationship quality. In addition, we only observed children's classroom behavior at one time during the middle of the school year. Increasing empirical evidence indicates that the links between children's behavior in the classroom and teachers' relationship perceptions are bidirectional. Several recent studies have demonstrated that teachers' reports of relational closeness and conflict and their reports of students' behavior problems are reciprocally related to each other over the course of one school year (Doumen et al., 2008; Roorda et al., 2014; Zhang & Sun, 2011). It is possible that teachers' initial relationship perceptions contributed to children's observed behavioral interactions in this study. However, because we only measured children's behavior at one time, we were not able to test the reciprocal relations between teachers' relationship perceptions and children's observed behavioral interactions across the preschool year. Future research could address the limitations of the present study by including observations of children's behavior and teacher-reported relationship quality concurrently at multiple times during the school year in order to examine reciprocal relations between children's behavioral interactions and teachers' relationship perceptions over time. These directions for future research could build on the findings of the present study to continue refining and deepening our understanding of the dynamics of relationships in the classroom.

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