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Effect of Peer Nominations of Teacher-Student Support at Individual and Classroom Levels on Social and Academic Outcomes

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Abstract

This longitudinal study examined the prospective relations between 713 elementary students' individual peer teacher support reputation (PTSR) and a measure of the classroom-wide dispersion of peer nominations of teacher support (Centralization of Teacher Support) on students' peer relatedness (i.e., peer acceptance and peer academic reputation) and academic motivation (i.e., academic self-efficacy and teacher-rated behavioral engagement). PTSR was measured as the proportion of classmates who nominated a given student on a descriptor of teacher-student support. Centralization of Teacher Support was assessed using social network analysis to identify the degree to which peer nominations of teacher support in a classroom centered on a few students. PTSR predicted changes in all student outcomes, above academic achievement and relevant covariates. Centralization of Teacher Support predicted changes in students' peer academic reputation, net the effect of PTSR and covariates. Students' academic achievement moderated effects of PTSR and Centralization of Teacher Support on some outcomes. Findings highlight the importance of peers' perceptions of teacher support and of the structure of those perceptions for children's social and academic outcomes. Implications for practice are discussed.

Keywords

student–teacher relationship; peer acceptance; peer academic reputation; perceived academic competence; peer perceptions; sociometric assessment; elementary students; classroom context; behavioral engagement

Classrooms are, by their nature, social contexts. An extensive body of research documents that students' relationships with their teachers (Hamre & Pianta, 2006; Roorda, Koomen, Spilt, & Oort, 2011) and with their classmates (Ladd, 1999; Rubin, Bukowski, & Parker, 2006) are directly and indirectly related to their academic motivation and learning. Consistent with social motivational theories (Deci & Ryan, 1991; Furrer & Skinner, 2003), relationships with teachers and peers characterized by acceptance, warmth, and low conflict promote students' sense of belonging to and liking for school, leading to cooperative and

effortful engagement in learning and endorsement of school social and behavioral norms (Buhs & Ladd, 2001; Connell & Wellborn, 1991; Hughes, Luo, Kwok, & Loyd, 2008). According to bio-ecological theory (Bronfenbrenner & Morris, 2006) students' recurring interactions with teachers and peers constitute proximal processes that drive development.

As the chief architects and managers of classroom contexts, teachers exert considerable influence on the classroom peer ecology. This influence likely operates at both the individual (i.e., individual teacher–student relationship) and classroom levels. At an individual level, the affective quality of the teacher–student relationship may influence students' peer relationships via multiple processes, including the nature and quality of students' classroom participation (Hughes et al., 2008; Ladd et al., 1999). Classmates may also rely on their observations of teacher–student instructional and social interactions in making judgments about classmates' social and academic traits (Birch & Ladd, 1998; Hughes, Cavell, & Willson, 2001). According to social referencing theory (Hughes et al., 2001), children are aware of teachers' differential interactions with students and use this information in forming judgments of children's competencies and likeability. Even young children are aware of teachers' differential interactions with students and use this information to make accurate inferences regarding teachers' attitudes toward and liking for students (Babad, 1993; Birch, 1997; Kuklinski & Weinstein, 2001; Weinstein, Marshall, Sharp, & Botkin, 1987). Both experimental (Retish, 1973; White & Kistner, 1992; White, Sherman, & Jones, 1996) and naturalistic studies (Ladd, Birch, & Buhs, 1999; Taylor, 1989; Taylor & Trickett, 1989) support this premise. For example, in a naturalistic study conducted with elementary students in Hong Kong, Chang and colleagues (2007) found that teacher-rated preference for children both mediated and moderated the association between student behaviors (i.e., prosocial leadership, aggression, and social withdrawal) and peer acceptance. They concluded that the teacher's preference for students influenced classmates' liking of the students relatively independently of classmates' own interactions with the students (the mediating effect) and biased classmates' evaluation of students' behaviors (moderating effect). The current study extends these findings by investigating the effect of classmates' perceptions of teacher–student relationships on students' classroom peer relationships.

Peer Perceptions of Teacher–student Support

It is surprising that even though the effect of teacher–student support on peer relationships is explained in terms of social referencing theory, few researchers have directly assessed classmates' perceptions of teacher support (Hughes, Zhang & Hill, 2006; Hughes et al., 2001). Peer nomination inventories are often used to assess a child's reputation within a peer group on various dimensions, such as aggression, prosocial behavior, or perceived popularity (e.g., Realmuto, August, Sieler, & Pessoa-Brandao, 1997). In this approach, students are asked to nominate classmates who best fit descriptors of various behavioral or social dimensions. A student who is frequently nominated for items characterizing a particular social or behavioral dimension is said to have a high reputation for that dimension. Research on peer reputations finds that peers react differently to classmates on the basis of these classroom reputations (Dodge & Frame, 1982; Hymel, 1986).

Whereas a student's opportunities to interact with each student in the classroom may be limited, students typically have many opportunities to observe teacher–student interactions with a given student. Furthermore, opportunities to observe teacher–student interactions are shared by students in the same classroom. The quality of that teacher–student interaction thus becomes part of the shared information classmates have about that child, thereby promoting a group consensus about the child's attributes. The resulting peer teacher support reputation (PTSR) may bias peers' subsequent interpretations of the child's behavior and liking for the child (Hymel, 1986). Studies using peer nominations to assess peer perceptions of teacher support have produced results consistent with social referencing theory. Specifically, Hughes and colleagues (Hughes et al., 2001 and 2006) found that elementary students' PTSR was concurrently associated with their peer acceptance and teacher-rated behavioral engagement, above relevant covariates.

To date, no study has examined the prospective relation between PTSR and child outcomes. Prospective studies that control for students' prior performance on child outcomes would provide stronger, though not definitive, evidence of a causal role of peer perceptions of teacher–student support on child outcomes. Furthermore, prior studies of the influence of PTSR on peer relatedness have been restricted to peer acceptance. Different dimensions of peer relatedness make both shared (redundant) and nonshared (unique) contributions to different child adjustment outcomes (Ladd, Kochenderfer, & Coleman, 1997). For example, Hughes, Dyer, Luo, and Kwok (2009) found that elementary students' peer academic reputation (i.e., the number of peer nominations as academically capable that students received) predicted changes in their academic self-efficacy beliefs, above peer ratings of liking as well as teacher ratings of students' abilities and students' measured academic achievement.

Classroom Level Teacher–student Support

Overall level of support

Teachers' interactions with students may be predictive of peer relationships because the teacher sets the classroom's tone for other interpersonal relationships, by modeling and rewarding behaviors deemed appropriate and by the affective quality of interactions with students (Mikami, Lerner, & Lun, 2010). However, few studies have examined the effect of classroom levels of teacher support on peer relationships. In a study of first-grade classrooms, Buyse, Verschueren, Verachtert, and Van Damme (2009) found that the average level of teacher-reported teacher-child conflict and closeness, aggregated across students, predicted students' teacher-rated psychosocial adjustment, above kindergarten levels of adjustment. In a study of the effect of teacher practices on classroom peer networks, observed teacher emotional support was associated with higher rates of friendship reciprocation (Gest & Rodkin, 2011). Finally, a prior study with the same longitudinal sample as the current study, (Hughes et al., 2006) found that the typical (i.e., normative) level of PTSR predicted first-grade children's peer acceptance and classroom engagement, above students' individual level of peer-nominated teacher support.

Centralization of support

In addition to the overall classroom level of teacher warmth and support, the structure, or distribution of teacher support may have implications for the peer ecology and students' academic motivation. Specifically positive, supportive teacher–student interactions may be distributed fairly equally across students in a classroom (an egalitarian structure) or may center on a relatively small number of students (a hierarchical structure). Although this concept is easily grasped, to the best of our knowledge, no study has investigated the implications of the classroom structure of the provision of teacher support for students' social or academic functioning. We borrow a construct from social network analysis referred to as *network centralization* (Kinderman & Gest, 2009; Wasserman & Faust, 1994) to capture the hierarchical versus egalitarian structure of peer perceptions of teacher support. In classrooms with high network centralization for peer nominations of teacher support, a few students receive many nominations, whereas most students receive no or few nominations. High classroom centralization for teacher support nominations represents a high level of group consensus as to who is preferred by the teacher and who is not. Such consensus may make teacher–student support more salient, or visible, in the classroom as well as more rigid (Mikami et al., 2010). High centralization for teacher support may also contribute to social dominance hierarchies. Social dominance refers to the ability of individuals to control resources in their peer group (Hawley, 1999). Drawing from research from social psychology, Mikami et al. (2010) suggested that when perceptions of teacher support are hierarchical (i.e., centralized) students may attribute more social power to those students who are preferred by the teacher. According to attribution theory (Lerner & Miller, 1978), children with low social power may be viewed as having more negative personality traits and are more likely to be rejected. Thus, classroom network centralization for teacher–student support may influence students' peer relationships above the student's level of individual support.

Although no study has examined the classroom structure of peer nominations of teacher–student support, studies employing social network analysis to investigate classmates' perceptions of students' status as popular (Garandeau, Ahn, & Rodkin 2011) and as academically capable (Hughes & Zhang, 2007) are instructive. Hughes and Zhang (2007) found that in first-grade classrooms in which classmates' perceptions of children's academic abilities were more centralized, academically at-risk children had lower perceived cognitive competence; furthermore, the centralization of peer perceptions of academic ability moderated the relation between measured academic ability and peer acceptance, such that lower ability students were more accepted by peers in classrooms in which perceptions of ability were more egalitarian.

Child Outcomes

We examine the effects of students' PTSR (i.e., the proportion of classmates who nominate a given student as experiencing a supportive relationship with the teacher) and the Centralization of Teacher Support on two dimensions of peer status (peer acceptance and peer academic reputation) and two dimensions of student academic motivation (academic self-efficacy and teacher-rated behavioral engagement). These two dimensions of academic

motivation were selected based on their importance to students' academic achievement and on prior research documenting an effect of teacher support on them (Hughes & Chen, 2011; Roorda, Koomen, Spilt, & Oort, 2011). Next, research that documents the developmental significance of each of the four study outcomes for students' academic achievement is briefly reviewed.

Peer acceptance

A child's level of social acceptance from classmates is the most frequently studied aspect of classroom peer relationships. The construct of peer group acceptance or rejection refers to the valence of the collective sentiment of a student's peer group. Whether measured in terms of the number of nominations received from classmates as "most liked" or "least liked" or in terms of a mean rating of liking, children who are more accepted and less rejected by their classmates are likely to perform better academically (Buhs, Ladd, & Herald, 2006; Ladd et al., 1999). Researchers investigating bidirectional effects between achievement and peer acceptance have found stronger support for the effect of peer acceptance on achievement than for achievement on peer acceptance (Ladd, Buhs, & Seid, 2000).

Peer academic reputation

Peer academic reputation (PAR) refers to a student's relative status in a peer group in terms of peer evaluations of academic competence. Peer academic reputation is assessed by asking students to nominate classmates who are characterized by high academic performance (e.g., one of the best at school work, works difficult math problems, and teacher calls on to read difficult passages; Gest, Domitrovich, & Welsh, 2005; Chen, Hughes, Liew, & Kwok, 2010). A student who is frequently nominated for items characterizing academic competencies is said to have a high PAR. Students likely make inferences about classmates' academic competencies based on a wide variety of cues, including how teachers group students by ability, provide public feedback to students regarding their performance, and select the level of difficulty of questions asked of students. Students' direct interactions with peers in academic settings, such as working together on a project, are also likely to influence their perceptions of classmates' abilities. Prospective studies document that a child's PAR represents a salient aspect of the peer ecology that shapes children's academic motivation and achievement (Gest et al., 2005; Gest, Rulison, Davidson, & Welsh, 2008; Molloy, Ram, & Gest, 2011). For example, Chen et al. (2010) found that PAR was more predictive than peer acceptance of cross-year changes in students' academic self-efficacy and teacher-rated engagement.

Academic self-efficacy

Self-efficacy beliefs refer to whether people believe themselves capable of exercising influence over their performance and over their achievement of goals (Bandura, 1991). Self-efficacy is specific to different domains of performance (e.g., athletic, social, or academic) and serves as one of the self-regulatory mechanisms that impact a person's motivation, actions, and cognitive processing (Wigfield & Eccles, 2000). An extensive body of research with elementary and middle school students documents longitudinal associations between students' perceived academic self-efficacy and changes in achievement (for review see Eccles, Wigfield, & Schieffle, 1998). Students who are more confident of their academic

abilities prefer more challenging learning environments, are more persistent in the face of challenges, seek academic assistance from knowledgeable others, place a higher value on academic mastery, and gravitate to peers who share their academic values.

Teacher-rated behavioral engagement

Engagement in learning is a multi-dimensional construct encompassing behavioral and psychological dimensions (Appleton, Christenson, Kim, & Reschly, 2006). Motivational theorists view psychological engagement variables, such as achievement goals and academic self-efficacy, as indirectly affecting academic achievement via their influence on students' behavioral engagement (Appleton et al., 2006; Perry & Weinstein, 1998). Behavioral engagement, defined in terms of time on task, persistence or effort on learning tasks, or cooperative engagement, is associated concurrently and prospectively with higher academic achievement, over and above measures of general cognitive ability (Greenwood, 1991; Hughes & Kwok, 2007; Ladd et al., 1999; Miles & Stipek, 2006). Furthermore, behavioral engagement mediates the effect of a number of classroom contextual variables on achievement, including teacher–student relationship quality (Hughes et al., 2008), peer acceptance (Ladd et al., 1999), and classroom instructional practices (Lau & Nie, 2008).

Study Purpose and Hypotheses

The purpose of the current study was to determine the effect of PTSR and the classroom structure of peer nominations of teacher support (i.e., Centralization of Teacher Support) on cross-year changes in children's peer acceptance and PAR as well as academic self-concept and behavioral engagement. We expected PTSR would be positively associated with all child outcomes and Centralization of Teacher Support would be negatively associated with all child outcomes. Previous research has shown that a child's level of individual risk may moderate the effect of individual teacher–student support and classroom adjustment. For example, Baker (2006) found that teacher-reported support buffered children with reading problems from poor school adjustment. Similarly, a positive classroom social–emotional climate has been found to be more strongly related to children's academic and social adjustment for students with high versus low levels of risk based on academic (Kiuru et al., 2012), demographic (Hamre & Pianta, 2005) or social (Gazelle, 2006) risk indicators. Of particular relevance to the current study, Hughes and Zhang (2007) found that more hierarchical structures for peer nominations of academic ability had more negative effects on the peer acceptance of lower achieving than higher achieving students. Based on these findings, we expected that the benefits of higher PTSR and lower centralization would be stronger for students with lower academic ability, relative to students with higher academic ability.

Based on the reasoning that individual levels of peer-rated teacher support might be more salient in classroom with more centralized teacher support structures, we also investigated whether the effect of PTSR on student outcomes is stronger in classrooms with high Centralization of Teacher Support. Finally, based on prior research documenting that teachers, peers, and students rate girls' relationships with teachers as more supportive that boys' relationships (Li, Hughes, Kwok, & Hsu, 2012; Spilt, Hughes, Wu, & Kwok, 2012)

and inconsistent findings regarding gender moderation of the associations between teacher support and child outcomes (Ewing & Taylor, 2009; Hamre & Pianta, 2005), we investigated gender moderation of the association between PTSR and Centralization of Teacher Support and child outcomes. The gender moderation analyses were exploratory.

In carrying out this purpose, we used a prospective design that permitted controlling for students' prior performance on each of the outcome measures. Because the research design is correlational, definitive conclusions regarding causal processes are not justified. However, by controlling for students' prior level of performance, as well as relevant covariates, we minimized the degree to which effects are due to unmeasured child variables. We also employed outcome measures from peers, children, and teachers. The inclusion of multiple sources of reports decreases the probability that findings are due to source-specific bias. Finally, we investigated these hypotheses in a sample of culturally diverse third- and fourth-grade students who entered public school at risk for poor achievement due to relatively low literacy skills (see Method section). Children with low literacy skills are at increased risk for lower levels of teacher and peer support (Estell, Farmer, Cairns, & Cairns, 2002; Ladd et al., 1999) as well as future academic failure (Alexander, Entwisle, & Horsey, 1997). For these reasons, educationally at-risk students represent a population of considerable importance for investigating the effects of classroom contextual features in order to identify factors that buffer them from academic failure.

Method

Participants

Participants were 713 third- and fourth-grade children (52.6% boys) attending one of three school districts (1 urban and 2 small city) in southeast and central Texas, drawn from a sample of 784 children who were recruited into a longitudinal study across two sequential cohorts when in first grade during the fall of 2001 and 2002 (Hughes & Kwok, 2007). The composition of first-grade classrooms in these three school districts was 42% Caucasian, 25% African American, 27% Hispanic, and 5% Other; 44% were eligible for free or reduced lunch, and 53% were boys. Children were eligible to participate in the larger longitudinal study if they scored below the median score for their school district on a state-approved, district-administered measure of literacy, spoke either English or Spanish, were not receiving special education services, and had not been previously retained in first grade. School records identified 1,374 children as eligible to participate based on active parent consent. No evidence of selective participation was found. For details on recruitment into the larger longitudinal study, see Hughes and Kwok (2007).

Of the 784 students recruited in first grade, 713 (90%) were eligible for the current study based on attending one of the three school districts from which they were recruited at Year 4. This requirement was necessary because sociometric procedures were conducted only in these districts. Analyses on study variables at baseline (Year 1), including age, IQ, and gender, did not indicate any difference between the 71 attrited students and the 713 continuing students. However, attrited students were more likely to be eligible for free or reduced lunch at baseline (62.6%) than were continuing students (49.3%). The ethnic composition of the sample for the current study was 34% White, 23% Black, 37% Hispanic,

and 5% Other. Children's mean age at Year 4 was 9.56 years (*SD* = 0.40 years). On the basis of family income, 65.7 % of participants were eligible for free or reduced lunch at Year 4. At Year 4, the average reading and math age standard scores on the Woodcock–Johnson III Tests of Achievement (Woodcock, McGrew, & Mather, 2001) were 95.09 (*SD* = 13.40) and 100.78 (*SD* = 12.07), respectively. At Year 4, students were located in 296 classrooms in 79 schools. The majority (72%) were in fourth grade, with 28% in third grade, due to having been retained in grade.

Procedures and Measures

Peer nominations of teacher support as well as peer academic reputation and peer acceptance were obtained via sociometric procedures. Children's reading and math achievement and academic self-efficacy were assessed individually at school by research staff. Teachers reported on students' behavioral engagement in the classroom as part of a longer questionnaire, for which they received compensation. All outcome measures were assessed at Year 3 and Year 4. Year 3 measures of each outcome and Year 4 reading and math achievement scores were used as covariates in the analyses. To minimize language factors in children's responses, students who had ever been in bilingual classrooms or who had limited English proficiency according to school records were administered a language proficiency test by a Spanish–English bilingual examiner to establish the child's dominant language, and all tests and interviews were administered in that language. In bilingual classrooms, Spanish–English bilingual examiners conducted the individual sociometric interview in English or Spanish, depending on the teacher's recommendation for each student.

Peer sociometric procedures and measures—Peer nomination procedures were used to assess peers' perceptions of children's teacher support and peer academic competencies in classrooms in which at least one participant in the longitudinal study was enrolled. In individual interviews, child participants were asked to name classmates who best fit each of several behavioral descriptors. Scores from research using similar sociometric procedures with elementary students provides good evidence of reliability and validity (e.g., Realmuto et al., 1997; Terry, 2000). Although only children with parent consent provided nominations, all children in the class were eligible to be nominated for each descriptor. Children could name as few or as many classmates as they wanted for each descriptor. A child's peer nomination score for each item was obtained by summing all nominations received and dividing that number by the number of possible nominations (i.e., the number of students participating in the sociometric assessment). Because reliable and valid sociometric data can be collected using the unlimited nomination approach when as few as 40% of children in a classroom participate (Marks, Babcock, Cillessen, & Crick, 2012), sociometric scores were computed only for children located in classrooms in which more than 40% of students in the classroom participated in the sociometric assessment. The mean percentage of total classmates participating in sociometric assessments across both years was 70% (range from 40% to 100%); the median number of total classmates providing nominations was 12.46. The mean number of participants in the longitudinal study enrolled in these classrooms is 1.95 (*SD* = 1.18), and the range is 1 to 7.

Peer teacher support reputation (PTSR)—Students were asked to nominate classmates who met the following description of teacher support: "These kids get along well with their teachers. They like to talk to their teachers, and their teachers enjoy spending time with them." A child's proportion of nominations received is the child's PTSR. Research with the same dataset as the current study found that PTSR scores were moderately correlated with teacher reports of teacher–student support and accounted for more trait variance than did teacher or child reports of teacher-support (Chen et al., 2010).

Centralization for teacher support—Centralization for Teacher Support was computed based on the distribution of peer nominations of support in a classroom, using the formula for network degree centralization[1] (Wasserman & Faust, 1994), modified to account for the fact that not all members of the class provided nominations

$$\text{Network degree centralization} = \text{sum}\,[\max(P_i) - P_i]/n\,(m-1),$$

where max (P_i) is the maximum number of nominations received by any child in the classroom. P_i is the number of nominations each student received, n is the number of individuals providing ratings, and m is the number of the students in the classroom.

The classroom degree centralization for teacher support nominations (Centralization for Teacher Support) is high when a relatively small number of students receive a large number of nominations and many students received no or few nominations. Higher scores on Centralization for Teacher Support indicate that the students demonstrate a higher degree of consensus in perceptions of who has a supportive relationship with the teacher. The centralization score is scaled so that a value of 0 indicates a maximally egalitarian structure (i.e., all students receive the same number of nominations), and a value of 1 indicates a maximally hierarchical setting (i.e., one student receives all the nominations). Wasserman and Faust (1994) stated that centralization scores "can be viewed as a measure of how unequal the individual actors' values are. It is (roughly) a measure of variability, dispersion, or spread" (p. 176). As expected, in our dataset, Centralization for Teacher Support was moderately correlated with classroom variance of peer nominations (.45), suggesting that variance and centralization assess related but distinct aspects of the dispersion of nominations.

Peer academic reputation (PAR)—Students were asked to nominate classmates for three academic descriptors: Best at school work ("These kids are best at schoolwork. They almost always get good grades and teachers often use their work as examples for the rest of the class"); best at math ("These kids are best in math. They almost always get good grades in math and the teacher calls on them to work hard math problems"); and best at reading ("These kids are best in reading. They usually get good grades in reading, and the teacher

[1]The term "degree" refers to an individual's density of ties to other members of a social network. Individuals who have the most ties to other actors in the network have the highest individual degree centrality. Individual degree values can range from 0 to 1. If an individual is connected in some way (e.g., close to, communicates with, esteemed by) to every other member of the network, the individual has a degree centrality of 1.0. Network degree centralization is a characteristic of the network instead of the individual, and reflects the range of the actors' degree centrality (Wasserman & Faust, 1994, pp. 178-181).

calls on them to read aloud or read hard words"). Using similarly worded items, other researchers have reported good convergent and divergent validity evidence for PAR (Gest et al., 2005; Gest et al., 2008; Hughes et al., 2009). In the present sample, the internal consistency of the three items at Year 3 and 4 were .90 and .93, respectively. A composite PAR score was calculated as the average score on these three items.

Peer Acceptance—In individual sociometric interviews, children were asked to indicate their liking for each child in the classroom on a 5-point scale. Specifically, the interviewer named each child in the classroom and asked the child to point to one of five faces ranging from sad (1 = *don't like at all*) to happy (5 = *like very much*). A child's mean liking score was the average rating received by classmates. An extensive literature provides evidence of good validity and short-term stability for liking ratings for elementary grade children (Terry, 2000).

Academic self-efficacy—Children's perceived reading and math competencies were assessed with the Competence Beliefs and Subjective Task Values Questionnaire (Wigfield et al., 1997). The math and reading scales consist of 5 items each. Specifically, children were asked how good they were in that domain, how good they were relative to the other things they do, how good they were relative to other children, how well they expected to do in the future in that domain, and how good they thought they would be at learning something new in that domain. We followed Eccles, Wigfield, Harold, and Blumenfeld's (1993) recommendation to provide a graphic representation of the response scale for younger children. Specifically, children were asked to respond by pointing on a thermometer numbered 0 to 30. The end point and midpoint of each scale were also labeled with a verbal descriptor of the meaning of that scale point (e.g., the number 1 was labeled with the words "not at all good," or "one of the worst"; the number 15 was labeled with the words "ok", and the number 30 was labeled with the words "very good" or "one of the best"). Scores on reading and math competence are associated in expected directions with students' actual achievement, demographic variables, and student attitudes toward achievement (Wigfield et al., 1997). The internal consistency for our sample was .82 for Reading and .83 for Math. Because the reading and math scale scores were moderately correlated (.58), and to reduce the number of analyses, a composite Academic Self-Efficacy score was calculated as the average of the standardized reading and math scale scores..

Teacher-rated behavioral engagement—Teachers rated students' behavioral engagement with an 11-item questionnaire, adapted from Skinner, Zimmer-Gembeck, and Connell (1998), that assesses students' effort, persistence, concentration, and interest. Example items include "Tries hard to do well in school," "Concentrates on doing work," and "Participates in class discussion." Teachers were asked to indicate the extent to which each statement was true of their student on a 1 (*Not true at all*) to 4 (*Very true*) scale. Scores on the behavioral engagement scale have demonstrated evidence of factorial and criterion-related validity (Chen et al., 2010; Hughes, 2011). For the current sample, the internal consistency of behavioral engagement was .91 and .93 at Year 3 and Year 4, respectively.

Reading and math achievement—The Woodcock–Johnson III Tests of Achievement (WJ III; Woodcock et al., 2001) is an individually administered measure of academic achievement for individuals ages 2 to adulthood. For our purposes, we used the WJ III Broad Reading cluster scores (stemming from the WJ III Letter–Word Identification, Reading Fluency, and Passage Comprehension subtests) and the WJ III Broad Math cluster scores (stemming from the WJ III Calculations, Math Fluency, and Math Calculation Skills subtests). Internal consistency reliabilities for the Broad Reading Cluster scores and Broad Math Cluster scores for children age 10 for the standardization sample was .95 and .94, respectively (Woodcock et al., 2001). Extensive research provides evidence of the construct validity of the WJ III (Woodcock et al., 2001). Analyses were conducted with Rasch-based W scores, which are especially well suited to assessing changes in achievement. Children who had ever been in bilingual classrooms or who had ever been identified by the schools as Limited English Proficient or Spanish speaking were administered the Woodcock–Muñoz Language Test (Woodcock & Muñoz-Sandoval, 1993) to determine if they were more proficient in Spanish than in English. Children more proficient in Spanish (N = 70) were administered the Batería III, the Spanish version of the WJ III (Muñoz-Sandoval, Woodcock, McGrew, & Mather, 2005). The Batería III yields W scores for the Broad Reading and Broad Math cluster scores that are equated to those of the WJ III. The reliability coefficients from the Batería III calibration sample approximate those obtained from the WJ III norming sample (Schrank et al., 2005). Based on the correlation of the Broad Reading and Broad Math cluster scores (.58), a composite reading and math achievement composite was created as the mean of the standardized WJ III or Batería III Broad Reading and Broad Math W scores. Research supports the validity of scores obtained from the WJ III (McClelland et al., 2007; Woodcock et al., 2001) and the Batería III (Diamantopoulou, Pina, Valero-Garcia, González, & Fuentes, 2012; Schrank et al., 2005).

Data Analysis Approach

Multilevel modeling—Hierarchical linear modeling (HLM) was used to examine the effect of peer nominations of peer teacher support reputation (PTSR) and the classroom Centralization of Teacher Support on PAR, peer acceptance, academic self-efficacy, and teacher-rated behavioral engagement. HLM was utilized due to the nested structure of the sample (i.e., students are nested within teachers). The number of classroom was 286, and the average number of children per classroom was 12.46 (SD = 3.04). All two-level HLM models were fitted using SAS PROC MIXED routine (version. 6.11) with random intercepts, due to the small variance of the slope.

First, the intraclass correlation coefficients (ICC) at the teacher level (level 2) were computed for each child outcome to determine whether two-level multilevel modeling was needed to account for potential within classroom dependency or not. To achieve this determination, intercept-only models were specified in SAS. The ICC was .14, .29, .16, and .02 for PAR, peer acceptance, teacher-rated behavioral engagement, and academic self-efficacy, respectively. The ICCs indicated that for three child outcomes (PAR, peer acceptance, and teacher-rated behavioral engagement), students within classrooms were not independent, necessitating the use of multilevel models. Thus, we tested a set of two-level HLMs for these three child outcomes. Due to the lack of between-teacher variance, which

yielded a very low ICC, we tested a single-level analysis for academic self-efficacy. Continuous analysis variables were standardized to assist with meaningful interpretation of intercept and testing interaction effect.

Missing data handling—As is often true in longitudinal studies, not all participants had complete data. The bottom row in Table 1 lists the level of missingness for all study variables. The percentage of missing data ranged from 12% (for academic self-efficacy at Year 3) to 32% (for teacher-rated behavioral engagement at Year 4). To examine whether or not the extent to which missingness on the outcome variables was significantly related to scores on other study variables (i.e., PTSR and CTS) scores at time 4, baseline variables of the outcome, and reading and math scores), we conducted 32 sets of *F* tests. None of the outcome variables was significantly related to scores on other study variables. The maximum likelihood estimation method was used for estimating all models. Maximum likelihood borrows the observations available for each case to compute the likelihood function (Enders & Bandalos, 2001), allowing for proper adjustment for data that are missing at random on the outcomes.

Primary analyses—First, we investigated the main effects of PTSR (individual-level predictor) on the four child outcome variables (i.e., PAR, peer acceptance, teacher-rated behavioral engagement, and academic self-efficacy), controlling for the reading and math achievement scores and the corresponding outcome variable measured in Year 3 (i.e., the autoregressive effect). We then examined the moderating (first-level interaction) effects of PTSR with Year 4 achievement on the four child outcomes.

Second, we investigated the main effects of Centralization of Teacher Support nominations (classroom-level predictor) on the four child outcomes, controlling for children's individual-level PTSR in addition to Year 4 achievement and the corresponding outcome variable measured in Year 3. Next, we examined the moderating (cross-level interaction) effects of Centralization of Teacher Support with children's Year 4 achievement on the four child outcomes (removing Year 3 reading and math achievement as a covariate). Results are reported separately by predictor.

The two-level HLM model to test cross-level interaction (Centralization of Teacher Support × child's achievement) is presented below.

Level -1 Model (students):

$$Y_{ij}=\beta_{0j}+\beta_{1j}(\text{Child's achievement})+e_{ij} \quad (1)$$

Level -2 Model (classroom):

$$\begin{aligned}\beta_{0j}&=\gamma_{00}+\gamma_{01}\,(\text{Centralization of teacher support})+u_{0j}\\ \beta_{1j}&=\gamma_{10}+\gamma_{11}\,(\text{Centralization of teacher support})\end{aligned} \quad (2)$$

The variable, Y_{ij}, is the child outcome measured at Year 4. The subscript *i* and *j* represents the *i*-th student from the *j*-th classroom. The random error term, e_{ij} is assumed to be

normally distributed with variance equal to σ^2, which captures the within-student variation. The Level-2 model captures the between-classroom variation in the intercept as well as the regression coefficients of the classroom-level predictor (Centralization of Teacher Support). In Equation 2, γ_{01} tests that Centralization of Teacher Support would predict the level of outcomes at Year 4, controlling for the corresponding outcome measured at Year 3 and PTSR. γ_{10} tests that children's achievement would predict the level of outcomes at Year 4, controlling for the corresponding outcome measured at Year 3 and PTSR. γ_{11} tests that children's achievement would moderate relation between the Centralization of Teacher Support and the level of outcomes, controlling for the corresponding outcome measured at Year 3 and PTSR. Due to the small variance of the slope, we estimated between-teacher variation only in the intercept, $V(u_{0j}) = \tau_{00}$.

Third, we tested gender moderation of the associations between both PTSR and CTS and each outcome. Moderation was tested using multiple group analysis with M*plus* (version 7, Muthén & Muthén, 1998–2011). Due to the nested nature of the data, we used the Satorra–Bentler chi square difference test (Satorra & Bentler, 1994).

Results

Descriptive Statistics

The bivariate correlations and descriptive data (i.e., means and standard deviations) for all variables used in the hypothesized hierarchical linear models, obtained using listwise deletion, are presented in Table 1. Level of missingness for each variable is also reported in Table 1. Because the correlations do not take into account the multilevel data structure, results should be interpreted with caution. The variables were screened for normality and outliers. None of the variables exhibited levels of skewness or kurtosis associated with problematic tests of fit or standard errors in structural equation modeling (West, Finch, & Curran, 1995). Thus, maximum likelihood estimation was used. Outcome measures exhibited moderate stability, ranging from .37 for academic self-efficacy to .50 for behavioral engagement. Year 4 outcomes were all significantly correlated, with correlations ranging from .19 (PAR with academic self-efficacy) to .43 (peer acceptance with behavioral engagement). PAR also was significantly correlated with Reading and Math Achievement (. 36).

Effects of PTSR

We first tested the main effect of PTSR (as an individual-level predictor) on the four child outcomes (PAR, peer acceptance, teacher-rated behavioral engagement, and academic self-efficacy). In each analysis, we controlled for the effect of achievement scores and the corresponding outcome measure assessed in the previous year. As shown in Table 2, on average, PTSR is positively associated with PAR ($\gamma = 4.75$, $SE = 0.38$, $p < .001$), peer acceptance ($\gamma = 0.80$, $SE = 0.11$, $p < .001$), and teacher-rated behavioral engagement ($\gamma = 0.79$, $SE = 0.18$, $p < .001$). PTSR explains 18%, 11%, and 4% of the variance in the model for PAR, peer acceptance, and teacher-rated behavioral engagement, respectively.

We then examined whether children's Year 4 achievement moderated the effect of PTSR on child outcomes, controlling for the corresponding outcome measured at Year 3 (see bottom half of Table 2). We found a significant moderation effect of children's achievement on the relation between PTSR and PAR ($\gamma = 1.54$, $SE = 0.32$, $p < .001$) and peer acceptance ($\gamma = -0.28$, $SE = 0.09$, $p < .01$). This significant moderation effect of children's achievement explains 5% and 3% of the variance in the model for PAR and peer acceptance, respectively. The estimated relation between PTSR and both PAR and peer acceptance according to the levels of child's achievement are depicted in Figure 1 in Panel A and Panel B, respectively. As expected, for peer acceptance, students with lower achievement have a steeper slope relative to students with higher achievement. In other words, higher levels of PTSR protected children with lower achievement from low peer acceptance. Results for PAR were opposite those expected. Specifically, for PAR, students with higher achievement have a steeper slope relative to students with lower achievement. In other words, a higher level of PTSR was more predictive of PAR for children with higher ability than for students with lower ability.

Effects of Centralization of Teacher Support

We first tested the main effect of Centralization of Teacher Support (as a classroom-level predictor) on the four child outcomes (PAR, peer acceptance, teacher-rated behavioral engagement, and academic self-efficacy). In these analyses, we controlled for the effect of PTSR (individual level predictor) in addition to effect of Year 3 achievement scores and the corresponding outcome measure assessed in Year 3. As shown in Table 3, on average, Centralization of Teacher Support was negatively associated with PAR at Year 4 ($\gamma = -1.56$, $SE = 0.58$, $p = .008$). Centralization of Teacher Support explains 14% of the variance in PAR in the model.

We then examined whether children's Year 4 achievement (at the individual level) moderated the effect of the Centralization of Teacher Support (at the classroom level) on child outcomes at Year 4, controlling for the effect of PTSR and the corresponding outcome measured at Year 3 (see bottom half of table 3). We found a significant moderation (i.e., cross-level interaction) effect of children's achievement on the relation between Centralization of Teacher Support and PAR ($\gamma = 1.19$, $SE = 0.56$, $p = .035$). This significant moderation effect of children's achievement explains 6% of the variance in the model for PAR. The estimated relation between Centralization of Teacher Support and PAR by the levels of child's achievement is depicted in Figure 2. As hypothesized, students with lower achievement have a steeper negative slope for PAR, relative to students with higher achievement. In other words, in classrooms in which there is a higher level of group consensus as to who is preferred by the teacher and who is not, children with lower achievement are viewed by their peers as less academically capable than they are in classrooms where perceptions of teacher support are distributed more equitably across classmates.

Gender Differences

Multiple group analyses were conducted to test whether boys and girls differ in the relation between predictors and child outcomes using M*plus* (version 7, Muthén & Muthén, 1998–

2011). We first allowed the relation to vary between predictors and student outcomes across gender and then imposed equality constraints on these relations, sequentially. We used Satorra–Bentler chi-square difference tests and found no significant gender moderation effects on any of the child outcomes.

Interaction of PTSR and Centralization of Teacher Support

Finally, we tested the effect of the interaction between PTSR and Centralization of Teacher Support on each of the four outcomes. In these analyses, we controlled for prior achievement and the previous score on the outcomes as well as the main effects of PTSR and Centralization of Teacher Support. Contrary to expectations, the interaction term was not statistically significant for any of the outcomes, indicating that the effect of PTSR on outcomes was not moderated by Centralization of Teacher Support.

Discussion

Peer Reputation for Teacher Support

Consistent with social referencing theory (Hughes et al., 2001), children who are perceived by their classmates as experiencing an affectively positive relation with the teacher are better liked and considered more academically capable by classmates, above the child's measured academic ability and prior year's peer acceptance or peer academic reputation (PAR). To our knowledge, this article describes the first prospective study to investigate an effect of peer nominations of teacher–student support (PTSR) on dimensions of peer relatedness. It is also the first to assess an effect of PTSR on students' PAR. The findings support the view that classmates use observations of teacher–student interactions in making judgments not only about children's desirability as a friend but also about children's academic abilities. Based on prior research finding that PAR predicts improved academic self-concept and engagement in learning (Hughes et al., 2009; Chen et al., 2010; Gest et al., 2005), these findings suggest that PAR may be one pathway by which the teacher–student relationship influences children's academic trajectories. Partial support for this interpretation is provided by the finding that PTSR also predicted changes in children's teacher-rated behavioral engagement, a strong predictor of children's future achievement.

Our hypothesis that PTSR would predict academic self-efficacy was not supported. Prior research has found both child and teacher reports of teacher–student support predict students' academic self-efficacy (Hughes, 2011). Furthermore, consistent with symbolic interactionist theory (Harter, 1998), previous researchers have found that peers' perceptions of their academic ability predict their academic self-efficacy (Bouchey & Harter, 2005). Failure to find an effect for PTSR on academic self-efficacy may be due to the timing of the assessment of academic-self efficacy. Specifically, it is likely that PTSR indirectly affects academic self-efficacy via its direct effect on PAR. Thus, some interval of time between the measurement of PAR and academic self-efficacy may be necessary to detect a mediated effect. In the current study, PAR and academic self-efficacy were assessed concurrently.

The effects of PTSR on peer liking and PAR are moderated by the child's measured academic ability, but in contrasting ways. Consistent with a biasing effect of teacher support

on peer liking and evaluations of students (Hymel, 1986; Hughes et al., 2001), higher levels of PTSR protected children with lower academic ability from low peer acceptance. Unexpectedly, a higher level of PTSR was more predictive of PAR for higher ability students than for lower ability students. Attribution theory may help explain this counterintuitive finding. According to attribution theory (Weiner, 1974), students use information about teacher–student interactions to make inferences concerning their own and others' ability and effort. When students observe the teacher showing some forms of support to a lower ability students (e.g., expressing sympathy to students who are struggling, praising students who do well on easy tasks, or offering help), they may interpret the support as evidence of low ability (Weiner, Graham, Taylor, & Meyer, 1983). In two analog experimental studies, Graham and Barker (1990) found that children judged students who received teacher academic assistance as less capable than students who received no teacher assistance. Future research is needed to investigate classmates' interpretations of different forms of teacher–student support to students of differing ability.

Centralization of Teacher Support

In classrooms in which there is a higher level of group consensus as to who is preferred by the teacher and who is not (i.e., centralized perceptions of teacher support), children with a history of academic risk are viewed by their peers as less academically capable than they are in classrooms where perceptions of teacher support are distributed more equitably across classmates. The effect of the Centralization of Teacher Support on PAR was above the effects of prior levels of PAR as well as children's current scores on a measure of academic achievement and individual PTSR. Furthermore, the negative effect of Centralization of Teacher Support on PAR was stronger for children with lower measured academic ability. This finding suggests that when the provision of teacher support is more inclusive, or egalitarian, more students have the opportunity to be perceived by their peers in a positive light, leading to less rigid stratification of social and academic status. One would expect that in classrooms with a more hierarchical structure of teacher–student support, social and academic hierarchies would also be more hierarchical, as students would use information about teacher support to allocate social influence. Support for this reasoning is provided by supplementary analyses with the dataset where we found that centralization scores for peer nominations of teacher support and centralization scores for peer nominations of academic competence are modestly and positively correlated (.25).

The structure of peer perceptions of teacher support, however, did not predict peer ratings of liking, teacher-rated engagement, or academic self-efficacy. The null effect of Centralization of Teacher Support on peer liking may indicate that personal liking for students is less affected by classroom context measures than are perceptions of children's behavioral or academic characteristics, as suggested by Mikami, Gregory, Allen, Pianta, and Lun (2011). The null effects of the Centralization of Teacher Support on engagement and academic self-efficacy in the current study may be due to an insufficient interval of time for a change in PAR to influence students' academic self-views and engagement (Chen et al., 2010).

Reasoning that individual levels of peer-rated teacher support would be more salient—and beneficial—to students in classrooms with centralized teacher support structures, we

expected a significant interaction between PTSR and Centralization of Teacher Support. The null finding for the interaction may reflect a possible downside to being preferred by the teacher in classrooms in which classmates view the teacher as preferring a relatively small number of students (i.e., the teacher's pet phenomenon) that may offset any potential benefit.

Limitations and Future Directions

Study findings need to be interpreted in light of certain limitations. The correlations reported in Table 1 may be misleading due to the multilevel nature of the data. Importantly, because the sample was selected for the larger longitudinal study on the basis of educational risk in first grade, results may not generalize to samples representing the full range of literacy skills. A second significant limitation of the study is the lack of measures of observed teacher practices. Future research is needed to assess teacher practices associated with individual PTSR and with measures of the centralization, or hierarchical structure, of teacher support. Practices that promote academic status hierarchies (e.g., ability grouping and rewarding correct answers versus effort) may lead to hierarchical teacher support structures as well as to hierarchical academic and social status structures (Mikami et al., 2010). In classrooms with highly centralized perceptions of teacher support, students may view the teacher as unfair and resist the teacher's leadership (Chui, Lee, & Liang, 2013). Future research is also needed to determine if teacher support hierarchies are associated with other classroom peer dynamics, such as victimization.

Implications of Study Findings for School Psychology

Results of the current study suggest that students in a classroom rely on their observations of the affective quality of teachers' interactions with students to form judgments of classmates' likeability and academic competence. It is not expected that a teacher will like all children equally. Engaging in positive interactions with children who have behavior problems, including aggression and disruptive behavior, is a challenge for teachers. Without assistance, teachers may find it difficult to model warm and positive interactions with all students in the classroom.

Several studies have found that providing teachers with the opportunity to reflect on individualized feedback on specific classroom teaching interactions with a supportive consultant results in a more positive classroom social–emotional climate as well as improved student social and academic outcomes (Allen, Pianta, Gregory, Mikami, & Lun, 2011; Bygdeson-Larsson, 2006; Raver et al., 2009). Of particular interest are findings from a recent randomized trial of a classroom intervention that targeted teachers' positive interactions with children with ADHD as a means of improving peer inclusiveness for children with ADHD (Mikami et al., 2013). Specifically, teachers in both intervention groups received training in classroom management. In addition, teachers in the experimental treatment were instructed to develop positive, one-on-one relationships with all children, but especially children with behavioral compliance issues and to communicate "to the child and to peers that the teacher valued and enjoyed interacting with the child" (p. 105). Additionally, to avoid a status hierarchy in the classroom, teachers were instructed to provide corrective behavioral feedback privately, to publicly praise children for strengths

unrelated to behavior, to identify commonalities between students to foster friendships, and to set up collaborative activities. Children with ADHD improved more in the experimental condition than in the standard condition on peer sociometric ratings of liking, number of reciprocated friendships, and peer positive perceptions entered into a memory book.

Teachers vary in their knowledge of classroom peer ecologies and understanding of how their relationships with individual students as well as patterns across a class of students' impact peer relationships (Nurmi, 2012; Rodkin & Ryan, 2012). Consultants could draw teachers' attention to peer group dynamics and to the negative role of certain classroom approaches, such as ability grouping and an emphasis on competition and correct answers versus effort and improvement, on the peer ecology. Consultants could also help teachers to recognize opportunities to publically communicate valuing of all students and to make special efforts for low-status students to have the opportunity to occupy leadership positions and interact with higher status classmates.

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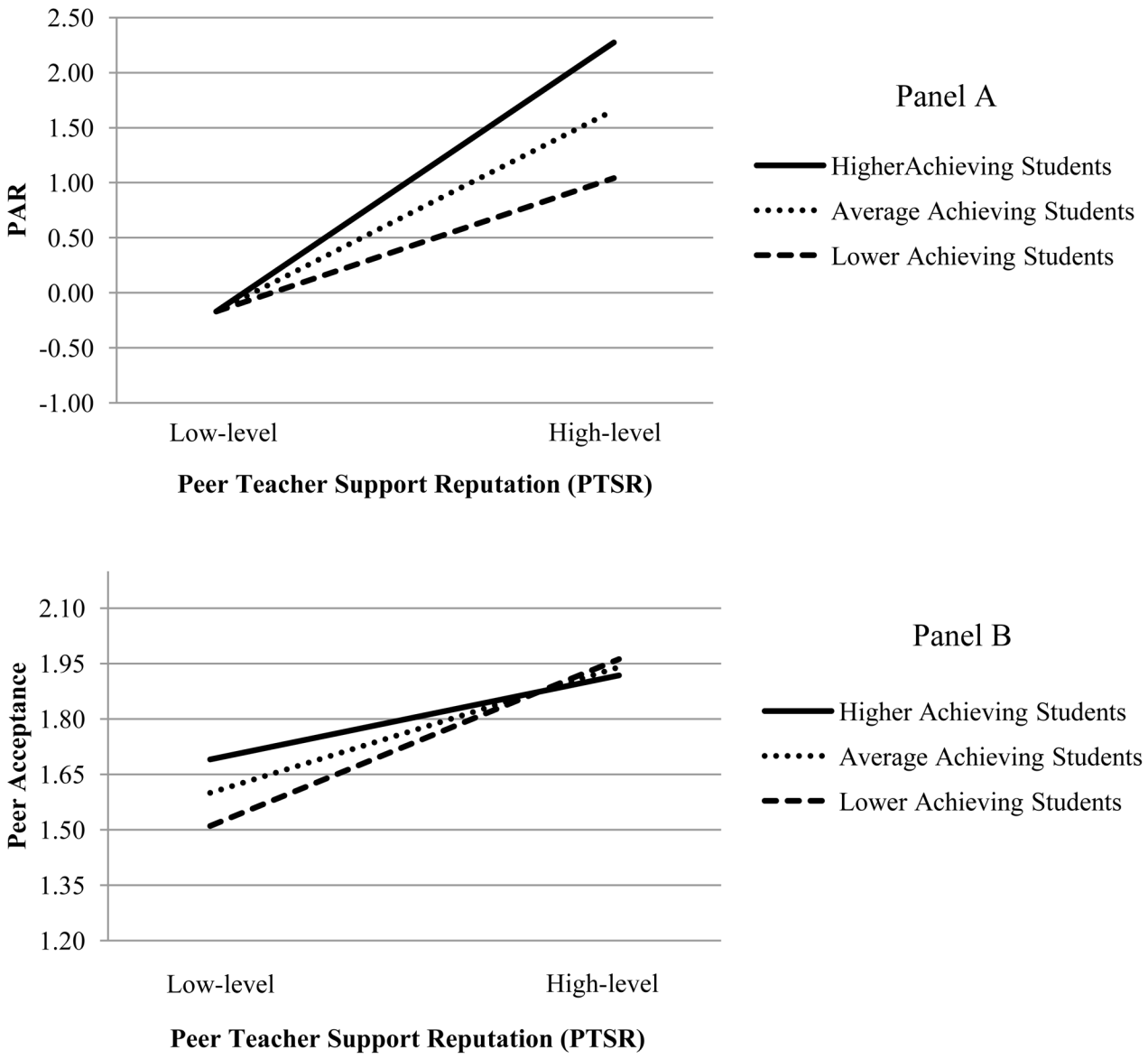

Figure 1.
Estimated relationship between peer teacher support reputation (PTSR) and PAR (Panel A) and peer acceptance (Panel B) for three different children's academic ability status

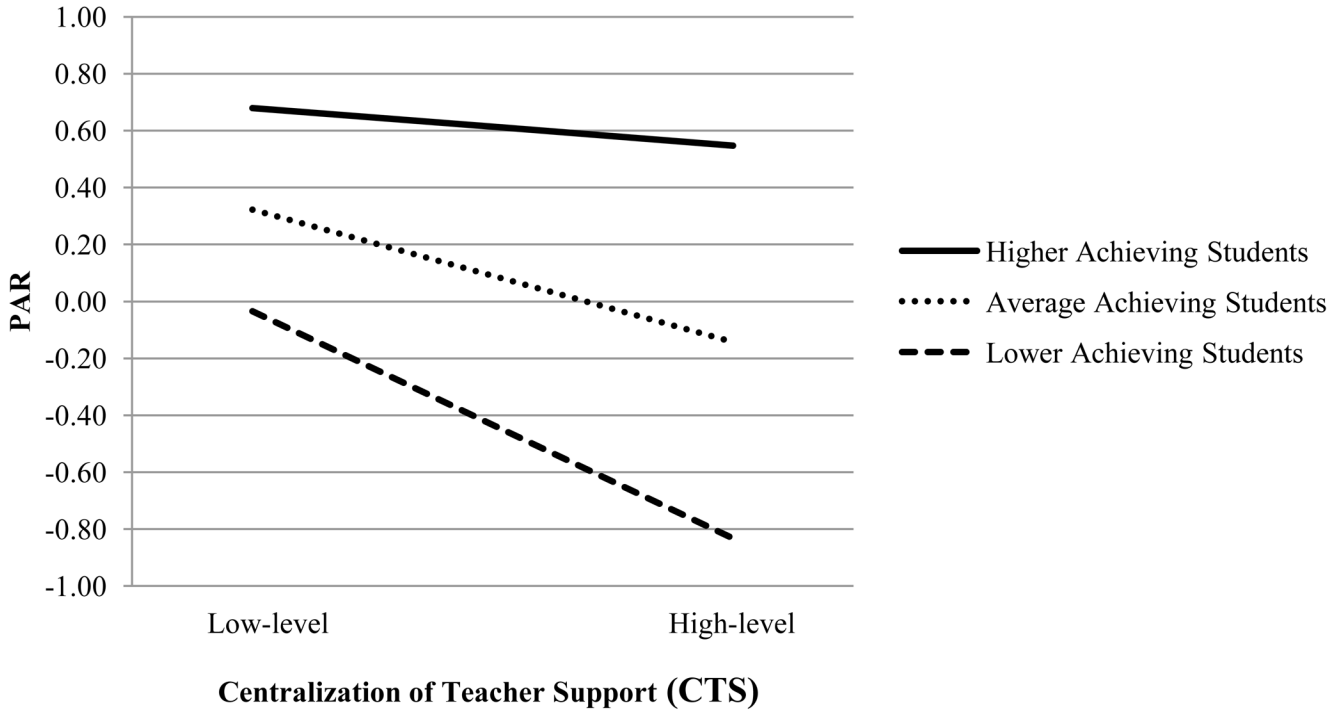

Figure 2.
Estimated relationship between centralization of teacher support (CTS) and peer academic reputation (PAR) for three different children's academic ability status

Table 1

Zero Order Correlations and Descriptive Statistics among Analysis Variables (N = 713)

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.
Correlation											
1. PTSR4	1.00										
2. CTS4	.00	1.00									
3. PAR3	.30	.05	1.00								
4. PAR4	.55	−.02	.53	1.00							
5. Peer Acceptance3	.20	.05	.33	.25	1.00						
6. Peer Acceptance4	.34	.07	.23	.29	.51	1.00					
7. Academic Self-efficacy3	.05	−.04	.17	.11	.07	−.08	1.00				
8. Academic Self-efficacy4	.05	−.03	.19	.19	.03	−.03	.37	1.00			
9. Behavioral Engagement3	.31	.02	.40	.35	.30	.26	.10	.14	1.00		
10. Behavioral Engagement4	.33	.07	.36	.43	.20	.33	.05	.13	.50	1.00	
11. Reading and Math Achievement4	.11	.23	.34	.36	.03	.05	.15	.20	.29	.28	1.00
Descriptive Statistics											
Mean	0.20	0.44	0.15	1.79	3.18	3.10	22.40	21.95	3.37	3.34	492.08
Std. Deviation	0.20	0.14	0.17	2.33	0.64	0.64	5.08	4.77	0.80	0.79	13.15
Missingness (%)	19%	20%	23%	19%	16%	19%	12%	14%	29%	32%	14%

Note. PTSR is Peer Teacher Support Reputation; CTS is Centralization for Teacher Support; PAR is Peer Academic Reputation. The number at the end of each variable indicates the study year when the variable was measured. Underlined correlations are significant at $p < .05$(two-tailed).

Table 2

Main and Interaction Effect of Peer Teacher Support Reputation (PTSR) on Peer Status and Student Academic Motivation Outcomes

	Outcome			
	PAR 4	Peer Acceptance 4	Behavioral Engagement 4	Academic Self-Efficacy 4
Effect	Est. (*SE*)	Est. (*SE*)	Est. (*SE*)	Est. (SE)
Model for Main Effect				
Intercept	0.11 (0.12)	1.62 (0.11)*	1.80 (0.15)*	14.37 (0.87)*
PTSR4	4.75 (0.38)*	0.80 (0.11)*	0.79 (0.18)*	0.45 (0.95)
Achievement4	0.45 (0.08)*	0.01 (0.02)	0.17 (0.04)*	0.72 (0.19)*
Outcome3	4.48 (0.47)*	0.41 (0.04)*	0.39 (0.05)*	0.33 (0.04)*
Model for Main and Interaction Effect				
Intercept	0.17 (0.12)	1.60 (0.11)*	1.80 (0.15)*	14.37 (0.88)*
PTSR4	4.57 (0.38)*	0.85 (0.11)*	0.79 (0.18)*	0.44 (0.96)
Achievement4	0.07 (0.11)	0.09 (0.03)*	0.18 (0.05)*	0.71 (0.29)*
PTSR4* Achievement4	1.54 (0.32)*	−0.28 (0.09)*	−0.05 (0.15)	0.03 (0.87)
Outcome3	4.14 (0.47)*	0.42 (0.04)*	0.39 (0.05)*	0.33 (0.04)*

Note. PTSR is Peer Teacher Support Reputation; CTS is Centralization for Teacher Support; PAR is Peer Academic Reputation. The number at the end of each variable indicates the study year when the variable was measured. Outcome3 refers to the baseline measure of the outcome.

* $p < .05$

Table 3

Main and Interaction Effect of Centralization for Teacher Support (CTS) on Peer Status and Student Academic Motivation Outcomes

	Outcome			
	PAR 4	Peer Acceptance 4	Behavioral Engagement 4	Academic Self-Efficacy 4
Effect	Est. (*SE*)	Est. (*SE*)	Est. (*SE*)	Est. (*SE*)
Model for Main Effect				
Intercept	0.81 (0.29)*	1.48 (0.14)*	1.86 (0.20)*	15.21 (1.14)*
CTS4	−1.56 (0.58)*	0.32 (0.20)	−0.11 (0.28)	−1.90 (1.45)
Achievement4	0.54 (0.08)*	0.01 (0.02)	0.16 (0.04)*	0.76 (0.20)*
PTSR4	4.75 (0.38)*	0.79 (0.11)*	0.74 (0.18)*	0.32 (0.95)
Outcome3	4.39 (0.47)*	0.41 (0.04)*	0.39 (0.05)*	0.33 (0.04)*
Model for Main and Interaction Effect				
Intercept	0.82 (0.29)*	1.48 (0.14)*	1.86 (0.20)*	15.21 (1.14)*
CTS4	−1.66 (0.58)*	0.33 (0.20)	−0.11 (0.28)	−1.91 (1.45)
Achievement4	0.05 (0.25)	0.03 (0.08)	0.16 (0.11)	0.71 (0.64)
CTS4* Achievement4	1.19 (0.56)*	−0.04 (0.18)	0.00 (0.27)	0.12 (1.47)
PTSR4	4.75 (0.38)*	0.79 (0.11)*	0.74 (0.18)*	0.32 (0.96)
Outcome3	4.34 (0.47)*	0.41 (0.04)*	0.39 (0.05)*	0.33 (0.04)*

Note. PTSR is Peer Teacher Support Reputation; CTS is Centralization for Teacher Support; PAR is Peer Academic Reputation. The number at the end of each variable indicates the study year when the variable was measured. Outcome3 refers to the baseline measure of the outcome.

* $p < .05$