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Hernández, Maciel
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Emotional Expression in School Context, Social Relationships, and Academic Adjustment in Kindergarten

Maciel M. Hernández[1], **Nancy Eisenberg**[1], **Carlos Valiente**[2], **Sarah K. VanSchyndel**[1], **Tracy L. Spinrad**[2], **Kassondra M. Silva**[2], **Rebecca H. Berger**[2], **Anjolii Diaz**[3], **Nathan Terrell**[2], **Marilyn S. Thompson**[2], and **Jody Southworth**[2]

[1]Department of Psychology, Arizona State University

[2]T. Denny Sanford School of Social and Family Dynamics, Arizona State University

[3]Department of Psychological Sciences, Ball State University

Abstract

This study evaluated direct relations of both kindergarteners' ($N = 301$) naturalistically observed emotion in two different school contexts and early kindergarten verbal competence to academic adjustment (i.e., standardized measures of academic achievement, teacher-reported academic skills, teacher-reported and observed school engagement) and if these relations were mediated by teacher-reported conflict with students and by peer acceptance. When controlling for verbal competence, positive emotions expressed in the classroom context positively directly predicted academic skills, whereas positive emotions expressed outside class (lunch/recess) negatively predicted academic skills. Negative emotions observed in the classroom context and during lunch/recess negatively predicted academic achievement. Positive emotions observed in both contexts indirectly predicted higher school engagement through its positive relation to peer acceptance; positive emotions expressed in lunch and recess indirectly predicted higher school engagement via lower teacher–student conflict. Negative emotions observed in both contexts also indirectly predicted lower school engagement via higher teacher–student conflict. Furthermore, verbal competence indirectly predicted higher academic adjustment via lower teacher–student conflict. Moreover, verbal competence moderated the association between peer acceptance (but not teacher–student conflict) and academic adjustment. Because verbal competence moderated the associations from peer competence, positive emotions in both contexts indirectly predicted higher academic adjustment via higher peer acceptance primarily for children with low, but not high, initial verbal competence.

Correspondence concerning this article should be addressed to Maciel M. Hernández, Department of Psychology, P.O. Box 871104, Arizona State University, Tempe, AZ 85287-1104. maciel.hernandez@asu.edu.

During the transition to school, children experience an environment with new norms, routines, and people (Rimm-Kauffman & Pianta, 2000). How students adapt to kindergarten can have implications for academic and social trajectories (Denham et al., 2012; Ladd, Birch, & Buhs, 1999; Rimm-Kauffman & Pianta, 2000). Although negative, and less so positive, emotional expressivity has been associated with socioemotional outcomes (Sallquist et al., 2009), there is a dearth of research on how emotions exhibited at school relate to academic performance and relationships in school (Denham et al., 2012). Understanding the interpersonal mechanisms by which emotional expressivity relates to academic adjustment has implications for promoting optimal conditions for academic success (Valiente et al., 2013). In addition, academic preparedness (i.e., early verbal competence) is a precursor to continued academic competence (Silva & Cain, 2015); thus, exploring how markers of academic preparedness facilitate the quality of relationships in school could inform an understanding of academic development (McEachern & Snyder, 2012). In this study, as depicted in Figure 1, we sought to evaluate (1) whether children's emotion expressivity in the classroom (Path B) or lunch/recess (Path D), as well early kindergarten verbal competence (herein termed verbal competence; Path G), had main effects on academic adjustment, (2) whether social relationships at school with peers and teachers mediated the associations between emotion expressivity in school (Paths A & H and Paths C & H) or verbal competence (Paths E & H) and academic adjustment, (3) whether the magnitude of the effects by emotion expressivity varied by context, and (4) whether verbal competence moderated the associations between social relationships at school and academic adjustment (Path F).

Emotional Expressivity and Academic Adjustment

Few investigators have examined, but theory suggests, that emotional expressivity relates to academic development, in part by affecting engagement in learning tasks (Linnenbrink, 2006; Valiente, Swanson, & Eisenberg, 2012). According to the broaden-and-build theory, positive emotions (e.g., happiness, excitement) encourage approach behaviors that contribute to learning, such as exploration and creativity (Fredrickson, 2001). Positive affective temperament during infancy, for example, has been positively related to expressive language in toddlers (Laake & Bridgett, 2014). Relatedly, positive emotion expressivity during an academic task has predicted higher kindergarten academic skills (Sirotkin, Denham, Bassett, & Zinsser, 2013). However, researchers have not always found direct predictions from positive expressivity to academic outcomes (Denham et al., 2012; Herndon, Bailey, Shewark, Denham, & Bassett, 2013; Lewis, Huebner, Reschly, & Valois, 2009), possibly due to the moderating role of context. Null findings could result from the use of observers' reports of emotion in limited school settings (e.g., not during instruction; Denham et al., 2012; Herndon et al., 2013) or teachers' or self-reports of general positive or negative affect (Lewis et al., 2009), thereby not focusing on positive emotions expressed in classrooms which is more proximal to learning tasks than are other school settings. We hypothesized that positive emotion expressed in class (Path B) would predict greater academic adjustment at greater magnitude than positive emotion during lunch and recess (Path D) because positive emotion in class is expressed during academic tasks. Positive emotion at lunch/

recess, however, may primarily reflect enjoyment of peers or more intense, dysregulated positive emotion (given the lesser structure in peer settings).

In contrast to positive expressivity, expressing negative emotions may limit attention and interest (Fredrickson, 2001). Lewis et al. (2009) found that self-reported negative (but not positive) emotion frequency predicted lower grade point average (GPA) among 7th to 10th graders. Moreover, Denham et al. (2012) reported that more negatively expressive preschoolers had lower kindergarten achievement and engagement. Similarly, teachers' reports of children's anger expressions have been negatively associated with engagement in kindergartners (Valiente, Swanson, & Lemery-Chalfant, 2012). However, these studies have not considered the school context. Negative expressivity in class might be especially disruptive to learning outcomes (Path B); alternatively, negative expressivity during class and during lunch and recess (Paths B, D) might similarly (i.e., have equal effects in magnitude) and negatively predict academic outcomes because negative expressivity is disruptive and might undermine the quality of relationships at school (see below).

Mediating Role of Social Relationships in School

Individuals' emotions are thought to promote or undermine bonds with people; negative emotion expressions in particular are often associated with difficult interpersonal relationships or reduced social interaction (Eisenberg et al., 1999; Vygotsky, 1978). Furthermore, problematic relationships may create a stressful social environment that renders academic tasks more difficult (Pianta & Stuhlman, 2004; Spilt, Hughes, Wu, & Kwok, 2012). Children's emotion expressions in the classroom—where children interact with teachers more than outside the classroom and peer interactions are supervised—may especially predict teacher–student relationship quality (Path A), which in turn is likely to predict academic adjustment. In contrast, emotion expressivity at lunch and recess—where peers interact to a greater degree and with less adult supervision—may be especially predictive of peer relationships (Path C) and might indirectly predict academic adjustment (Path H).

In addition to examining prediction by emotional expressivity in school contexts, we evaluated the verbal competence of kindergartners early in the first semester of school as another aspect of expression/communication at school. Verbal competence is a marker of school readiness and is positively associated with later academic adjustment (e.g., Silva & Cain, 2015) and the quality of social interactions at school (e.g., Justice, Cottone, Mashburn, & Rimm-Kaufman, 2008; McEachern & Snyder, 2012). Thus, verbal competence was expected to predict academic adjustment (Path G) and social relationships in school (Path E); also, social relationships in school were expected to mediate the association between verbal competence and academic adjustment.

Teacher–student conflict as a mediator

Students who exhibit positive emotions are less likely, whereas those who exhibit more negative emotions are more likely, to encounter conflict with others, including with teachers (Eisenberg et al., 1999; Valiente, Swanson, & Lemery-Chalfant, 2012). Relatively intense negative emotion expressions are thought to disrupt children's capacity to cooperate and,

thus, might undermine the quality of behavior at school and relationships with teachers. However, the empirical evidence, based on a limited number of studies, is mixed regarding the extent to which children's expressed emotions, especially positive emotions, predict teacher–student relationship quality. For example, Ladd et al. (1999) found that behaviors closely linked to negative emotions (e.g., aggression, hostility), but not behaviors linked to positive or neutral emotions (e.g., non-hostility, cooperative play), predicted teacher–student conflict in kindergarten. Furthermore, Valiente, Swanson, and Lemery-Chalfant (2012) reported that kindergarteners' teacher- and parent-reported anger were negatively related to teacher-reported teacher–student relationship quality (i.e., high closeness, low conflict). In a study of 7th to 10th grade students, adolescents' reports of positive affect in school were positively correlated, and reports of negative affect were negatively correlated, with perceived teacher–student relationship quality (Reschly, Huebner, Appleton, & Antaramian, 2008). However, in a similar study, only self-reported positive affect, but not negative affect, uniquely predicted teacher–student relationship quality among adolescents (Lewis et al., 2009).

There is strong evidence that teacher–student relationship quality has implications for academic adjustment (e.g., Juvonen, 2006; Pianta & Stuhlman, 2004). Teacher–student conflict has been associated with lower levels of children's cooperative participation (Birch & Ladd, 1997; Ladd et al., 1999), school liking (Birch & Ladd, 1997; Silva et al., 2011), teacher-reported engagement in kindergarten (controlling for prior engagement; Portilla, Ballard, Adler, Boyce, & Obradovi, 2014), and achievement on standardized tests (controlling for earlier achievement; Spilt et al., 2012; Valiente, Lemery-Chalfant, Swanson, & Reiser, 2008).

An alternative proposal – often unexamined – is that academic-related skills predict later teacher–student relationship quality (Path E). Children who have higher verbal skills may have an easier time engaging with school tasks and have fewer problems with teachers because their stronger basis for communication may ease social and academic tasks in school (Justice et al., 2008). Spilt et al. (2012) reported significant correlations between (but did not test the prediction of) 1st grade achievement and teacher–student conflict from 2nd to 5th grades. Furthermore, Maldonado-Carreño and Votruba-Drzal (2011) tested a rigorous model of growth in teacher–student relationship quality predicting growth in academic skills from kindergarten to 5th grade, but an alternative model that initial academic skills may predict growth in teacher–student relationship quality was not tested. In order to address this alternative hypothesis, we examined whether earlier verbal competence negatively predicted later teacher–student conflict (Path E).

On the basis of the research literature and prior theorizing, we expected teacher–student conflict to mediate the association between emotional expressivity and academic adjustment. Positive expressivity—perhaps especially in class (Path A)—was hypothesized to predict relatively low teacher–student conflict, and conflict, in turn, was expected to negatively predict academic adjustment (Path H). Additionally, because negative expressivity in class likely is disruptive and salient to teachers, it was expected to predict low academic adjustment via poor relationships with teachers. Furthermore, we hypothesized that children's emotional expressivity during lunch and recess (Path C) might not relate to low

academic adjustment (Path H) via conflict with teachers because teachers may be less aware of, and impacted by, these emotional displays. However, if teachers are aware of negativity at lunch and recess, this could foster student-teacher conflict. We also tested a hypothesis that verbal competence (a basis for social skills) would negatively predict teacher–student conflict (Path E), which would negatively predict later academic adjustment (Path H).

Peer acceptance as a mediator

Peers co-construct their school environment and scaffold learning opportunities (Vygotsky, 1978; Wentzel & Watkins, 2002). There is some evidence that children's emotional expressions relate to the quality of peer interactions (see Doughterty, 2006, for a meta-analysis on positive and negative emotionality [experience and observed]; Rubin, Bukowski, & Parker, 2006; Valiente, Swanson, & Lemery-Chalfant, 2012). Children who are reported or observed expressing high levels of negative emotion tend to be relatively low in peer liking/status and social competence (e.g., Ladd et al., 1999; Maszk, Eisenberg, & Guthrie, 1999). Also, observed and reported positive emotionality has been positively associated with social competence (Sallquist, DiDonato, Hanish, Martin, & Fabes, 2012; Spinrad et al., 2004).

Nonetheless, negative emotionality may be inconsistently related to peer acceptance. Among peers, negative expressivity (especially anger) can sometimes be an sign of dominance and controversial social status (i.e., children being liked by some peers and disliked by others; Ladd, 2005). Aggression is also sometimes associated with high peer status (Ladd, 2005). Thus, negative emotion expressions closely related to aggression, especially in a peer context with less adult supervision (i.e., during lunch and recess), may not predict peer acceptance (Path C).

Children who feel accepted by their peers might be likely to engage in academic tasks (Path H). Well-liked, socially competent children tend to be cooperative and exhibit academic competence (Ladd et al., 1999; Rubin et al., 2006; Valiente et al., 2008; Zhou, Main, & Wang, 2010), as well as positive school attitudes (Eggum-Wilkens et al., 2014; Juvonen, 2006; Ladd, 2005; Wentzel & Watkins, 2002). Conversely, children not accepted by their peers are at higher risk for academic difficulties (Buhs & Ladd, 2001; Rubin et al., 2006). Peer acceptance, however, has been more consistently related to grades than standardized test scores (Wentzel & Watkins, 2002), possibly because grades better reflect ongoing behavior at school.

A few researchers have tested for reciprocal associations between academic indices and social competence. Welsh, Parke, Widaman, and O'Neil (2001) found that academic competence in 1st grade positively predicted peer social competence (e.g., being liked by peers) in 2nd grade; furthermore, social competence in 2nd grade positively predicted academic competence in 3rd grade. In a study by Zhou et al. (2010), however, GPA did not predict later social competence and Eggum-Wilkens et al. (2014) reported that preschool verbal competence did not correlate with peer play. Furthermore, McEachern and Snyder (2012) observed that verbal competence was correlated with, but did not predict, social competence. Thus, there is more evidence that peer and social competence predict academic adjustment (Path H) than the reverse (Path E).

The Moderating Role of Early Kindergarten Verbal Competence

As reviewed, social relationships in school are associated with academic adjustment (Path H; e.g., Eggum-Wilkens et al., 2014; Portilla et al., 2014); however, this association might be weakest for children who show high initial academic-related skills (Path F). Children who have high verbal competence are expected to have a smoother adjustment to academic-related demands (Silva & Cain, 2015). Conversely, children with lower verbal competence levels may benefit (or be impaired) most from positive (or negative) social relationships in school – including with teachers and peers who help scaffold children's learning experiences. For example, Cadima, Leal, and Burchinal (2010) found that classroom organization predicted higher academic skills for kindergarteners with lower, but not higher, prior achievement. Thus, prior levels of the academic-related skills may modify the association between socio-emotional factors in school and later developmental outcomes. Although a tentative hypothesis, we also predicted that the associations between teacher–student conflict or peer acceptance and academic adjustment would be strongest for children with lower verbal competence. Accordingly, we expected a moderated indirect pathway whereby teacher–student conflict and peer acceptance would mediate the predicted associations between positive or negative expressivity and academic adjustment most strongly for children with lower verbal competence.

The Present Study

In the present study, we examined whether emotions expressed at school in classroom and lunch/recess contexts differentially predicted social relationships and academic adjustment. We used multi-informant reports to reduce shared method variance biases and provide a stronger test of study hypotheses. Furthermore, we observed expressions of emotion in both the classroom and during lunch and recess, as well as classroom engagement. Moreover, we used a short-term longitudinal design based on variables observed or assessed in the fall and spring semesters.

Based on the research reviewed, in addition to direct relations of children's expressivity to academic adjustment (Paths B & D), we expected positive and negative expressivity to predict low and high conflict with teachers (Path A & C), respectively, which in turn would negatively predict academic adjustment (Path H). We expected pathways involving teacher–student conflict to be especially evident for positive and negative expressivity in classrooms (Path A) and perhaps for negative expressivity in lunch and recess (Path C) and, thus, tested unique prediction by emotional expressivity in the two school contexts. Furthermore, we expected verbal competence to directly predict higher academic adjustment (Path G) and to negatively predict teacher–student conflict (Path E), which would in turn also predict later academic adjustment (Path H). Regarding peer acceptance, we expected that positive and negative emotion expressivity, especially at lunch and recess (Path C), would positively and negatively predict peer acceptance, respectively, which in turn would positively predict academic skills and school engagement (Path H). We did not expect verbal competence to predict peer acceptance (Path E). Furthermore, we predicted that the association of both teacher–student conflict and peer acceptance to academic adjustment would be strongest for children with lower verbal competence (Path F), and thus expected that verbal competence

would moderate the mediated pathway from positive or negative expressivity to academic adjustment via peer acceptance and/or teacher conflict.

Method

Participants

Participants were kindergarteners ($N = 301$; 52% girls; $M_{age} = 5.48$ years, $SD_{age} = 0.35$ years) from five schools in a southwestern metropolitan area in the United States. Two cohorts of children were drawn from 26 classrooms at the beginning of the school year, one year apart. Of 541 children in the 26 classrooms, 301 parents provided consent for their children to participate in the study; an additional 34 children contributed to only peer nominations. The recruitment rate (301 children or 56% of the potential sample) was typical of similar studies of young children (e.g., McClelland et al., 2007). Participating children were from various ethnic backgrounds (53% Hispanic, 34% White, 3% Asian, 2% American Indian/Alaska Native backgrounds, 2% Black, 1% Other, 6% Unknown [percentages are rounded]) and had parents with varied education (30% of mothers and 39% of fathers completed high school or less, 31% of mothers and 24% of fathers attended some college, and 39% of mothers and 37% of fathers graduated from college) and income (average: $50,000 to $69,999; range: > $9,999 to $100,000+). Teachers used English during instruction, with the exception of two dual language (English/Spanish) instruction classrooms. Among participants of Hispanic background, English was primarily the home language of preference (84% English, 16% Spanish[1]).

Procedure

Teachers received a questionnaire for each participating child during the spring semester, assessing children's social relationships in school, academic skills, and school engagement. Observers rated children's expressivity at school and engagement in class. Observers received several weeks of training, which included rating child interactions in pre-coded videos and/or in pilot preschool settings. Bi-weekly checks of validity were made for agreement with the coding supervisor. Observers coded children's engagement in the classroom setting and children's emotions in the classroom and at lunch or recess. Observations were conducted 2 to 3 times each week for 9 to 12 weeks, depending on the number of children in the class, in the fall and spring semesters. Each child was observed by 2 or 3 different observers. Observers had a list of participants for each class and coded (on a score sheet) a child's emotional expressivity after each 30-s observation. The first child observed was randomly selected and individual children were not coded again until the entire list of children, if present, was coded.

A separate group of research assistants administered standardized assessments of verbal competence and achievement in designated rooms in the latter part of the fall and spring semesters, respectively, and collected peer nominations from participants and peers in the

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[1]Language competence scores (based on Woodcock-Johnson III picture vocabulary test) of Hispanic children from Spanish-speaking households were lower compared to those from English-speaking households, $t(159) = 6.58$, $p < .001$. We included a covariate indicating Spanish-speaking households instead of ethnicity in our analyses. Using the Spanish-speaking household variable as a covariate resulted in the same pattern of results when we used the ethnic background variable as a covariate.

latter part of the fall semester. Research assistants attended two 2.5-hr trainings per week for five weeks before data collection started. During these training sessions, research assistants received instruction on how to administer the peer nomination and standardized assessments as described in the Woodcock-Johnson III Examiner's Manual (Mather & Woodcock, 2001). Research assistants obtained verbal assent from the child before beginning each assessment session.

Measures

Positive and negative expressivity at school—Observers rated the intensity, frequency, and duration of children's positive (e.g., happiness, joy, excitement) and negative (e.g., anger, frustration, sadness) expressivity exhibited in class (e.g., classroom, art/music lab, library) and during lunch and recess in the fall semester. The majority (88%) of classroom observations were conducted in the regular classroom (as opposed to art/music lab and library) and lunch and recess observations were conducted in lunch (51%) and recess (49%). Positive expressivity refers to expressions of happiness, joy, excitement, amusement, pride, positive anticipation, and awe [not differentiating among these emotions], as demonstrated by the following indicators: smiles, cheeks raised, eyes squinted in an intense smile or wide and bright when excited or joyful, jumping up and down, and chest and head up and upbeat tone and/or laughter. Expressions of negative emotion included pouted lips, lips downturned in a frown, behavior (e.g., brows down or arched in sadness, crying), vocal tone (e.g., whiny) and content (e.g., "S/he made me feel bad"), vocalizations (e.g., slow, gentle sighs). Emotion was coded on prepared code sheets as follows: $0 = $ *no evidence of emotion*; $1 = $ *minimal evidence* (e.g., emotion indicator seen once, small intensity and brief [< 3 s]); $2 = $ *moderate evidence* (e.g., two indicators of emotion, small intensity, and brief; one indicator of emotion, small intensity, lasting 4 to 9 s; one indicator, medium intensity, lasting < 5 s); $3 = $ *strong evidence* (e.g., three or more indicators, small intensity, and brief; two or more indicators, medium intensity; one or more indicators, small intensity, lasting more than 10 s; one or more emotional displays, medium intensity, lasting more than 5 s; any high intensity indicator). This observation method has been used in prior research (e.g., Fabes, Leonard, Kupanoff, & Martin, 2001; Spinrad et al., 2004). Reliability ratings were obtained from pre-coded videos (only used for reliability purposes for the second study cohort) and randomly selected live observations (10% of all observations) rated simultaneously with supervisors. Inter-observer reliabilities (intraclass correlations [ICC]) were .96 for both types of emotion. For each child, observers' ratings were averaged across all observations for each emotion in the classroom ($M_{time} = $ 40 min 24 s, $SD_{time} = $ 13 min 47 s) or at lunch and recess ($M_{time} = $ 20 min 26 s, $SD_{time} = $ 7 min 5 s), representing emotion expressivity levels in a specific school setting. Each child had at least 10 minutes worth of observation segments for classroom and 10 minutes for lunch/recess.

Early kindergarten verbal competence—Verbal competence was assessed with the Woodcock-Johnson III Tests of Achievement picture vocabulary subtest (Woodcock, McGrew, & Mather, 2001), administered in the latter part of the fall semester in English or Spanish (seven children completed the assessment in Spanish). W scores were used in all analyses and have shown adequate reliability (e.g., reliability coefficient of .76 for 5-year-olds; McGrew & Woodcock, 2001).

Teacher–student relationship conflict—In the latter part of the spring semester, teachers rated (1 = *definitely does not apply*; 5 = *definitely applies*) teacher–student conflict (7 items, e.g., "This child and I always seem to be struggling with each other," α = .90), from the Student–Teacher Relationship Scale (Pianta, Steinberg, & Rollins, 1995). This measure has been used in previous studies, showing strong psychometric properties and stability over time (Birch & Ladd, 1997; Portilla et al., 2014).

Peer acceptance—Peer acceptance was assessed using peer nominations from participating children ($N = 301$) in the second half of the fall semester. An additional 34 peers provided peer nominations in the fall but were not part of the larger study. Children were asked to name three children in their class they played with the most. Nominations were scored based on order selected (3 = *first*, 2 = *second*, 1 = *third*, 0 = *no nomination*), which were summed, divided by the number of children who provided nominations (on average, 12.46 peers provided nominations per child). Z-scores were calculated based on scores for each classroom. A higher score represents being nominated more as a playmate. Previous studies have established the stability and reliability of measures obtained through similar procedures (Hymel, 1983).

Academic achievement—Academic achievement was assessed with the Woodcock-Johnson III Tests of Achievement, which has adequate reliability (e.g., reliability coefficients of .96 [passage comprehension] and .92 [applied problems] for 5-year-olds; McGrew & Woodcock, 2001). In the latter part of the spring semester, students completed the passage comprehension (i.e., reading) and applied problems (i.e., math) subsets in either English or Spanish (one child completed the assessment in Spanish). Raw test scores were converted to W scores representing equal-interval units in a Rasch scale. Passage comprehension and applied problem scores were correlated, $r(289) = .53$, $p < .001$.

Academic skills—Teachers rated children's reading, math, spelling, and language skills in the latter part of spring semester (1 = *far below grade level* to 5 = *far above grade level*; 4 items; α = .97; rs(286–287) = .82–.92, ps < .001). Previous studies have established the reliability of measures obtained through similar procedures (Iyer, Kochenderfer-Ladd, Eisenberg, & Thompson, 2010).

School engagement—School engagement was assessed using three measures, based on prior research regarding cognitive, affective, and behavioral engagement (see Wang & Degol, 2014). Teachers rated (1 = *does not apply*, 2 = *applies sometimes*, 3 = *certainly applies*), in the latter part of the spring semester, children's school liking (7 items; e.g., "This child enjoys most classroom activities," α = .87) and cooperation (7 items; e.g., "This child follows a teacher's directions," α = .90), using the Teacher Rating Scale of School Adjustment (Birch & Ladd, 1997). The scale items were averaged (after reversing items as appropriate) for each scale.

Observers rated children's engagement exhibited in class during the spring semester. Engagement was measured as the degree to which the child participated in academic-related activities (e.g., lectures, group tasks, test taking, story time). The engagement observation coding system was created for the current study and based on similar child engagement

categories from the Classroom Observation System for Kindergarten (La Paro, Rimm-Kaufman, & Pianta, 2006). Children were observed in 30-s intervals and rated for engagement if they were working on an academic task. Engagement was coded as follows: 0 = *no evidence of engagement* (e.g., not paying attention, not participating, off-task behaviors); 1 = *minimally or passively engaged* (e.g., paying attention but not participating); 2 = *moderately engaged* (e.g., attends to the teacher during at least half of observation or attends to the teacher during the majority of the observation but becomes disruptive); 3 = *highly engaged* (e.g., attends to the teacher during the majority of the observation, is not disruptive). Reliability ratings were obtained from pre-coded videos that were used for reliability purposes starting in the second year of the study and randomly selected live observations (9% of all observations), simultaneously rated by a second observer (ICC = .93). Scores were averaged across all observations (M_{time} = 32 min 27 s, SD_{time} = 10 min 32 s), representing observed engagement in the classroom.

Covariates—Age, ethnicity (0 = white, non-Hispanic; 1 = ethnic minority [i.e., Hispanic, Asian, American Indian/Alaska Native, Black, multi-ethnic]), sex (0 = girl; 1 = boy), and socioeconomic status (SES) were used as control variables. SES was a computed by averaging the z-scores of family income and parents' education ($t(230)$ = .67, $p < .001$).

Results

Table 1 provides the descriptive statistics for the study variables. Although not displayed, *t* tests for non-independent samples indicated that, on average, students displayed higher levels of positive, $t(287)$ = −28.11, $p < .001$, and negative emotion, $t(268)$ = −5.03, $p < .001$, during lunch and recess than in the classroom. Moreover, they displayed more positive than negative emotion when in classes, $t(300)$ = 38.02, $p < .001$, or at lunch and recess, $t(268)$ = 43.65, $p < .001$. Before testing our proposed models, we examined the percent of missing data at the measure level, which was minimal (from 0 to 5%; there was a 94% response rate for teachers). Children who had missing data on some spring measures, compared to those who did have data in the spring, did not differ on variables measured in the fall semester, based on *t* tests. Next, we evaluated the measurement properties of our study variables in a structural equation modeling (SEM) framework using M*plus* (Muthén & Muthén, 1998–2014). We used the 'Type = Complex' analysis command to account for the non-independence of observations due to clustering of data by classroom (ICCs for study variables ranged from 0 to .25) and full information maximum likelihood estimation with robust standard errors (MLR), to account for missing data and estimate standard errors robust to non-independence of observations when using 'Type = Complex'. Finally, we used structural models to test the specified direct, mediated, and moderated relations.

Confirmatory Factor Analysis (CFA)

We first identified a measurement model that examined the degree to which each manifest variable loaded on the appropriate latent factor (i.e., academic achievement, academic skills, engagement, and teacher–student conflict). The CFA with all latent variables showed good fit to the data: MLR χ^2 (48) = 67.23, $p < .05$, CFI = .99, RMSEA = .04, 90% CI [.01, .06]. The academic skills latent variable, composed of four teacher-rated items as indicators, had

significant standardized factor loadings (.89 to .96). The academic achievement latent variable was composed of passage comprehension and applied problem scores as indicators and had significant standardized loadings (.80 and .66). For the school engagement latent variable, the school liking scale, cooperation scale, and observed school engagement scores had significant standardized loadings (.51 to .90). Three parcels were created by randomly grouping and averaging the seven items on teacher–student conflict (Little, Cunningham, Shahar, & Widaman, 2002). These three parcels were used as indicators for the latent factor of teacher–student conflict, with significant factor loadings (.78 to .92).

Correlations among Latent and Manifest Variables

Positive emotion in the classroom was positively correlated with academic skills and peer acceptance, and positive emotion in lunch/recess was positively correlated with engagement and peer acceptance and marginally, negatively correlated with teacher–student conflict (see Table 1). Negative emotion in class was negatively correlated with achievement, engagement, and peer acceptance. Negative emotion in lunch/recess was negatively correlated with achievement and engagement. Negative expressivity in class and lunch/recess were both positively correlated with teacher–student conflict. Verbal competence was positively correlated with academic achievement, skills, and engagement, and negatively correlated with teacher–student conflict. Teacher–student conflict was negatively related to academic achievement, skills, and engagement. Peer acceptance was positively correlated with academic skills and engagement.

Structural Modeling Analysis Plan

A series of models were tested within an SEM framework (Figure 2). We included the covariates of age, ethnicity, sex[2], and SES as predictors of the endogenous and mediating variables and correlated the covariates with each other and with exogenous variables specified for each model. The observed direction and significance of the path coefficients between the variables were used to support or reject the hypothesized relations among variables. First, we evaluated the extent to which children's positive emotion expressivity in the classroom or lunch/recess had main effects on academic adjustment variables, as depicted in Figure 2 (Model 1). In this model, we also evaluated the extent to which verbal competence predicted academic adjustment. Furthermore, analyses were performed to test for differences in the magnitude of all direct effects (one path at a time) for emotion expressivity in the classroom versus lunch and recess. If, for example, constraining paths (e.g., the paths from positive emotion in class to academic skills and from positive emotion in lunch/recess to academic skills) to be equal did not worsen fit according to the scaled χ^2 difference test (Satorra & Bentler, 2001), the constrained paths were retained. Mediated effects, via social relationships in school, were tested with the 'MODEL INDIRECT' command in M*plus* (Muthén & Muthén, 1998–2014). The same pattern of analyses was tested with a second model, as depicted in Figure 2 (Model 2), using negative (instead of positive) emotional expressivity in the classroom or lunch/recess.

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[2]We evaluated whether sex moderated the paths in models tested in the current study. Path coefficients were equivalent between boys and girls. Thus, the models were tested with boys and girls in one group.

To test the hypothesized interaction between social relationships in school and verbal competence, in a positive emotion expressivity model based on Model 1 (and then in a negative emotion expressivity model based on Model 2), we centered peer acceptance and verbal competence and used the product of the two as a predictor of the academic adjustment variables. The hypothesized interaction between teacher–student conflict and verbal competence was tested using a latent moderated structural technique beacause teacher–student conflict was specified as a latent variable (Klein & Moosbrugger, 2000). When an interaction was significant for either peer acceptance or teacher–student conflict, simple slopes analyses were tested at low (one SD below the mean), average, and high verbal competence levels (one SD above the mean; Preacher, Curran, & Bauer, 2006).

Finally, to test moderated mediation, indirect effect analyses using R mediation statistical software were conducted based on (1) the direct effect estimates from positive or negative emotion expressivity to peer acceptance or teacher–student conflict, and (2) the simple slope estimates from peer acceptance or teacher–student conflict to academic adjustment at high, average, and low levels of verbal competence (for details on R mediation, see Tofighi & MacKinnon, 2011).

Positive Emotion Expressed at School

We first tested a model identifying the associations among positive emotion expressivity at school (measured in the classroom and separately during lunch/recess time), teacher–student conflict, peer acceptance, and academic adjustment (i.e., academic achievement, academic skills, and school engagement), MLR χ^2 (116) = 162.76, $p < .01$, CFI = .98, RMSEA = .04, 90% CI [.02, .05].

Main effects of positive emotion expressivity—In Figure 2a, positive emotions observed in the classroom during the fall semester positively predicted peer acceptance in fall ($b = .09$, $p < .001$), but not teacher–student conflict in the spring. Positive emotion expressivity in classes also positively and directly predicted later academic skills. Positive emotion expressivity in lunch and recess negatively predicted later teacher–student conflict and positively predicted peer acceptance. Furthermore, positive emotions in classes and in lunch/recess predicted peer acceptance to an equal degree and these two paths were constrained to be equal, χ^2 (1) = 0.05, $p > .10$; paths from positive emotions in the two contexts to the mediators could not be constrained to be equal. Positive emotions observed in lunch/recess negatively predicted academic skills. Verbal competence predicted higher academic achievement, academic skills, school engagement, and lower teacher–student conflict. Although not in the figure, SES predicted higher academic achievement ($b = .30$, $p < .001$); age predicted higher school engagement ($b = .10$, $p < .10$) and peer acceptance ($b = .12$, $p < .10$); and boys had lower school engagement ($b = −.06$, $p < .10$).

Mediated effects of social relationships in school—Some of the predicted mediated paths via the effects of social relationships were significant (supplemental material; Table S1, Model 1). Positive emotions observed in class indirectly predicted higher engagement via its effect on peer acceptance ($b = .01$, $p < .05$). Similarly, positive expressivity at lunch/recess indirectly predicted higher engagement through its effect on teacher–student conflict

($b = .12$, $p < .05$) and peer acceptance ($b = .01$, $p < .05$). In contrast, indirect effects from positive expressivity in class or at lunch/recess predicting academic achievement and skills, via teacher–student conflict and peer acceptance, were not significant. Furthermore, verbal competence indirectly predicted academic achievement ($b = .03$, $p < .05$), skills ($b = .03$, $p < .05$), and engagement ($b = .21$, $p < .001$) via teacher–student conflict.

Moderated effects of social relationships in school—We tested the interaction between peer acceptance and verbal competence based on the previous model (i.e., Model 1 in Figure 2). The interaction between peer acceptance and verbal competence significantly predicted academic achievement ($b = -.13$, $p < .05$), academic skills ($b = -.11$, $p < .10$), and school engagement ($b = -.07$, $p < .05$), with model fit being MLR χ^2 (133) = 190.01, $p < .001$, CFI = 0.98, RMSEA = .04, 90% CI [.03, .05]. Simple slopes analyses revealed that peer acceptance predicted higher academic achievement for children low in verbal competence ($b = .28$, $p < .001$; Figure 3a). Peer acceptance predicted academic skills at low ($b = .24$, $p < .001$) and average ($b = .10$, $p < .10$) verbal competence levels (Figure 3b). Finally, peer acceptance predicted school engagement at low ($b = .38$, $p < .001$) and average ($b = .21$, $p < .05$) verbal competence levels (Figure 3c). The interaction effects for teacher–student conflict and verbal competence predicting academic achievement, academic skills, and school engagement were not significant ($p > .05$) and, thus, subsequent moderated mediation effects were not tested.

Moderated mediation: Verbal competence and peer acceptance in school—Tests of moderated mediation revealed that at low levels of verbal competence, positive expressivity in the classroom positively predicted academic achievement ($b = .08$, $p < .001$), academic skills ($b = .07$, $p < .001$), and school engagement ($b = .11$, $p < .001$) via peer acceptance. At an equivalent magnitude (due to path constraints), positive emotion expressed during lunch and recess positively predicted all academic adjustment variables via peer acceptance for children low in verbal competence. For children with average verbal competence, positive expressivity in the classroom positively predicted school engagement via peer acceptance ($b = .06$, $p < .05$). In equal magnitude, positive expressivity during lunch/recess also indirectly predicted school engagement via peer acceptance for children with average verbal competence.

Negative Emotion Expressed at School

A similar model tested the associations among negative emotion expressed in school, in the classroom and separately during lunch/recess, teacher–student conflict, peer acceptance, and academic adjustment (i.e., academic achievement, academic skills, and school engagement). This model showed adequate fit to the data: MLR χ^2 (118) = 204.88, $p < .001$, CFI = .96, RMSEA = .05, 90% CI [.04, .06].

Main effects of negative emotion expressivity—In regard to prediction by negative expressivity, negative emotion expressivity in both contexts positively predicted teacher–student conflict and did not predict peer acceptance (Figure 2b). Negative emotion expressivity in the two contexts predicted teacher–student conflict as well as academic achievement to an equal degree, χ^2 (1) = 1.25 and 0.05, ps > .10; thus, paths from negative

expressivity in the two contexts were constrained to be equal for both of these variables. Verbal competence and the covariates included in this model predicted the same variables as those in Model 1.

Mediated effects of social relationships in school—In mediation tests (refer to supplemental material; Table S1, Model 2), negative emotion expressed in the classroom and at lunch/recess uniquely predicted school engagement only via teacher–student conflict. In contrast, no analogous mediated effects via peer acceptance were found and prediction of academic achievement and skills via teacher–student conflict was not significant. As in Model 1, verbal competence indirectly predicted all three academic adjustment variables via teacher–student conflict, although the indirect effects predicting academic achievement and skills were marginally significant.

Moderated effects of social relationships in school—Finally, moderation results of the relations of peer acceptance (or teacher–student conflict) were similar to those from the positive expressivity model, albeit the interaction effects generally were near significant, possibly because negative expressivity had greater absolute unstandardized coefficients predicting school outcomes (thus, perhaps accounting for more variance in outcomes) than did positive emotionality. Moderated mediation was not examined because negative expressivity did not predict peer acceptance and only peer acceptance interacted with verbal competence to predict academic adjustment.

Discussion

The present study tested whether emotion expressivity in two different school contexts, as well as verbal competence, would predict later academic adjustment via social relationships in school. Furthermore, interactions between verbal competence and social relationships when predicting subsequent academic adjustment were tested, as well as moderated indirect patterns. Positive and negative emotions expressed in school predicted somewhat different aspects of school adjustment and these relations sometimes varied between school contexts.

Main Effects on Academic Adjustment

We found main effects of emotion expressivity on academic adjustment. Positive emotions expressed in class positively predicted later teacher-reported academic skills, whereas positive emotions expressed during lunch/recess negatively predicted later teacher-reported academic skills. This pattern suggests that positive expressivity during lunch/recess serves a different function than positive expressivity during class. Positive expressivity was observed more (i.e., more often or at a higher intensity) at lunch and recess than in class, consistent with earlier research on emotional expressions in playground and classroom settings (Craig, Pepler, & Atlas, 2000). Positive emotion may have been expressed less frequently and less intensely (and perhaps was more regulated) in class than at lunch and recess because of the structure in classes and the presence of adults. In addition, the classroom is a salient context for learning academic tasks, undoubtedly more than in lunch and recess; thus, positive emotion expressed in class may best foster academic processes because it could represent students enjoying their time in class or interacting well with others.

Some research suggests that children who express intense positive affect (e.g., exuberance, excitement) are also impulsive and low in self-regulation (Else-Quest, Hyde, Goldsmith, & Van Hulle, 2006; Sallquist et al., 2009), which would be expected to undermine attention and self-control in class and children's ability to meet academic task demands (Duckworth, Quinn, & Tsukayama, 2012). Perhaps unregulated positive expressivity was more likely to be exhibited at lunch and recess due to less structure and control in recess/lunch than in class, which could explain why positive expressivity at lunch/recess, but not in class, negatively predicted school adjustment (although not originally hypothesized). These results provide preliminary support of the importance of the context in which positive emotions are expressed for predicting some aspects of academic adjustment.

Negative emotions expressed in class and during lunch/recess negatively predicted academic achievement, consistent with conceptual arguments regarding general negativity and achievement (Denham et al., 2012; Valiente, Swanson, & Eisenberg, 2012). Although we can only speculate, negative emotion expressivity in class might often reflect problems with the class tasks and negative expressivity outside class may indicate lack of emotion regulation in unstructured school settings, but both have comparable negative implications for achievement. Although negative expressivity in class and during lunch and recess were negatively correlated with school engagement, they did not directly predict engagement; rather, these relations were mediated through teacher–student conflict (see below).

Mediated Effects of Teacher–Student Conflict

Positive emotions expressed during lunch/recess – but notably not in class – negatively predicted teacher–student conflict, which in turn predicted engagement. Positive emotion expression in the classroom was not significantly associated with teacher–student conflict even in zero-order correlations. Although we had expected a negative relation of positive expressivity in class to teacher-student conflict, positive expressivity might sometimes be disruptive if inappropriately expressed in class, which might cause conflict with the teacher (and a positive relation between positive expressivity and teacher-student conflict) and, thus, undercut the strength of any negative association between the two variables. In contrast, positive emotions expressed in lunch and recess might have predicted lower conflict because high levels of positive expressivity in a less-structured context are not considered disruptive by adults and might even reflect better social competence.

Although we initially speculated that negative expressivity in class especially predicts teacher–student conflict, negative expressivity during lunch and recess and in class had equally positive predictive relations to teacher–student conflict. Furthermore, negative expressivity during lunch/recess and in class both negatively predicted school engagement via teacher–student conflict. These findings suggest that one mechanism by which expressivity predicts school engagement is via teacher–student conflict. Teachers seemed especially attuned to children's negative emotions regardless of where the emotions were displayed, echoing previous findings on general negative emotionality (e.g., Ladd et al., 1999; Valiente, Swanson, & Lemery-Chalfant, 2012). Expression of negative emotion may also be more stable in its effects across contexts than positive expressivity. Negative expressions were less common than positive ones in both contexts; thus, children who

express more negativity may stand out compared to their peers. Teacher–student conflict did not mediate the associations between expressed negative or positive emotion and academic achievement or skills; rather, there were some direct effects from negative or positive emotion to academic achievement or skills. Indirect effects via teacher–student conflict may have been significant only for engagement because engagement corresponds to a socio-emotional process more than academic achievement and skills; that is, school engagement is, in part, an emotional and motivational response to participating and being in school (Wang & Degol, 2014).

Teacher–student conflict also mediated the relations of verbal competence to all three academic adjustment measures, supporting prior research indicating that verbal competence relates to the teacher–student relationship (Justice et al., 2008). Thus, teacher–student conflict may perpetuate associations between verbal competence and later academic adjustment because it involves how teachers interact with and teach children. Verbal competence, however, did not moderate the association between teacher–student conflict and academic adjustment.

Mediated Effects of Peer Acceptance

Positive emotion expressivity in the classroom and during lunch/recess in the fall each uniquely predicted school engagement via peer acceptance. These findings suggest that positive expressivity in each context had distinct effects on peer acceptance—perhaps because positive emotion at recess and lunch reflects enjoyable interactions with peers whereas in the class it partly reflects good adjustment at school and a general pleasant demeanor. Furthermore, positive expressivity in both contexts positively predicted peer acceptance to an equal degree, supporting the importance of positive emotion expressivity, regardless of context, for predicting peer acceptance. Negative expressivity, however, did not predict peer acceptance and consequently it was not a mediator in analyses. Negative expressivity, especially anger, could express dominance, a characteristic often associated with controversial social status (Ladd, 2005).

Furthermore, peer acceptance predicted later academic skills and engagement, controlling for verbal competence, supporting previous research (Pianta & Stuhlman, 2004). Verbal competence did not predict peer acceptance, similar to previous findings (e.g., Eggum-Wilkens et al., 2014; McEachern & Snyder, 2012), but contrary to one study (Welsh et al., 2001). Furthermore, peer acceptance did not predict or mediate relations to achievement, supporting research that peer acceptance is mostly associated with grade assessments rather than standardized tests (Wentzel & Watkins, 2002). Rather, the association between peer acceptance and achievement was moderated by verbal competence.

Moderated Effects of Peer Acceptance and Verbal Competence

Peer acceptance positively predicted academic achievement, skills, and engagement for children with low or average, but not high, verbal competence. Moreover, positive emotions expressed in both contexts predicted academic achievement, academic skills, and school engagement via peer acceptance, especially for children with lower to average verbal competence, perhaps because they benefited most from their positive peer interactions.

These findings support Vygotsky's (1978) argument that peers and social interactions contribute to the learning experience, but perhaps more for children with lower to average verbal competence. Although prior research demonstrates a positive association between social competence and academic adjustment (e.g., Wentzel & Watkins, 2002), our results suggest that this association is most important for students with a weaker verbal competence; these findings could inform peer and academic interventions, when school readiness is most critical (Silva & Cain, 2015). Peer-based scaffolding at school may be especially important for children with lower verbal abilities in increasing the likelihood that they will initially like school and be engaged, setting precedent for academic trajectories.

Strengths, Limitations, and Future Directions

Strengths of this study include the use of standardized assessments, observed emotion and school engagement, and multi-informant reports from observers, teachers, and peers. The present study also extends earlier research by examining how emotion expressivity observed in two school contexts predicts kindergarteners' academic adjustment, using a short-term longitudinal design. Additionally, study participants were from diverse ethnic backgrounds, which provide for generalizability of results to a diverse population.

One limitation in our study was that teacher–student conflict and academic adjustment measures were assessed concurrently, which could be why there was a high correlation between teacher–student conflict and school engagement. This minimizes the ability to describe possible bidirectional association between school engagement and teacher–student conflict; for example, children who are less engaged in academic tasks may have more conflict with teachers because disengagement defies teacher expectations for student behavior. However, the association between teacher–student conflict and academic adjustment persisted even when controlling for earlier verbal competence. Additionally, there may be some degree of ICC at the school level that was not modeled due to the small number of schools.

We assessed emotional expressivity and verbal competence concurrently, but it is also plausible that emotional dispositions prior to entry to school promote academic readiness, as suggested by some research (Laake & Bridgett, 2014). Furthermore, examining emotional expression patterns across time would elucidate possible transactional and cascade relations with social relationships in school and academic adjustment, and with family relationships (Bridgett, Laake, Gartstein, & Dorn, 2013). Growing research evidence demonstrates that children's early emotion dispositions inform parenting styles (Bridgett et al., 2013; Calkins, Hungerford, & Dedmon, 2004). Children's expressive tendencies probably are shaped by and shape early relationship experiences (Fabes et al., 2001).

The present study provides empirical support that emotional expressivity at school provide contexts for forming social relationships and for indirect effects on school engagement (Valiente, Swanson, & Eisenberg, 2012). Given significant direct and indirect negative effects of negative emotions in class and in lunch/recess on measures of academic adjustment, interventions that address children's negative emotion expressivity in school may have benefits on strengthening teacher–student relationships. Although future investigation is warranted, children who express strong positive emotions in primarily peer

settings (i.e., lunch/recess) may also benefit from emotion regulation training given that positive expressivity was related to lower academic skills (although not related to achievement or engagement). However, it is important to further verify why positive expressivity in peer settings was negatively related to less adaptive behavior at school. Furthermore, children who demonstrate lower verbal abilities early in kindergarten might benefit most from efforts to enhance peer relationships. Finally, because verbal abilities and teacher–student conflict were negatively associated, teacher training to effectively work with students with verbal difficulties is warranted.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

Acknowledgments

References

Birch SH, Ladd GW. The teacher–child relationship and children's early school adjustment. Journal of School Psychology. 1997; 35:61–79.10.1016/S0022-4405(96)00029-5

Bridgett DJ, Laake LM, Gartstein MA, Dorn D. Development of infant positive emotionality: The contribution of maternal characteristics and effects on subsequent parenting. Infant and Child Development. 2013; 22:362–382.10.1002/icd.1795

Buhs ES, Ladd GW. Peer rejection as an antecedent of young children's school adjustment: An examination of mediating processes. Developmental Psychology. 2001; 37:550–560.10.1037/0012-1649.37.4.550 [PubMed: 11444490]

Cadima J, Leal T, Burchinal M. The quality of teacher-student interactions: Associations with first graders' academic and behavioral outcomes. Journal of School Psychology. 2010; 48:457–482.10.1016/j.jsp.2010.09.001 [PubMed: 21094394]

Calkins SD, Hungerford A, Dedmon SE. Mothers' interactions with temperamentally frustrated infants. Infant Mental Health Journal. 2004; 25:219–239.10.1002/imhj.20002

Craig WM, Pepler D, Atlas R. Observations of bullying in the playground and in the classroom. School Psychology International. 2000; 21:22–36.10.1177/0143034300211002

Denham SA, Bassett HH, Thayer SK, Mincic MS, Sirotkin YS, Zinsser K. Observing preschoolers' social-emotional behavior: Structure, foundations, and prediction of early school success. The Journal of Genetic Psychology. 2012; 173:246–278.10.1080/00221325.2011.597457 [PubMed: 22919891]

Doughtery LR. Children's emotionality and social status: A meta-analytic review. Social Development. 2006; 15:394–417.10.1111/j.1467-9507.2006.00348.x

Duckworth AL, Quinn PD, Tsukayama E. What No Child Left Behind leaves behind: The roles of IQ and self-control in predicting standardized achievement test scores and report card grades. Journal of Educational Psychology. 2012; 104:439–451.10.1037/a0026280 [PubMed: 24072936]

Eggum-Wilkens ND, Fabes RA, Castle S, Zhang L, Hanish LD, Martin CL. Playing with others: Head Start children's peer play and relations with kindergarten school competence. Early Childhood Research Quarterly. 2014; 29:345–356.10.1016/j.ecresq.2014.04.008 [PubMed: 24882941]

Eisenberg N, Fabes RA, Murphy BC, Shepard S, Guthrie IK, Mazsk P, Jones S. Prediction of elementary school children's socially appropriate and problem behavior from anger reactions at

age 4–6 years. Journal of Applied Developmental Psychology. 1999; 20:119–142.10.1016/S0193-3973(99)80007-0

Else-Quest NM, Hyde JS, Goldsmith HH, Van Hulle CA. Gender differences in temperament: A meta-analysis. Psychological Bulletin. 2006; 132:33–72.10.1037/0033-2909.132.1.33 [PubMed: 16435957]

Fabes RA, Leonard SA, Kupanoff K, Martin CL. Parental coping with children's negative emotions: Relations with children's emotional and social responding. Child Development. 2001; 72:907–920.10.1111/1467-8624.00323 [PubMed: 11405590]

Fredrickson BL. The role of positive emotions in positive psychology: The broaden-and-build theory of positive emotions. American Psychologist. 2001; 56:218–226.10.1O37//0OO3-O66X.56.3.218 [PubMed: 11315248]

Herndon KJ, Bailey CS, Shewark E, Denham SA, Bassett HH. Preschoolers' emotion expression and regulation: Relations with school adjustment. The Journal of Genetic Psychology. 2013; 174:642–663.10.1080/00221325.2012.759525 [PubMed: 24303577]

Hymel S. Preschool children's peer relations: Issues in sociometric assessment. Merrill-Palmer Quarterly. 1983; 29:237–260.

Iyer RV, Kochenderfer-Ladd B, Eisenberg N, Thompson M. Peer victimization and effortful control: Relations to school engagement and academic achievement. Merrill-Palmer Quarterly. 2010; 56:361–387.10.1353/mpq.0.0058 [PubMed: 23105166]

Justice LM, Cottone EA, Mashburn A, Rimm-Kaufman SE. Relationships between teachers and preschoolers who are at risk: Contribution of children's language skills, temperamentally based attributes, and gender. Early Education and Development. 2008; 19:600–621.10.1080/10409280802231021

Juvonen, J. Sense of belonging, social bonds, and school functioning. In: Alexander, PA.; Winne, PH., editors. Handbook of educational psychology. 2nd. Mahwah, NJ: Erlbaum; 2006. p. 655-674.

Klein A, Moosbrugger H. Maximum likelihood estimation of latent interaction effects with the LMS method. Psychometrika. 2000; 65:457–474.10.1007/BF02296338

La Paro KM, Rimm-Kaufman SE, Pianta RC. Kindergarten to 1st grade: Classroom characteristics and the stability and change of children's classroom experiences. Journal of Research in Childhood Education. 2006; 21:189–202.10.1080/02568540609594588

Laake LM, Bridgett DJ. Happy babies, chatty toddlers: Infant positive affect facilitates early expressive, but not receptive language. Infant Behavior and Development. 2014; 37:29–32.10.1016/j.infbeh.2013.12.006 [PubMed: 24441013]

Ladd, GW. Children's peer relations and social competence: A century of progress. New Haven, CT: Yale University Press; 2005.

Ladd GW, Birch SH, Buhs ES. Children's social and scholastic lives in kindergarten: Related spheres of influence? Child Development. 1999; 70:1373–1400.10.1111/1467-8624.00101 [PubMed: 10621962]

Lewis AD, Huebner ES, Reschly AL, Valois RF. The incremental validity of positive emotions in predicting school functioning. Journal of Psychoeducational Assessment. 2009; 27:397–408.10.1177/0734282908330571

Linnenbrink EA. Emotion research in education: Theoretical and methodological perspectives on the integration of affect, motivation, and cognition. Educational Psychology Review. 2006; 18:307–314.10.1007/s10648-006-9028-x

Little TD, Cunningham WA, Shahar G, Widaman KF. To parcel or not to parcel: Exploring the question, weighing the merits. Structural Equation Modeling. 2002; 9:151–173.10.1207/S15328007SEM0902_1

Maldonado-Carreño C, Votruba-Drzal E. Teacher-child relationships and the development of academic and behavioral skills during elementary school: A within- and between-child analysis. Child Development. 2011; 82:601–616.10.1111/j.1467-8624.2010.01533.x [PubMed: 21410918]

Maszk P, Eisenberg N, Guthrie IK. Relations of children's social status to their emotionality and regulation: A short-term longitudinal study. Merrill-Palmer Quarterly. 1999; 45:468–492.

Mather, N.; Woodcock, RW. Woodcock-Johnson III Tests of Achievement. Ithasca, IL: Riverside Publishing; 2001. Examiner's Manual.

McClelland MM, Cameron CE, Connor CM, Farris CL, Jewkes AM, Morrison FJ. Links between behavioral regulation and preschoolers' literacy, vocabulary, and math skills. Developmental Psychology. 2007; 43:947–959.10.1037/0012-1649.43.4.947 [PubMed: 17605527]

McEachern AD, Snyder J. The relationship of impulsivity-inattention and verbal ability to overt and covert antisocial behaviors in children. Journal of Youth and Adolescence. 2012; 41:984–994.10.1007/s10964-011-9710-2 [PubMed: 21882011]

McGrew, KS.; Woodcock, RW. Woodcock-Johnson III. Ithasca, IL: Riverside Publishing; 2001. Technical Manual.

Muthén, LK.; Muthén, BO. Mplus User's Guide. 6th. Los Angeles, CA: Muthén & Muthén; 1998–2014.

Pianta RC, Steinberg MS, Rollins KB. The first two years of school: Teacher-child relationships and deflections in children's classroom adjustment. Development and Psychopathology. 1995; 7:295–312.10.1017/S0954579400006519

Pianta RC, Stuhlman MW. Teacher-child relationships and children's success in the first years of school. School Psychology Review. 2004; 33:444–458.

Portilla XA, Ballard PJ, Adler NE, Boyce WT, Obradovi J. An integrative view of school functioning: Transactions between self-regulation, school engagement, and teacher-child relationship quality. Child Development. 2014; 85:1915–1931.10.1111/cdev.12259 [PubMed: 24916608]

Preacher KJ, Curran PJ, Bauer DJ. Computational tools for probing interactions in multiple linear regression, multilevel modeling, and latent curve analysis. Journal of Educational and Behavioral Statistics. 2006; 31:437–448.10.3102/10769986031004437

Reschly AL, Huebner ES, Appleton JJ, Antaramian S. Engagement as flourishing: The contribution of positive emotions and coping to adolescents' engagement at school and with learning. Psychology in the Schools. 2008; 45:419–431.10.1002/pits.20306

Rimm-Kauffman SE, Pianta RC. An ecological perspective on the transition to kindergarten: A theoretical framework to guide empirical research. Journal of Applied Developmental Psychology. 2000; 21:491–511.10.1016/S0193-3973(00)00051-4

Rubin, KH.; Bukowski, WM.; Parker, JG. Peer interactions, relationships, and groups. In: Eisenberg, N.; Damon, W.; Lerner, RM., editors. Handbook of child psychology: Vol. 3, Social, emotional, and personality development. 6th. Hoboken, NJ: John Wiley & Sons Inc; 2006. p. 571-645.

Sallquist JV, DiDonato MD, Hanish LD, Martin CL, Fabes RA. The importance of mutual positive expressivity in social adjustment: Understanding the role of peers and gender. Emotion. 2012; 12:304–313.10.1037/a0025238 [PubMed: 21859190]

Sallquist JV, Eisenberg N, Spinrad TL, Reiser M, Hofer C, Zhou Q, Eggum N. Positive and negative emotionality: Trajectories across six years and relations with social competence. Emotion. 2009; 9:15–28.10.1037/a0013970 [PubMed: 19186913]

Satorra A, Bentler PM. A scaled difference chi-square test statistic for moment structure analysis. Psychometrika. 2001; 66:507–514.10.1007/BF02296192

Silva KM, Spinrad TL, Eisenberg N, Sulik MJ, Valiente C, Huerta S. School Readiness Consortium. Relations of children's effortful control and teacher-child relationship quality to school attitudes in a low-income sample. Early Education and Development. 2011; 22:434–460.10.1080/10409289.2011.578046 [PubMed: 22573932]

Silva M, Cain K. The relations between lower and higher level comprehension skills and their role in prediction of early reading comprehension. Journal of Educational Psychology. 2015; 107:321–331.10.1037/a0037769

Sirotkin YS, Denham SA, Bassett HH, Zinsser KM. Keep calm and carry on: The importance of children's emotional positivity and regulation for success in Head Start. NHSA Dialog. 2013; 16:113–119.

Spilt JL, Hughes JN, Wu JY, Kwok OM. Dynamics of teacher–student relationships: Stability and change across elementary school and the influence on children's academic success. Child Development. 2012; 83:1180–1195.10.1111/j.1467-8624.2012.01761.x [PubMed: 22497209]

Spinrad TL, Eisenberg N, Harris E, Hanish L, Fabes RA, Kupanoff K, Holmes J. The relation of children's everyday nonsocial peer play behavior to their emotionality, regulation, and social

functioning. Developmental Psychology. 2004; 40:67–80.10.1037/0012-1649.40.1.67 [PubMed: 14700465]

Tofighi D, MacKinnon DP. RMediation: An R package for mediation analysis confidence intervals. Behavior Research Methods. 2011; 43:692–700.10.3758/s13428-011-0076-x [PubMed: 21487904]

Valiente C, Eisenberg N, Spinrad TL, Haugen R, Thompson MS, Kupfer A. Effortful control and impulsivity as concurrent and longitudinal predictors of academic achievement. The Journal of Early Adolescence. 2013; 33:946–972.10.1177/0272431613477239

Valiente C, Lemery-Chalfant K, Swanson J, Reiser M. Prediction of children's academic competence from their effortful control, relationships, and classroom participation. Journal of Educational Psychology. 2008; 100:67–77.10.1037/0022-0663.100.1.67 [PubMed: 21212831]

Valiente C, Swanson J, Eisenberg N. Linking students' emotions and academic achievement: When and why emotions matter. Child Development Perspectives. 2012; 6:129–135.10.1111/j.1750-8606.2011.00192.x [PubMed: 23115577]

Valiente C, Swanson J, Lemery-Chalfant K. Kindergartners' temperament, classroom engagement, and student-teacher relationship: Moderation by effortful control. Social Development. 2012; 21:558–576.10.1111/j.1467-9507.2011.00640.x

Vygotsky, LS. Mind in society: The development of higher psychological processes. Cambridge, MA: Harvard University Press; 1978.

Wang M, Degol J. Staying engaged: Knowledge and research needs in student engagement. Child Development Perspectives. 2014; 8:137–143.10.1111/cdep.12073 [PubMed: 27087833]

Welsh M, Parke RD, Widaman K, O'Neil R. Linkages between children's social and academic competence. Journal of School Psychology. 2001; 39:463–482.10.1016/S0022-4405(01)00084-X

Wentzel KR, Watkins DE. Peer relationships and collaborative learning as contexts for academic enablers. School Psychology Review. 2002; 31:366–377.

Woodcock, RW.; McGrew, KS.; Mather, N. Woodcock-Johnson III Tests of Achievement. Itasca, IL: Riverside; 2001.

Zhou Q, Main A, Wang Y. The relations of temperamental effortful control and anger/frustration to Chinese children's academic achievement and social adjustment: A longitudinal study. Journal of Educational Psychology. 2010; 102:180–196.10.1037/a0015908

Fall Fall / Spring Spring
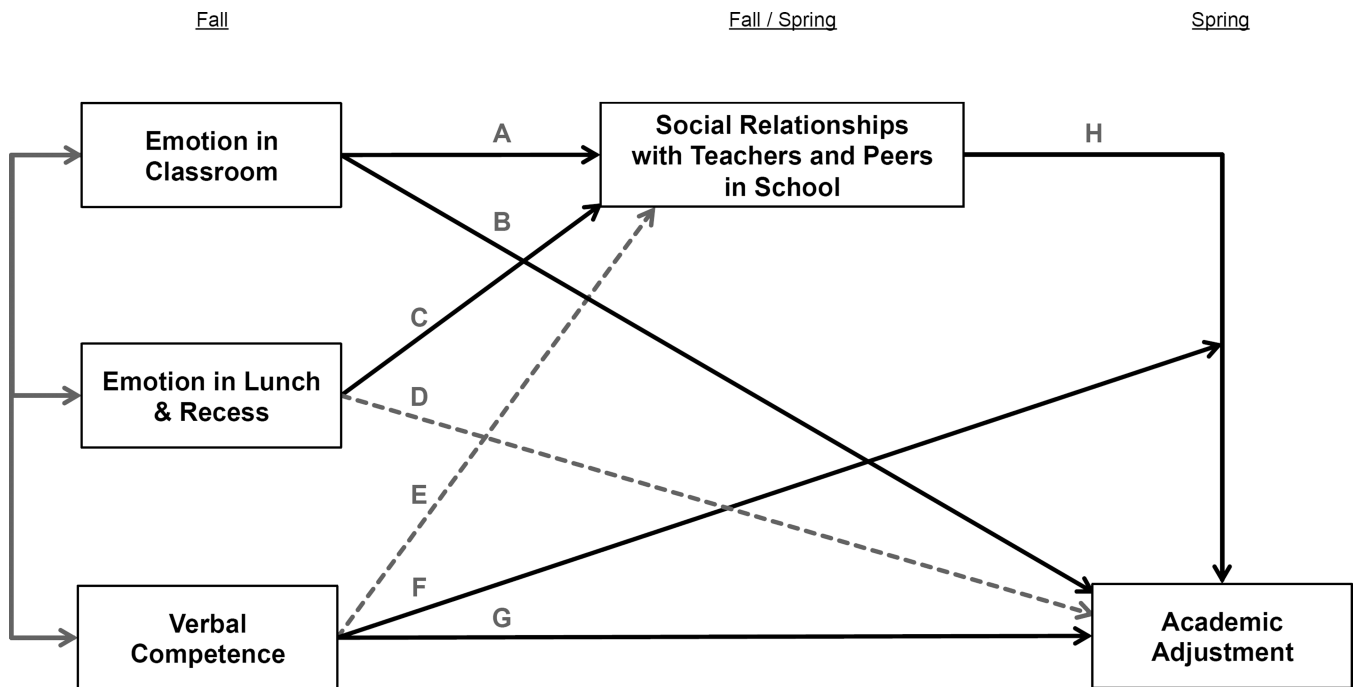
Figure 1.
Conceptual model of direct and indirect associations between emotions, verbal competence, social relationships in school, and academic adjustment in kindergarten. Dashed lines represent partial empirical support in the research literature, as described in the manuscript.

A. Model 1. Positive emotions in school and early kindergarten verbal competence.
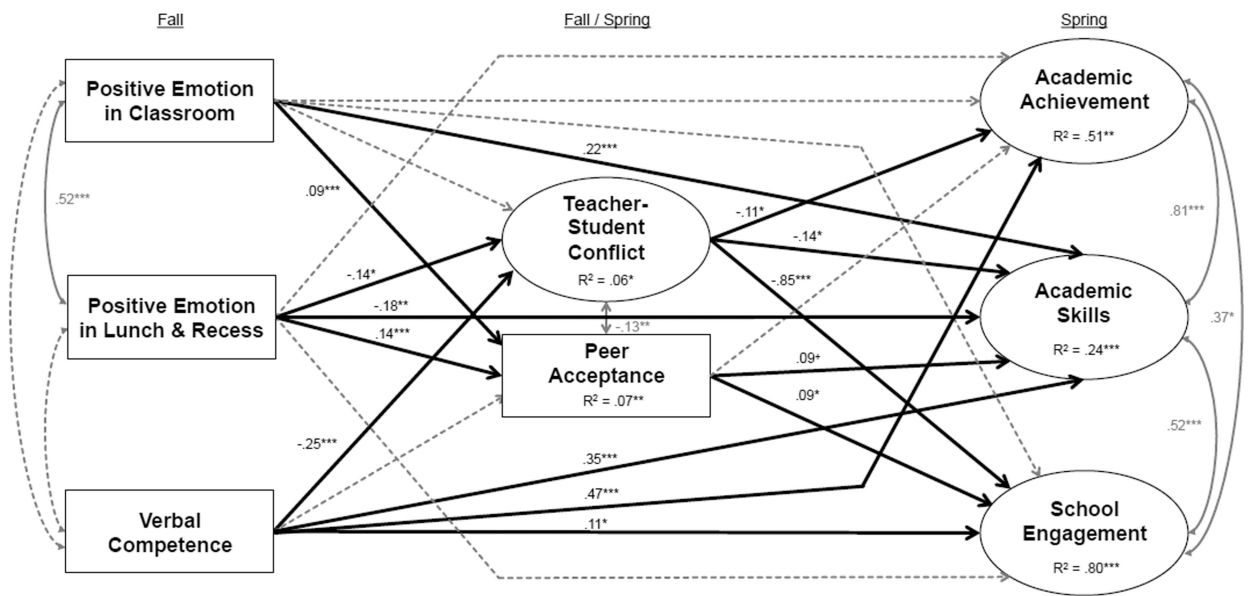
B. Model 2. Negative emotions in school and early kindergarten verbal competence.
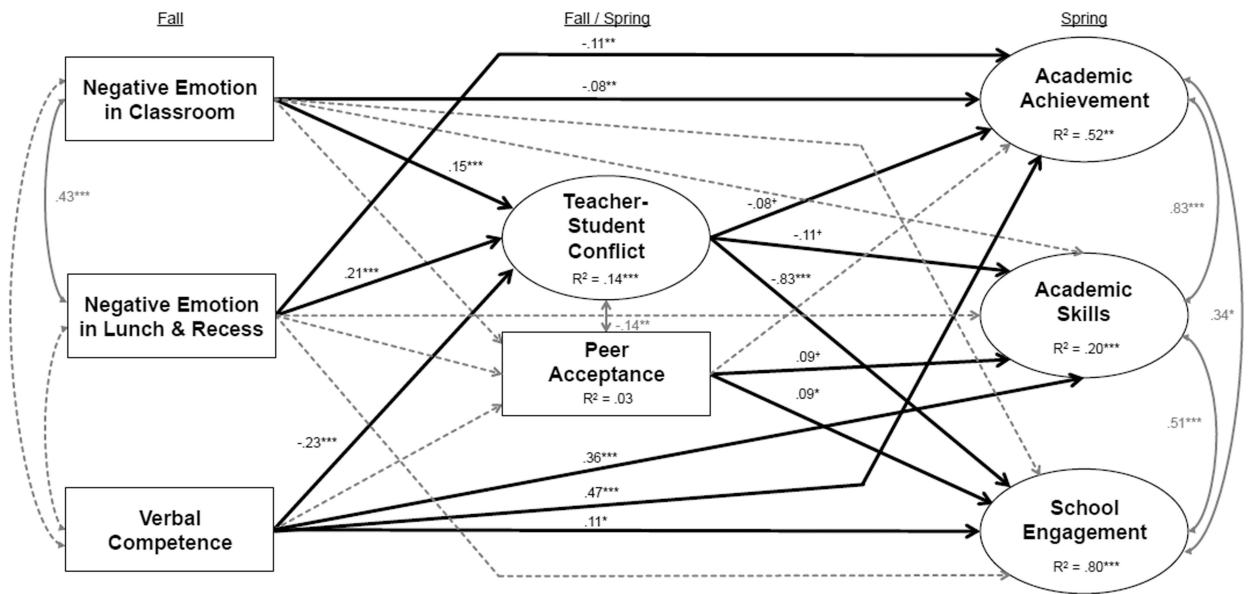
Figure 2.
(A) Model 1. Positive emotions in the classroom and at lunch and recess, MLR χ^2 (116) = 162.76, $p < .01$, CFI = .98, RMSEA = .04, 90% CI [.02, .05]. (B) Model 2. Negative emotions in the classroom and at lunch and recess, MLR χ^2 (118) = 204.88, $p < .001$, CFI = .96, RMSEA = .05, 90% CI [.04, .06]. For both Models 1 and 2, coefficients are standardized on a continuous scale. In these models, ovals represent latent variables and rectangles represent manifest variables. Nonsignificant paths are included in the model but paths are dashed to aid visual simplicity. Covariates: age, sex, ethnic minority, and SES.

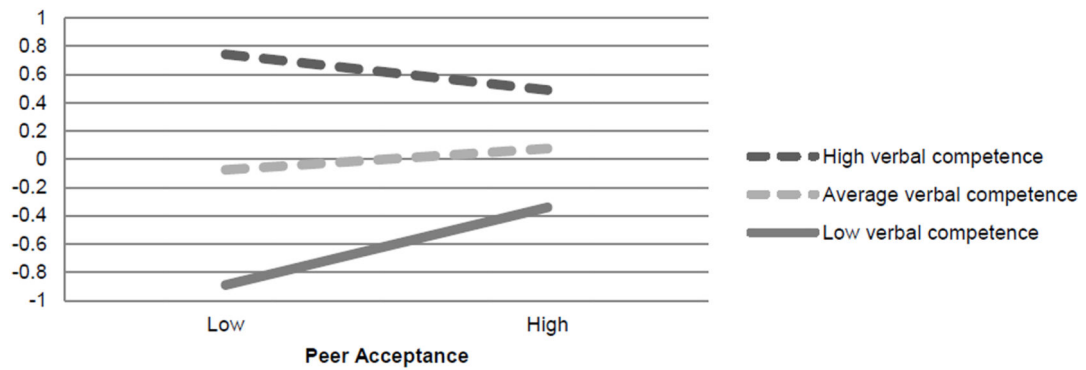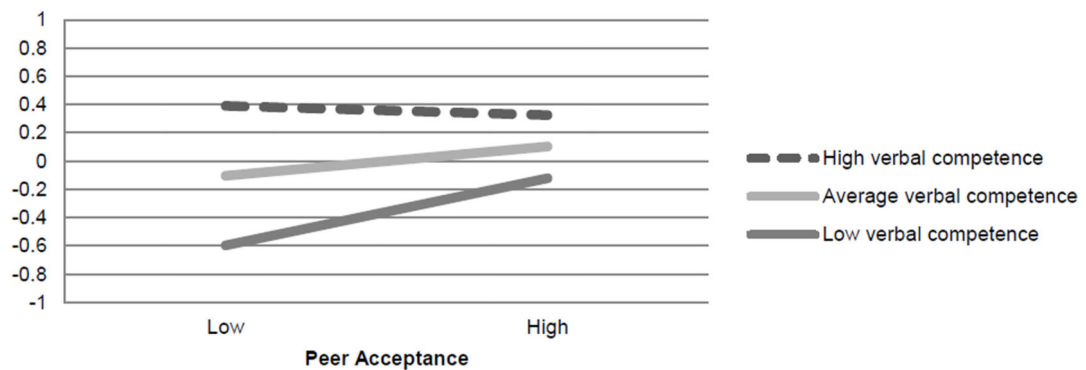$^{+}p < .10.$ $^{*}p < .05.$ $^{**}p < .01.$ $^{***}p < .001.$

A. Academic Achievement

B. Academic Skills

C. School Engagement
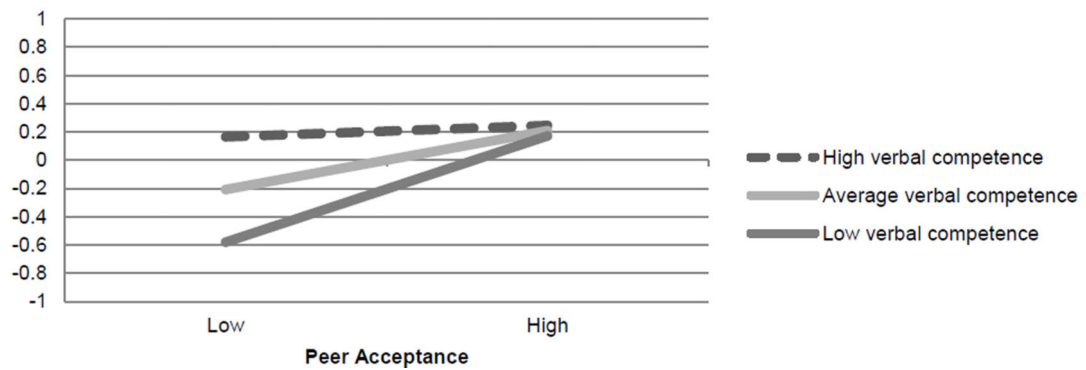
Figure 3.
(A) Peer acceptance predicted academic achievement at low ($b = .28$, $p < .001$) verbal competence levels. (B) Peer acceptance predicted academic skills at low ($b = .24$, $p < .001$) and average ($b = .10$, $p < .10$) verbal competence levels. (C) Peer acceptance predicted school engagement at low ($b = .38$, $p < .001$) and average ($b = .21$, $p < .05$) verbal competence levels. Peer acceptance did not significantly predict any of the outcomes at high levels of verbal competence (dashed lines).

Table 1

Correlations and descriptive statistics among study variables and covariates (N = 301)

	M	SD	Report	Time	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1 Academic achievement[a]	435.67	16.10	WJ	T2	--													
2 Academic skills[a]	3.05	.82	TR	T2	.81***	--												
3 School engagement[a]	--	--	--	T2	.32***	.41***	--											
4 Teacher-student conflict[a]	1.55	.86	TR	T2	-.19**	-.19**	-.88***	--										
5 Peer acceptance	.05	.97	PR	T1	.07	.12*	.23***	-.14*	--									
6 Positive emotion: Classroom	.72	.29	OB	T1	.04	.16*	.04	-.01	.18***	--								
7 Positive emotion: Lunch & recess	1.37	.45	OB	T1	.00	-.03	.13*	-.10+	.20***	.52***	--							
8 Negative emotion: Classroom	.06	.08	OB	T1	-.14*	-.03	-.29***	.28***	-.10*	.01	.02	--						
9 Negative emotion: Lunch & recess	.10	.11	OB	T1	-.17**	-.07	-.25***	.24***	.00	-.05	-.14**	.43***	--					
10 Early kindergarten verbal competence	469.52	12.04	WJ	T1	.64***	.41***	.20***	-.15**	.04	.01	.04	.00	-.02	--				
11 Age	5.48	.34	CR	T1	.03	.05	.08	.04	.14*	.03	.10*	-.09+	-.06	.01	--			
12 Ethnic minority[b]	.64	.48	CR	T1	.29**	-.14*	.01	-.02	.01	.06	-.11	-.04	.04	-.41***	.13*	--		
13 Sex[c]	.49	.50	CR	T1	.13+	.08	-.07	.05	.06	.04	.08	-.08	-.04	.10***	.12*	-.08	--	
14 SES[d]	-.05	.97	CR	T1	.54***	.25***	.01	-.03	-.04	-.03	-.02	.02	.05	.53***	-.10	-.35***	.11*	--

Note.

[a] Latent variable;

[b] ethnic minority (1 = minority, 0 = white, non-Hispanic);

[c] sex (1 = boy; 0 = girl);

[d] SES (family income and average parent education).

WJ = Woodcock-Johnson assessment, TR = teacher report, OB = observer report, PR = peer report, CR = caregiver report, T1 = fall assessment, T2 = spring assessment. Not shown are descriptive statistics for school engagement indicators: school liking (M = 2.81, SD = .32), cooperation (M = 2.67, SD = .43), and engagement (M = 2.76, SD = .20).