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Prediction of Children's Early Academic Adjustment from Their Temperament: The Moderating Role of Peer Temperament

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Abstract

The goal of the study was to examine whether target children's temperamental negative emotional expressivity (NEE) and effortful control in the fall of kindergarten predicted academic adjustment in the spring and whether a classmate's NEE and effortful control moderated these relations. Target children's NEE and effortful control were measured in the fall via multiple methods, academic adjustment was measured via reading and math standardized tests in the spring, and observations of engagement in the classroom were conducted throughout the year. In the fall, teachers nominated a peer with whom each target child spent the most time and rated that peer's temperament. Target children with high effortful control had high reading and math achievement (*p*s = .04 and < .001, respectively), and children with low NEE increased in engagement during the year ($p < .001$). Peers' temperament did not have a direct relation to target children's academic adjustment. Peers' negative emotion, however, moderated the relation between target children's effortful control, as well as NEE, and changes in engagement (*p*s = .03 and .05, respectively). Further, peers' effortful control moderated the relations between target children's NEE and reading and changes in engagement (*p*s = .02 and .04, respectively). In each case, target children's temperament predicted the outcome in expected directions more strongly when peers had low NEE or high effortful control. Results are discussed in terms of how children's temperamental qualities relate to academic adjustment, and how the relation between NEE and changes in engagement, in particular, depends on peers' temperament.

Keywords

academic achievement; peers; school adjustment; temperament

Temperamental characteristics, such as effortful control and negative emotional expressivity (NEE), are consistent predictors of multiple indicators of early academic adjustment, including reading and math achievement and classroom engagement (Duckworth & Allred, 2012; Eisenberg, Valiente, et al., 2010). In addition to temperament, children's early peer relationships also relate to academic adjustment (Ladd, Kochenderfer, & Coleman, 1997).

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With respect to young children's peers, researchers have focused mainly on the association of peer relationship quality (e.g., acceptance, popularity, and victimization) to academic adjustment (Bukowski, Castellanos, Vitaro, & Brendgen, 2014). Little is known about whether peers' characteristics relate to children's academic adjustment.

The first goal of the current study was to examine whether a target child's temperament (i.e., effortful control and NEE) in the fall of kindergarten directly predicted academic adjustment (i.e., reading and math achievement and classroom engagement) in the spring, controlling for prior levels of academic adjustment (i.e., vocabulary or early fall engagement). The second goal of our study was to examine whether the relation between children's temperament and their own academic adjustment depended on a close classroom peer's effortful control or NEE. The study addressed the questions of whether peers' temperament directly predict children's early academic adjustment and whether children's and peers' temperamental qualities jointly predict change in children's academic adjustment.

Temperament and Early Academic Adjustment

Temperament is often defined as "constitutionally-based individual differences in reactivity and self-regulation in the domains of affect, activity, and attention" (Rothbart & Bates, 2006, p. 100). Effortful control is one commonly studied self-regulatory temperamental construct and is defined as "a dispositional trait…that represents the tendency to be able to employ top-down control to self-regulate… [via] controlled operations that underpin complex cognition" (Nigg, 2017, p. 363). NEE (e.g., sadness, anger) is another component of temperament that is important for children's adjustment; more generally, emotions are viewed as influencing cognition, motivation, and behavior (Frijda, 1986).

Effortful control

Effortful control is considered an asset in the school environment because it helps children to ignore distractions in the classroom (e.g., disruptive classmates) and concentrate on academic tasks. Moreover, effortful control promotes adaptive social behavior, such as taking turns and controlling emotions, which fosters positive relationships with others and strengthens children's social resources at school. Previous researchers have found that children with low effortful control often experience challenges adapting to school (Cerda, Im, & Hughes, 2014; Eisenberg, Valiente, et al., 2010; Rimm-Kaufman & Pianta, 2000) and tend to have lower academic achievement later in elementary school (Duncan et al., 2007). For example, kindergarteners with low effortful control had less growth in mathematics, literacy, and vocabulary during kindergarten after controlling for other measures of executive functioning (McClelland et al., 2014). Similarly, adults' ratings of pre-kindergarteners' effortful control predicted increases in literacy and math achievement in kindergarten, after controlling for cognitive skills (Blair & Razza, 2007). Effortful control has also been found to be important for kindergarten classroom participation, which, in turn, predicted greater achievement in first grade (Valiente, Swanson, Lemery-Chalfant, & Berger, 2014). These findings consistently point to a positive association of effortful control with achievement and classroom engagement.

NEE

Children who experience or express high levels of negative emotion at school may be more likely to have problematic interactions with peers or teachers, in turn straining their ability to focus on learning at school. Because emotions have functional implications for motivation and cognition, negative emotions expressed at school may also interfere with children's ability to comprehend and retain new information (Pekrun, 2009).

NEE, particularly when expressed at school or by young children, has not been extensively explored in relation to academic adjustment, despite theoretical rationale for doing so (Raver, 2002; Valiente, Swanson & Eisenberg, 2012). Students' NEE has predicted poor adjustment at school, such as conflictual interactions with peers or teachers or lower classroom participation, which, in turn, predicted poorer academic achievement (Hernández, Eisenberg, et al., 2016; Valiente, Swanson, & Lemery-Chalfant, 2012; Zhou, Main, and Wang, 2010). Externalizing NEE, such as anger, and internalizing NEE, such as anxiety, have both been related to lower academic achievement in elementary school (Segool, Carlson, Goforth, Von Der Embse, & Barterian, 2013), suggesting that NEE, broadly defined, is a risk factor for low achievement, engagement, and adjustment at school.

However, some researchers have documented non-significant relations from NEE to task engagement and reading achievement (Hirvonen, Aunola, Alatupa, Viljaranta, & Nurmi, 2013; Martin, Nagle, & Paget, 1983). One possible reason that findings are mixed is that NEE is rarely observationally measured in school. Negative emotions expressed during structured classroom activities likely have important implications for academic adjustment because they directly affect information-processing, memory formation, motivation, and relationships at school (Frijda, 1986). For example, (Diaz et al., 2017) found that kindergartners' NEE at school negatively predicted observed engagement. Moreover, children who expressed more negative emotion at school experienced greater conflict with their kindergarten teacher, which, in turn, predicted fewer gains in academic achievement between kindergarten and first grade, relative to other children (Hernández et al., 2016). Alternatively, it is possible that findings regarding NEE and academic adjustment are mixed because moderating factors impact whether NEE acts as a risk factor for maladjustment. As one example, Valiente et al. (2010) found that NEE was negatively related to reading and math achievement at high, but not low, levels of effortful control. At low levels of NEE, students high in effortful control had the highest level of reading and math achievement; at high levels of NEE, all students were at the same relatively low level of achievement, regardless of their level of effortful control.

The Role of Peers' Temperament

Peers whom children spend considerable time with at school are considered to be an important influence on young children's academic adjustment (Kinderman, 2007). According to Bronfenbrenner and Morris (2006), peers are believed to reinforce children's behavior over time through habitual social interactions. For example, spending time with peers with high NEE or low effortful control may offer consistently less support for on-task behaviors within the classroom, placing children at risk for lower classroom engagement and lower academic achievement. In contrast, children who spend time with highly regulated

peers may be more likely to stay on-task and succeed academically because of the high levels of support and reinforcement peers with high regulation might consistently exhibit at school.

There is some evidence that peer characteristics relate directly to young children's adjustment. Kindergarten children who spent more time with prosocial peers at school in the fall were more likely to be rated as prosocial and were observed to express more positive emotion at school in the spring (Fabes, Hanish, Martin, Moss, & Reesing, 2012). Additionally, children high in NEE or low in effortful control tend to have more problematic interactions with peers (Eisenberg, Eggum, Sallquist, & Edwards, 2010), likely resulting in more conflictual or dysregulated interactions, which, in turn, may interfere with children's opportunities for learning at school (Coolahan, Fantuzzo, Mendez, & McDermott, 2000). If children's peers exhibit high levels of NEE or poor regulation at school, the consistent types of peer interactions children encounter at school may offer less support for learning in the classroom.

Of central importance to the goals of the current study, children with certain temperamental qualities may be more susceptible than others to the negative or positive influence that peers' temperamental qualities have on their academic adjustment. In line with perspectives emphasizing vantage sensitivity, whereby children's individual differences are more pronounced in positive social environments (Pluess & Belsky, 2013), children's self-regulation or low levels of NEE might be expected to be especially associated with high academic adjustment when children frequently interact with a child with the type of temperament found to relate to positive academic outcomes (i.e., high effortful control or low NEE). A positive social environment would not be expected to undermine regulation and learning, and might even provide the opportunity for children with low NEE or high effortful control to flourish. However, it also seemed quite possible that, consistent with a diathesis-stress model (Monroe & Simons, 1991), children's low effortful control (in comparison to high effortful control) or high NEE (in comparison to low NEE) would be more strongly related to poor academic adjustment in a negative social environment (i.e., when peers had low effortful control or high NEE). Children prone to NEE and low effortful control might have poorer academic adjustment than expected if they spent time with peers with high NEE or low effortful control; peers with these qualities might heighten other classmates' NEE and dysregulation, undermining children's opportunities for learning in the classroom. In any case, it is possible that either of the aforementioned patterns of moderation might be particularly true for children high in NEE (in contrast to those low in effortful control) because previous research has produced mixed findings regarding children's NEE and academic adjustment, suggesting moderating factors might play a stronger role in this relation.

The Present Study

In the present study, we tested whether target children's effortful control or NEE predicted reading and math achievement in the spring of kindergarten (while controlling for vocabulary assessed in the fall) and change in engagement between the fall and spring of kindergarten. Additionally, we tested the possibility that the temperamental characteristics of

a peer whom the target child spends the most time with at school might affect this relation. Children were considered target children only if we had parental permission to assess both their temperament and academic adjustment. In order to test our predictions, similar to in some previous work (Fabes et al., 2012; Hanish, Martin, Fabes, Leonard, & Herzog, 2005), we asked target children's teachers to identify a classmate with whom the target child spent the most time interacting with at school and to rate that classmate's effortful control and NEE. Finally, to provide a stringent test of our predictions, we also controlled for demographic factors that might contribute to these relations (i.e., Hispanic ethnicity, sex, and socio-economic status [SES]; e.g., Hanish et al., 2005; Valiente et al., 2014).

We hypothesized that target children's, but perhaps not their peers', temperamental qualities would be uniquely related to children's academic adjustment in the expected directions (i.e., positively for effortful control and negatively for NEE). In regard to the second hypothesis, an interaction between children's and peers' temperament might take multiple forms. From a vantage sensitivity perspective (Pluess & Belsky, 2013), we expected that the positive relation from children's effortful control and (perhaps especially) low levels of NEE to academic adjustment would be strongest when peers were high in effortful control or low NEE. Alternatively, based on a diathesis-stress perspective (Monroe & Simons, 1991), NEE (and perhaps low effortful control) could be expected to more strongly predict poor academic adjustment if children spent the most time with peers high in NEE or low in effortful control.

Method

Participants

Target children included 301 kindergarteners (51.5% girls; M_{age} = 5.48 [SD = 0.35]) from 26 kindergarten classrooms in the Phoenix metropolitan area. Parents (N = 284) reported target children's ethnicity (53% Hispanic), and race: White (85.99%), African American (7.77%), Asian American (2.88%), American Indian/Alaskan Native (2.1%), and other (1.4%). Although 22% of parents did not identify their country of origin, the majority of target children's parents (65%) indicated they were born in the United States. Approximately 11% of children's parents were born in Mexico and 4% were born in another foreign country. On average target children's parents reported living in the United States for 33 years (min = 9, max = 62). Target children's mothers and fathers had diverse educational backgrounds, with the following percentages, respectively, for mothers and fathers: no high school diploma (11% and 17%); high school diploma or equivalent (18% and 21%); some college, but no degree (30% and 24%); or held a higher education degree (39% and 36%); the educational status of 1.6% of mothers and 2.3% of fathers was unknown. Among the 77% of target children's parents who reported annual family income, the median was between $60,000 and $69,000 (range: < $10,000 to > $100,000). Children's kindergarten teachers (n=26; 100% female) had an average of 8.11 years of teaching experience (SD = 7.16; min = 1; max = 20). The majority of teachers had Bachelor's degrees (65%); some had graduate coursework (10%) or a Master's degree (25%); all teachers had degrees in education.

Procedures

Recruitment and consent—In August, two cohorts of target children were recruited one year apart (N = 301; n =178 in year 1; n = 123 in year 2) from kindergarten classrooms in five elementary schools. Families were recruited at meet-the-teacher night, curriculum night, and through materials sent home to parents. Parents returned consent forms via mail, and target children provided assent each time they participated in behavioral assessments. The sample of target children represented 62% of all kindergarten children in participating classrooms (M = 12.11 children per classroom). An additional 34 children's parents in these classes provided consent for children to participate in only the peer nomination portion of the study, which increased the sample used for peer nomination procedures (N = 335; see below for details). All procedures were approved by the Arizona State University Institutional Review Board.

Data collection—During the fall of kindergarten, we obtained data on target children's demographics (parents' reports), temperament (parents', teachers', and trained observers' reports; direct assessment; naturalistic observations; and peer), vocabulary (direct assessment), and engagement (observations). In late fall, teachers nominated a peer that each target child spent the most time with at school and rated that peer's temperament via an electronic or paper survey. In the spring, target children's reading and math achievement were assessed via direct assessments completed in conjunction with research staff in a private room at school and we re-assessed engagement via observations.

Naturalistic observations: Trained observers ($n_{observers}$ = 34 in fall and 38 in spring; n_{total} = 42) conducted observations of target children's NEE and engagement in classrooms approximately three hours per day, two to three days per week, for 9–12 weeks per semester. Observers were assigned 1–3 classrooms (at least two observers collected data in each class). To help observers identify target children, observers were given a randomly-ordered picture collage of target children in each classroom. Observers collected data from each class on separate days of the week and collected data from every available target child on the picture collage in 30-second intervals before beginning the list again. Prior to data collection each semester, observers were trained intensively in pilot preschools, and, throughout data collection, reliability data were collected in the classroom biweekly between expert staff and observers on target children. In year two (i.e., for the second cohort), reliability data were also collected biweekly via pre-coded 5-minute videos of non-participant preschool children's interactions.

Questionnaires: Near the beginning of the fall semester, teachers and parents returned questionnaire packets on target children's temperament via electronic survey or mail. Teachers were directed to complete surveys outside of school hours. Near the end of the fall semester, trained observers completed short surveys on target children's temperament (100% web-based).

Direct assessments: Trained research staff (different from trained observers) removed target children from class for approximately 45 minutes each semester in order to complete assessments. In a quiet space alone with the experimenter, target children completed

assessments of vocabulary and effortful control in the fall and standardized assessments of reading and math in the spring. During the fall, target children and an additional 34 non-target classroom peers were also removed from the classroom to participate in a peer nomination procedure.

Peers' temperament: In the late fall, teachers nominated a peer whom the target child spent the most time with at school and returned questionnaires via electronic survey or mail on that peer's temperamental qualities. If the nominated peer was not a target child participating in the study (27% of nominated peers), their identities remained anonymous. Whether or not the nominated peer was a target child or not was not related to any of the outcomes in the study.

Measures

Target children's effortful control—Effortful control was assessed in the fall with teachers', parents', and observers' ratings, as well as a behavioral assessment.

Teachers' and parents' ratings: Teachers and parents rated children's effortful control via three subscales of the Children's Behavior Questionnaire (CBQ), a well-validated measure of temperament (Rothbart, Ahadi, Hershey, & Fisher, 2001). The CBQ prompts respondents to rate the extent to which each statement describes children's behavior on a scale from *1* (extremely false) to *7* (extremely true). The subscales of effortful control include attentional focusing (e.g., "is easily distracted when listening to a story"; n_{items} = 11; αs = .93 and .89 for teachers and parents, respectively), inhibitory control (e.g., "has trouble sitting still when s/he is told to do so"; n_{items} = 13; αs = .93 and .81 for teachers and parents, respectively), and attentional shifting (e.g., "can easily leave off working on a project if asked"; n_{items} = 12; αs = .94 and .84 for teachers and parents, respectively). For teachers, some items were slightly reworded to make them appropriate for the school context (Eisenberg, et al., 1997). For each reporter, the three subscales were strongly correlated, *rs*(300) = .75 to .85, *p*s < .001 for teachers, and *r*s (231) = .42 to .65, *p*s < .001 for parents. Each reporters' subscales were averaged together to form effortful control rating composites for teachers and parents, respectively.

Observers' ratings—Trained observers rated statements about target children's inhibitory control (*n* = 5 items) and attention focusing (*n* = 4 items) on a scale from *1* (extremely false) to *7* (extremely true) via a short version of the CBQ, which demonstrates internal consistency, criterion validity, and a robust temperament factor structure for children ages 3–8 years (Putnum & Rothbart, 2006). Observers' responses to each item were averaged (i.e., 2–3 observers' ratings per child), and the averaged observer items were used to form the inhibitory control (α = .95) and attention focusing (α = .93) subscale scores. Given the high correlation among subscales, *r*(284) = .90, *p* < .001, the subscale scores were averaged together to form an effortful control composite for observers.

The Continuous Performance Task—Target children were administered a slightly adapted Continuous Performance Task (e.g., the images were a bit different), a computer-based behavioral assessment where children were asked to press the space bar on a keyboard

as quickly as possible after a target stimulus (i.e., a fish) appeared (NICHD Early Child Care Research Network, 2003). Eighty familiar objects (e.g., flower) including the target stimulus were individually-presented for 0.5 s in 1.5 s intervals. All children completed ≥75% of trials. The proportion of trials in which children pressed the space bar when the target was not presented (i.e., false alarms) was converted into a *z*-score and subtracted from a *z*-score of the proportion of trials that the child correctly pressed the space bar when the target was presented (i.e., correct hits); higher scores indicated greater correct hits, controlling for the number of false alarms. This score, labeled the detectability score, reflects how well children are able to discriminate between target and non-target stimuli during a sustained attention task. For young children, this score has been shown to load onto a latent effortful control construct (Sulik et al., 2009).

Target children's NEE: NEE was assessed during the fall with naturalistic observations, peer nominations, and parents', teachers', and observers' ratings.

Naturalistic observations: While in the classroom, at lunch/recess, and in specials (i.e., art, physical education, etc.), observers rated children's NEE (e.g., frustration, sadness, and fear/anxiety) every 30 seconds on a 4-point scale: *0* (none), *1* (minimal evidence; i.e., low intensity emotional indicator seen one time, lasting < 3 s), *2* (moderate evidence; i.e., two minimal evidence indicators; one low intensity indicator lasting between 4 and 9 s; one medium intensity indicator lasting < 5 s), and *3* (strong evidence; i.e., three minimal evidence expressions, two moderate evidence expressions, any high intensity indicator, any low intensity indicator lasting ≥ 10 s, any medium intensity indicator lasting > 5 s). Similar to previous work (Fabes, Leonard, Kupanoff, & Martin, 2001; Spinrad et al., 2004), NEE indicators were coded based on the prevalence and duration of discrete facial (e.g., pursed lips), behavioral (e.g., sharp pointing), verbal (e.g., "you're making me angry"), and paralinguistic (e.g., harsh sigh) indicators (e.g., anger/frustration) that occurred during a 30-second period. Using reliability videos and biweekly classroom coding with a gold standard rater, observers reliably rated negative emotion in the fall (ICC = .96). Data from one unreliable observer were removed from the data. An average of 124 observations of NEE per target child was collected in the fall (SD = 40.01). Observations for each child were averaged across the entire fall semester to form a naturalistic observation score for NEE.

Teachers' and parents' ratings—Using the CBQ (or a slightly modified version, for teachers; e.g., Eisenberg et al., 1997), teachers and parents rated target children's sadness (e.g., "seems to feel sorry for her/himself when things are going badly"; n_{items} = 12; αs = .90 and .79 for teachers and parents, respectively) and anger/frustration (e.g., "gets quite frustrated when prevented from doing something she/he wants to do"; n_{items} = 11; αs = .94 and .85 for teachers and parents, respectively). Teachers' reports of anger and sadness were highly correlated, $r(298) = .78$, $p < .001$, and were averaged together to form a NEE composite. The same was done for parents' reports, given the high correlation between subscales, $r(236) = .43$, $p < .001$.

Observers' ratings—Using a short version of the CBQ, observers rated children's anger (n =4 items) and sadness (n = 8 items). Similar to the protocol for observers' effortful

control ratings, items for anger and sadness were averaged across observers (i.e., 1–3 observers per child), and the averaged items were used to form anger (α = .94) and sadness (α = .90) subscales. Given high correlations among subscales, $r(273) = .71$, $p < .001$, the subscales were then averaged together to form a NEE composite for observers.

Peer nominations—While participating in one-on-one sessions with a trained research assistant at school, 335 children (n = 301 target children + 34 non-target classroom peers) nominated up to three peers who "gets angry the most", or "gets sad the most" (among the participating children in the class; $M_{raters\ per\ child} = 12.46$). Children's anger and sadness nomination scores were each summed across all nominations based on the order in which they were nominated (*3* [nominated first] through *0* [not nominated) and divided by the number of participating nominators in that class. Children's scores were standardized using the classroom average (Hernández et al., 2016). Higher scores represent more anger or sadness nominations from participating peers within the classroom. Measures obtained through similar procedures have demonstrated reliability in kindergarten-aged samples (Hymel, 1983). The correlated subscales, $r(301) = .16$, $p < .001$, were averaged to form a NEE composite for peers' nominations.

Target children's engagement: An observational engagement scale was developed using categories similar to those used in the Classroom Observation Scale (La Paro, Rimm-Kaufman, & Pianta, 2006). In fall and spring, observers rated engagement during academic tasks on a 4-point scale: *0* (no evidence of engagement; i.e., participated < five seconds), *1* (minimally or passively engaged; e.g., pays attention but does not participate for nearly all 30 s or participates some of the time but becomes disruptive), *2* (moderately engaged; e.g., attends to the teacher and participates appropriately at least half of the time or attends and participates most of the time, but becomes disruptive), and *3* (highly engaged; actively participates ≥ 25 seconds and is not disruptive). Engagement was coded during language arts, math, science, art/music, physical education, and computer activities but not during transitions (e.g., passing papers), classroom management, or free-time. An average of 67.78 and 73.16 observations were collected for each child in fall and spring semesters, respectively (*SDs* = 23.65 and 27.33). Using both reliability videos and live coding during biweekly classroom meetings as the gold standard, observers reliably rated engagement in fall and spring (ICCs = .91 and .93, respectively). Data from three unreliable observers in the fall semester were dropped. Observations during the first four weeks of the fall semester (i.e., an index of initial engagement) and during the entire spring semester were averaged to form early fall and spring engagement composites, respectively.

Target children's reading and math achievement: The passage comprehension and applied problems subtests from the Woodcock-Johnson III Tests of Achievement were administered in the spring semester to assess reading comprehension and math problem solving, respectively. One child completed these two assessments in Spanish. Raw scores for each subtest were converted to the W metric, which represents equal-interval units on a Rasch scale, and were utilized for analyses. These scores are widely used and demonstrate adequate reliability in early childhood samples (Woodcock, McGrew, & Mather, 2001).

Target children's vocabulary: The Picture Vocabulary subtest from the Woodcock-Johnson III Tests of Achievement (Woodcock et al., 2001) was administered in the fall to assess vocabulary. Seven children were administered this test in Spanish, which exhibits internal consistency similar to the English version in samples of children ages 6–13 (Schrank et al., 2005). Standard scores reflecting children's percentile rank were utilized in analyses.

Peers' temperament: In the late fall, teachers nominated a peer that the target child spent the most time interacting with at school and rated this peer's NEE and effortful control using the short version of the CBQ, which asked teachers to rate how true each statement described the peer's behavior on a scale from *1* (extremely false) to *7* (extremely true). Similar to children's effortful control ratings, ratings of peers' attention focusing (n_{items} = 5; α = .86) and inhibitory control (n_{items} = 4; α = .82) were strongly correlated, $r(292) = .83$, $p < .001$, and averaged together to form an effortful control composite. Likewise, teachers ratings of peers' anger (n_{items} = 4; α = .91) and sadness (n_{items} = 8; α = .90) were correlated, $r(291) = .65$, $p < .001$, and averaged to form a NEE composite.

Target children's covariates: Target children's covariates included: 1) sex (dummy coded with zero equal to female), 2) Hispanic ethnicity (dummy coded with zero equal to non-Hispanic), 3) socio-economic status (a continuous variable calculated as the standardized average of annual income and average parental education level), 4) observed engagement during the first month of the fall semester, and 5) vocabulary.

Missing Data

Tables 1 and 2 show the sample size for study variables. All target children had at least some data on their own temperament. Eight target children were missing data on their peer's temperament. Compared to children with peer data, children missing peer data scored higher on passage comprehension in the spring, $t(287) = 2.18$, $p = .03$. Seven children were missing outcome data in the spring. Compared to children with outcome data, those without outcome data were more likely to have high observed NEE, $t(299) = 2.63$, $p = .01$, their teachers were more likely to report that they had high NEE, $t(6.69) = -2.75$, $p = .04$, and their peers nominated them as expressing negative emotion slightly more often, $t(6.11) = 2.20$, $p = .07$. Children with missing data did not differ on demographic variables (i.e., age, sex, SES, ethnicity) or other variables. Maximum likelihood with robust standard errors (MLR) was utilized in all analyses to address missing data, which performs as well as multiple imputation analyses when data are assumed to be Missing at Random (Muthén & Asparouhov, 2002).

Data Analytic Plan

First, descriptive statistics and correlations among the study variables were calculated using IBM SPSS Statistics 24.0. All subsequent analyses were estimated using Mplus 6.11. In addition to MLR to account for missing data in the sample, the Type=Complex specification was utilized to account for children being nested in classrooms. Because our research questions focus on individual rather than classroom-level effects and our study had low power to detect classroom-level effects ($n = 26$ classrooms), this approach was chosen over multi-level modeling, which separately estimates child and classroom levels of variance in

the data. To ease interpretation in path analyses, all predictors were grand-mean centered (Aiken & West, 1991).

Using Mplus 6.11, confirmatory factor analyses (CFA) were conducted to determine the best-fitting model of children's effortful control and NEE. Next, using the observed factor scores saved from the best-fitting CFA model, a path analysis was conducted to test our first hypothesis—that target children's temperamental qualities directly and uniquely predicted children's academic adjustment. Finally, we tested our second hypothesis that target children's and peers' temperament would interact to predict children's academic adjustment by estimating additional path analysis models that included interactions between children's and peers' temperamental qualities. All CFA and path analysis models were considered to have very good fit if the chi-square was not significant at $p < .05$, RMSEA ≤.05, CFI ≥.95, and SRMR ≤.08 (Little, 2013; Hu & Bentler, 1999). Acceptable fit indices also included models with RMSEA between .05 and .08, and CFA between .90 and .99 (Little, 2013, p 109, 115).

Results

Factor Structure of Target Children's Temperament

As presented in Table 1, correlations among target children's temperament variables were generally in the expected directions. Indicators of children's effortful control (i.e., teachers', parents', and observers' reports and detectability scores on the continuous performance task) were moderately to strongly positively correlated, *rs* between .25 and .57, *ps* < .001. Although most indicators of children's NEE (i.e., teachers', parents', and observers' reports; naturalistic observations; and peer nominations) were moderately positively correlated, *rs* between .31 and .38, *p*s between <.001 and .01, parents' reports of NEE were not significantly correlated with other indicators of NEE and were dropped from subsequent analyses. Children's temperament variables displayed multivariate normality.

Next, CFA models were estimated to determine the best-fitting structure of target children's temperament (i.e., one or two factors). In both models, the residual variances of items from the same reporter (e.g., teachers' reports of NEE and effortful control) were allowed to freely covary. In our hypothesized two-factor model, we estimated separate latent factors for children's effortful control and NEE. This model fit the data well, $\chi^2(17) = 41.67$, $p < .001$, RMSEA = .07 (95% CI: .04, .10), CFI = .94, SRMR = .05, and all loadings were significant (see Figure 1a). To test the fit of this model, relative to an alternative one-factor model, we allowed all items to load onto a single latent factor, representing "dysregulated temperament" (see Figure 1b). In the one-factor model, all items loaded significantly, λ* between .35 and .81, but the fit was relatively poor, $\chi^2(18) = 64.37$, $p < .001$, RMSEA = .09 (95% CI: .07, .12), CFI = .89, SRMR = .06. Although the two CFA models were not nested and could not be compared using frequentist approaches (e.g., a chi-square difference test), the Bayesian fit indices for the two-factor model (AIC = 4062.31, BIC = 4162.40, saBIC = 4076.77) indicate a better fit to the data than the one-factor model (AIC = 4096.98, BIC = 4193.37, saBIC = 4110.91). Children's scores on the two latent factors, which were mean-centered by default calculation, were saved out for future path analyses using the Save=Fscores subcommand in Mplus.

Descriptive Statistics and Correlations among Study Variables

Descriptive statistics and correlations for the major study variables used in path analyses are shown in Table 2. No variables displayed skew (≤ |2|) or kurtosis (≤ |7|). Children's effortful control was positively related to applied problems, passage comprehension, and spring engagement. The reverse pattern was detected for children's NEE. Peers' effortful control was positively related to passage comprehension and engagement and peers' NEE was negatively related to engagement.

Path Analysis Models—Five path analysis models were conducted to estimate: 1) the direct effects of children's and peers' temperament on children's academic adjustment, 2) the interaction between children's effortful control and peers' effortful control, 3) the interaction between children's effortful control and peers' NEE, 4) the interaction between peers' NEE and children's effortful control, and 4) the interaction between children's and peers' NEE. In all models, fall predictors (i.e., demographics, children's and peers' temperament, vocabulary, and initial engagement) were allowed to covary, and the residual variances of target children's passage comprehension, applied problems, and spring engagement were allowed to covary. All models fit the data at least adequately; fit indices and unstandardized betas for each model can be found in Table 3.

Hypothesis 1: Direct effects of child and peer temperament—Children's effortful control was significantly positively related to applied problems and passage comprehension. Specifically, a one *SD* increase in effortful control was associated with a .27 *SD* increase in math achievement and a .15 *SD* increase in reading achievement, indicating a small-medium and small effect size, respectively. Children's NEE was inversely related to change in engagement but not passage comprehension or applied problems. Specifically, a one *SD* increase in NEE was associated with .21 *SD* decrease in engagement between fall and spring, indicating a small-medium effect size. Peers' temperament did not uniquely predict the academic outcomes. Fall engagement predicted spring engagement. Vocabulary and socioeconomic status predicted spring passage comprehension and applied problems but did not predict changes in engagement. Boys performed higher on applied problems than girls, but sex was unrelated to passage comprehension and changes in engagement. Hispanic ethnicity did not predict outcomes.

Hypothesis 2: Moderation by peer temperament—In order to test the possibility that peers' characteristics moderated the relation between target children's temperament and academic adjustment, four interaction effects were tested, one at a time in separate models (children's effortful control X peers' effortful control; children's effortful control X peers' NEE; children's NEE X peers' effortful control; children's NEE X peers' NEE). The interaction terms were computed by multiplying the centered children's and peers' temperament variables together (Aiken & West, 1991). Each model included the same effects that were estimated in the direct effects model in addition to one interaction. If interaction effects were significant, interactions were probed following Aiken and West's (1991) method of probing the simple effects of children's temperament on academic adjustment at 1 *SD* below, at, and 1 *SD* above the mean of peers' temperament.

Children's effortful control X peers' effortful control: The interaction between children's and peers' effortful control did not significantly predict any outcomes.

Children's effortful control X peers' NEE: There was a significant interaction between children's effortful control and peers' NEE predicting changes in engagement, but not applied problems or passage comprehension. The interaction effect predicting changes in engagement indicated a small effect size (.11 *SD* increase for every 1 *SD* increase in the interaction term). As depicted in Figure 2a, children's effortful control positively and significantly predicted changes in engagement only when peers had low (one *SD* below the mean) levels of NEE, $b = .07$, $p < .001$. When peers had average or high (one *SD* above the mean) NEE, children's effortful control was not significantly related to changes in engagement, bs = .04 and .01, ps > .10.

Children's NEE X peers' effortful control: The interaction between children's NEE and peers' effortful control significantly predicted passage comprehension and changes in engagement; both interaction effects indicated a small effect size (.08 and .10 *SD* change for every one *SD* increase in the interaction term, respectively). However, the interaction effect did not significantly predict applied problems. As depicted in Figure 2b, children's NEE negatively predicted passage comprehension when peers' had high effortful control, $b = -7.27$, $p = .02$. When peers' had low or average effortful control, children's NEE was unrelated to passage comprehension, bs = −1.82 and −4.55, ps > .11. A similar pattern was found in relation to changes in children's engagement. As depicted in Figure 2c, children's NEE was negatively related to changes in engagement when peers had average or high effortful control, $bs = -0.07$ and −0.10, ps < .001. When peers had low effortful control, children's NEE was unrelated to changes in engagement, $b = -0.04$, $p > .11$.

Children's NEE X Peers' NEE: The interaction between children's NEE and peers' NEE significantly predicted changes in engagement, $b = 0.02$, $p = .05$, but did not significantly predict applied problems or passage comprehension, bs = 0.27 and 1.61, ps > .19. The significant interaction effect predicting changes in engagement indicated a small effect size (.06 *SD* change for every one *SD* increase in the interaction term). When we probed the interaction, we found that children's NEE was significantly negatively related to changes in engagement at all levels of peers' NEE. However, the negative relations became weaker as peers' NEE became stronger, bs = -.09, -.07, and -.05, ps < .001, <.001, =.05, for peers with low, average, and high NEE, respectively (Figure 2d).

Follow-up analyses—In the current study, because we included a longitudinal control for engagement but vocabulary was used as a proxy longitudinal control for achievement, it was possible that the differences in findings for achievement versus changes in engagement in our study were an artifact of the methodological design. To test for this possibility, the path analyses in Table 3 were re-estimated, excluding early fall engagement as a covariate in the models. The only result that differed when fall engagement was removed from the model was that effortful control significantly predicted spring engagement (in addition to NEE), b = 0.08, z = 3.09, $p = .01$ l. These results indicated that effortful control predicted *levels* of engagement, whereas NEE predicted *changes* in engagement across the school year.

Discussion

The present study examined short-term, longitudinal relations between children's temperament and academic adjustment. Further, we examined whether peers' temperament moderated these relations. In support of our first hypothesis and previous research, children's effortful control was positively related to reading and math achievement, whereas NEE was negatively related to changes in engagement from fall to spring. Further, we found that peers' temperament frequently moderated the relation between children's temperament and changes in engagement. There was limited evidence of moderation with respect to reading, and no evidence of moderation with respect to math.

Direct Relations between Temperament and Academic Adjustment

Our findings support previous research indicating that children's effortful control is a significant predictor of math and reading achievement, adding to the large body of work linking self-regulation to academic achievement (Allan, Hume, Allan, Harrington, & Lonigan, 2014). Moreover, we found that the relation from effortful control to math achievement was larger in magnitude than to reading achievement, replicating previous meta-analytic findings (Allan et al., 2014). However, we did not find evidence that effortful control significantly predicted changes in engagement, as we expected based on previous research linking effortful control and behavioral engagement (Rim-Kaufman, Curby, Grimm, Nathanson, & Brock, 2009; Valiente et al., 2014).

As supported by our follow-up analyses, effortful control may be more related to the *level of* engagement during the kindergarten year, whereas NEE may be more related to *change in* engagement through the year. Children with high effortful control may have started higher in the fall and maintained a high level of engagement through the spring semester. This interpretation is also supported by the strong, positive relation between target children's effortful control and early classroom engagement in the fall. Another possibility is that children with high NEE may be less likely to experience a desire to engage in classroom activities than children who experience difficulty regulating their attention and overt behavior, which may explain why children's NEE was more closely linked to changes in engagement than was effortful control. Because NEE and effortful control tend to be highly negatively correlated, person-centered analyses may offer additional information about how these traits work together to predict children's adjustment at school. This study is the first to our knowledge to examine the unique relations of effortful control and NEE to changes in classroom engagement. Previous research examining the relation between effortful control and engagement has not simultaneously considered children's NEE as a predictor (e.g., Valiente et al., 2014); nor did it test for change in engagement across the kindergarten year. Thus, the current study may have offered a more stringent test of the unique relations between these two temperamental constructs and changes in engagement during kindergarten. Importantly, most target children in our study exhibited high levels of engagement both semesters (Ms = 2.71 and 2.80; SDs = .21, respectively), indicating the restricted range may have precluded our ability to detect significant relations from effortful control to changes in engagement. Future longitudinal work is needed to clarify the unique

relation between effortful control and change in engagement, while considering other highly correlated temperamental traits, such as NEE.

The Moderating Role of Peers' Temperament

There was some support for the hypothesis that peers' temperament affected the relations between temperament and engagement and, to a lesser extent, reading, but not math. In general, when interaction effects between children's and peers' temperament were significant (75% of interactions for engagement and 25% of interactions for reading), the simple slopes analyses pointed to a consistent pattern of findings (especially with respect to changes in engagement) Specifically, we found that children with low NEE, in comparison to those with high NEE, were more likely to increase their level of engagement in the classroom across the kindergarten year when their peers did not have high NEE or low effortful control. A similar pattern was found regarding target children's effortful control; children with high effortful control increased in engagement across the school year only when their peers expressed moderate or low levels of negative emotion. This pattern of results supports a vantage sensitivity perspective, where individual differences among children become more pronounced in positive social environments (Pluess & Belsky, 2013). Peers with high self-regulation or low NEE may be less distracting for other children in the classroom and may provide a better learning environment and serve as more constructive models of behavior; peers with such temperamental characteristics may create an environment that allows children's own temperamental characteristics to be more predictive of engagement.

To our knowledge, this is the first study to examine whether peers' temperamental characteristics moderate the relation from children's temperament to academic achievement and changes in engagement during early elementary school. Previous research on classroom composition effects suggests that the classroom-average of peers' self-regulation skills in early elementary school directly predicted individual children's increases in reading comprehension and vocabulary, over-and-above the contribution of children's own self-regulation skills (Skibbe, Phillips, Day, Brophy-Herb, & Connor, 2012). Additionally, the classroom average of peers' self-regulation skills in preschool predicted change in individual preschooler's self-regulation from fall to spring, particularly for children with lower self-regulation in the fall, compared to their classroom peers (Montroy, Bowles, & Skibbe, 2016). This study expands upon these findings by (1) examining the prediction by a close peer's temperament, rather than the average skills of the entire classroom; (2) examining the moderating effects of peers' NEE as well as self-regulation; and (3) examining these associations in relation to classroom engagement as an additional indicator of academic adjustment, which may be more closely directly related to children's temperament than academic achievement (see below for additional discussion on this point). Rather than finding a direct association between peers' characteristics and target children's academic adjustment, as was found in previous classroom composition research (Skibbe et al., 2012), the findings from the current study suggest that a close classmate's temperament moderates the relation between children's own temperament and academic adjustment (particularly classroom engagement). The difference between our findings and Skibbe and colleagues'

(2012) findings may be due to methodology—the global classroom environment may predict children's academic adjustment differently than the characteristics of children's close peers.

Future research should examine the correlates of peers' characteristics at multiple levels of social complexity within early elementary classrooms (Bukowski et al., 2015). It is possible that the correlates of a close peer's temperament further depends on the classroom environment. For example, spending time with a peer with poor self-regulation or high NEE in a classroom where most peers exhibit dysregulated behavior may be not be as detrimental as in a classroom where most other peers have high self-regulation or low NEE; in a classroom where most peers have high self-regulation (e.g., a generally adaptive learning environment), children who affiliate with peers with low self-regulation or high NEE may be less popular, less likable by other classroom peers, or may be more likely to exhibit deviant behavior (Snyder et al., 2011). These poorer social adjustment outcomes, in turn, may further contribute to poorer academic adjustment later in development (Bukowski et al., 2015). A close classmate's temperament is likely only one important piece of the social environment in the early elementary classroom predictive of young children's academic adjustment.

One interesting implication of our study is that peers' temperament may be more important for predicting changes in children's engagement throughout the kindergarten year than for reading and math achievement at the end of the year. Because engagement was naturalistically observed throughout the kindergarten year, the measure may have tapped multiple constructs related to children's quality-adjusted learning hours, or the quantity and quality of children's learning experiences at school (Duckworth & Allred, 2012). The quality and quantity of children's learning experiences, in turn, have been shown to predict subsequent achievement and the development of achievement motivation later in elementary school (Gardner-Neblett, Decoster, & Hamre, 2014; Howse, Lange, Farran, & Boyles, 2003; Trentacosta & Izard, 2007; Valiente et al., 2014). Thus, the manifestations of children's effortful control and NEE in the classroom, such as cooperative participation during tasks or the ability to wait patiently, may have direct implications for children's ability to remain engaged in academic tasks at school. Achievement, on the other hand, may be primarily reflective of knowledge retention and assessment performance, which may be less likely to be directly impacted by children's peer context. Another possibility is that children's engagement may be more sensitive to environmental influences, such as peer temperament, than are academic achievement outcomes, which might be more related to genetic differences in IQ or temperament.

In future work, researchers might examine whether peers' temperament continues to moderate the relation between children's temperament and academic adjustment as children progress through school. For example, the importance of certain peer temperamental qualities may change as children become more accustomed to school and develop more sophisticated emotional display rules and practice with regulatory skills. Further, other qualities of children's peers, such as achievement orientation, may be important to consider as moderating peer characteristics. Additional work may consider whether the role of peers' temperament predicts achievement later in elementary school through changes in

engagement during kindergarten, as is suggested by previous work on children's temperament (Valiente et al., 2011).

Implications and Future Directions

The current study has several strengths, including the multi-method assessment of children's fall temperament, the longitudinal analyses predicting spring academic adjustment after controlling for fall vocabulary and early observed engagement at school, and the diverse sample of children. Moreover, engagement and NEE were directly observed in the classroom, which is a measurement approach that is rarely utilized. The work presented here suggests that school observations may be a useful tool for future research.

Our study should be considered in light of a few limitations. First, vocabulary was used as a proxy for baseline cognitive skills. Collecting reading and math achievement data in fall as well as the spring would have enhanced our ability to assess change in children's skills across the kindergarten year. We were also only able to measure peers' temperament via teachers' report; multiple measurement sources may have better captured peers' temperamental qualities. Moreover, our research design was correlational. Thus, it is impossible to know whether target children's academic adjustment was affected by spending time with peers of certain qualities, or whether target children with higher academic adjustment tend to affiliate with particular types of peers. Future work with more stringent longitudinal or experimental designs is better suited to determine the directionality of this association. Finally, we do not know how stable young children's early relationships with peers were in the first semester of kindergarten. Thus, it is impossible to know whether children's peers have an impact beyond the kindergarten year.

Despite these limitations, the current study provides evidence for the notion that children's temperament (particularly NEE) and their peers' temperamental qualities interactively predicted changes in kindergartners' engagement and, to a lesser extent, reading. Because the transition to kindergarten is such a crucial developmental time, creating an environment that fosters adaptation might enhance children's current and future academic adjustment. The data presented here offer insight into these processes, and further work in this area may advance our understanding regarding risk and promotive factors for children's academic adjustment. Although limited research has considered the importance of the qualities of young children's peers (e.g., Fabes et al., 2012; Hanish et al., 2005), findings from the current study indicate such research has the potential to enhance children's transitions to kindergarten.

Our findings, if replicated, suggest that adopting a universal classroom-based approach to promoting an understanding of individual differences and building supportive networks for children to rely on when they encounter difficult situations at school (with peers or otherwise) may not only support children with temperamental vulnerabilities, but may also benefit classmates exposed to such children. INSIGHTS is one such temperament-based program that is designed to help parents and teachers effectively interact with children based on their temperamental qualities and to help children understand their own and their peers' individual differences (McCormick, O'Connor, Cappella, & McClowry, 2015; O'Connor, Cappella, McCormick, & McClowry, 2014). Results from randomized control trials suggest

that educating parents, teachers, and children about temperamental differences was associated with gains in classroom engagement and decreases in disruptive behaviors for children with difficult temperament (McCormick et al., 2015) and increases in reading and math compared to children in a supplemental reading intervention (O'Connor, et al., 2014). Interventions such as INSIGHTS also foster positive relationships between teachers and children with difficult temperament (McCormick et al., 2015), which might help reduce some of the negative effects of associating with peers with characteristics that offer low support for learning in the classroom. Although the results from the current study are preliminary, our findings have implications for educators and add to the literature linking children's temperament to academic adjustment. These results suggest that it is important for parents and teachers to 1) be aware of temperamental differences among children and the risks and assets associated with those individual differences, and 2) understand how to interact with children and peer dyads with particular temperamental characteristics in a way that scaffolds students' learning and adjustment.

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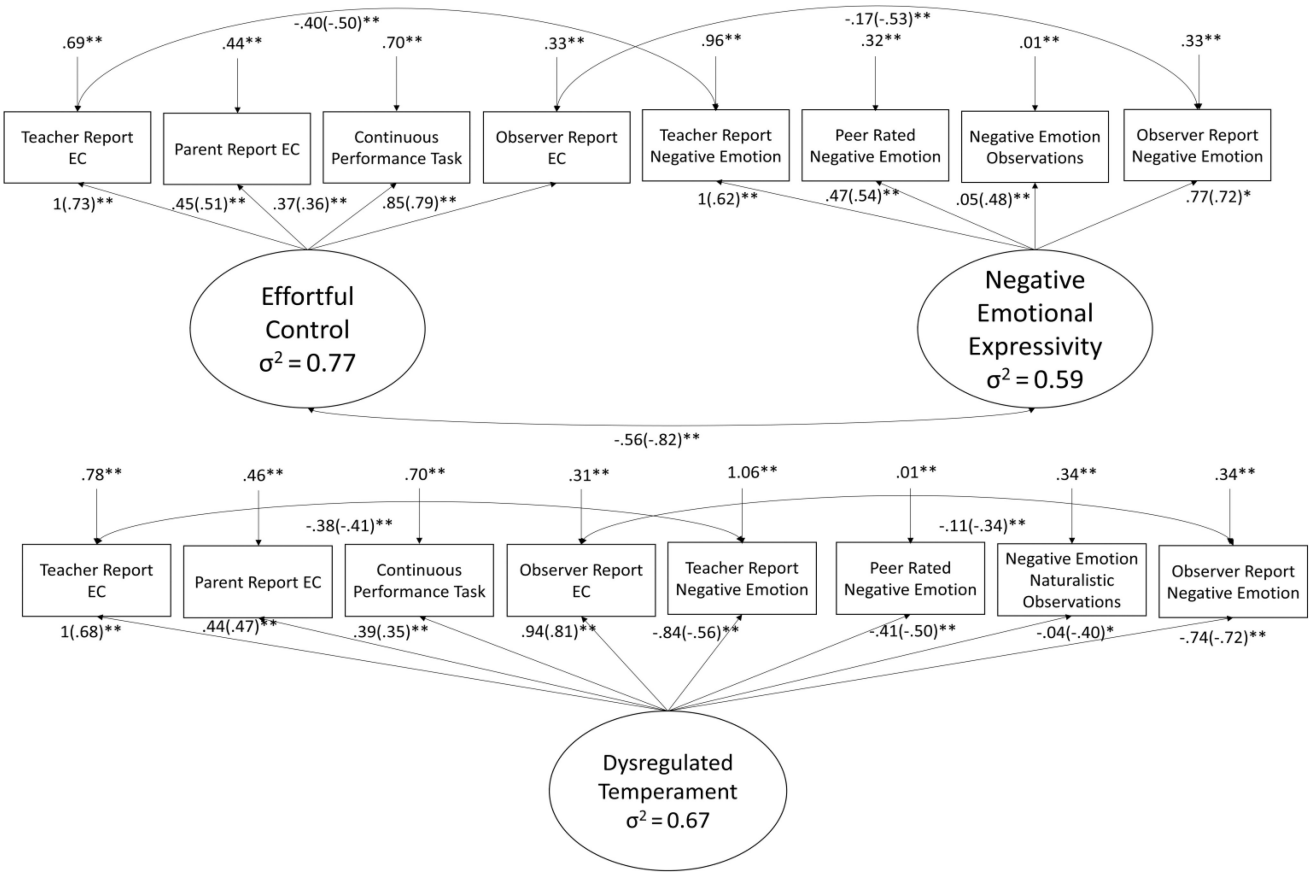
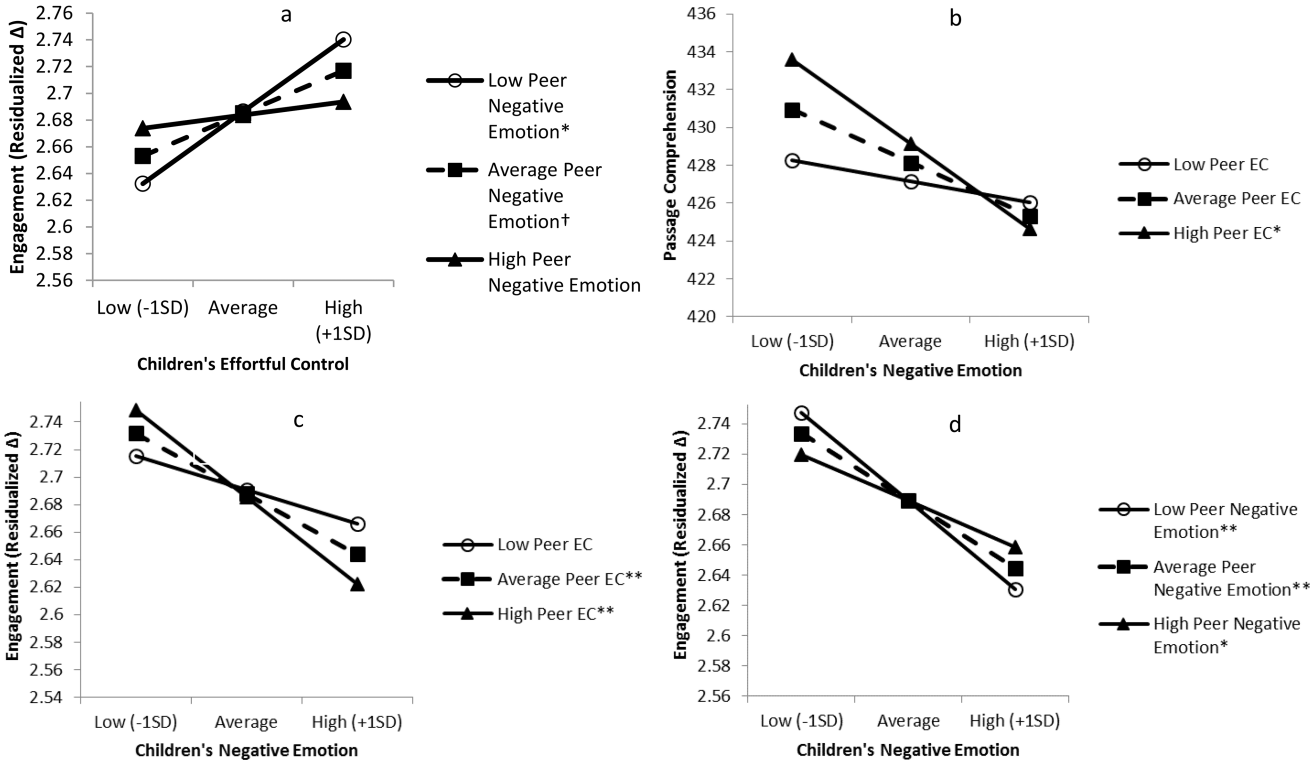
Educational Impact and Implications Statement

Our results suggest that children who enter kindergarten with high self-regulation, or the ability to purposefully control one's own behavior, attention, and emotions, tend to have high reading and math achievement in the spring, and children with low negative emotional expressivity in the fall tend to increase in engagement during the year. However, the findings relating to changes in engagement in particular often depended on the temperament of the classroom peer with whom the child spent the most time with during the fall of kindergarten. Children's self-regulation and negative emotional expressions most strongly and consistently predicted changes in engagement in the expected directions when peers expressed low levels of negative emotion or had high self-regulation. Universal school-based programs that focus on social-emotional learning, particularly promoting self-regulation or reducing negative emotions, may promote increases in engagement during kindergarten for many children in the classroom, not just those who express high levels of negative emotion or who have low self-regulation.



Figures 1a and 1b. CFAs of Children's Temperament

Note: Loadings are depicted as unstandardized (standardized). All variances and residual variances are unstandardized. ** $p < .01$, * $p < .05$



Figures 2a–2d. Peers' temperament moderates the association between children's temperament and academic adjustment

Note: ** $p < .01$; * $p < .05$ (see the text in the results section for exact p values); In Figures 2a, 2c, and 2d, peers' temperament did not significantly predict engagement at any value of children's temperament (i.e., when children's temperament was treated as the moderator). Thus, the crossover pattern evident in the graphs does not represent significant differences among children whose peers have high or low negative emotion or effortful control, respectively, holding the value of children's temperament constant. However, in Figure 2b, when target children negative emotion was treated as the moderator, the relation between peer's effortful control and passage comprehension was only significant when target children have low negative emotion.

Table 1

Correlations Among Target Children's Temperament Variables

	Children's Effortful Control (EC)				Children's Negative Emotional Expressivity (NEE)				
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
Children's EC									
1. Teachers' Report EC		.46 *	.30 *	.57 *	−.63 *	−.19 *	−.31 *	−.25 *	−.43 *
2. Parents' Report EC			.25 *	.38 *	−.24 *	−.07	−.13	−.56 *	−.26 *
3. Detectability				.28 *	−.13	−.04	−.09	−.20 *	−.33 *
4. Observers' Report EC Children's NEE					−.41 *	−.34 *	−.42 *	−.05	−.72 *
5. Teachers' Report						.31 *	.33 *	.18 *	.31 *
6. Naturalistic Observations							.32 *	.06	.38 *
7. Peer Nominations								.07	.39 *
8. Parents' Report									.11
9. Observers' Report									
Mean	4.8	4.8	2.9	5.3	3.5	0.1	0.0	4.2	2.5
SD	0.6	.0.5	0.5	0.8	0.5	0.6	0.5	0.3	0.8
N	300	234	300	286	299	301	301	227	285

Note: $N = 301$;

** $p < .01$;

* $p < .05$.

EC = Effortful Control; NEE = Negative Emotion. Variables 1–2, 4–5, and 8–9 were measured via the Child Behavior Questionnaire (range 1 to 7). Variable 3 was measured using the Continuous Performance Task (range −6 to 6). Variable 6 was measured via naturalistic observations (range 0 to 3). Variable 7 was standardized within classrooms per peer nomination protocol (range −3 to +3).

Table 2

Correlations and Descriptive Statistics Among Study Variables

	Children's and Peers' Temperament				Academic Adjustment			Covariates				
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
1. Children's EC		−.65**	.42**	−.35**	.30**	.30**	.47**	.19**	.53**	.15	−.23**	−.06
2. Children's NEE			−.26**	.32**	−.16**	−.25**	−.47**	−.08	−.47**	−.11	.01	.04
3. Peers' EC				−.61**	.06	.13*	.14*	−.04	.10	−.24**	.04	−.05
4. Peers' NEE					−.07	−.11	−.16**	−.01	−.16**	.15	−.11	.12
5. Applied Problems						.53**	.11*	.54**	.17**	.21**	.45**	−.35**
6. Passage Comprehension							.12	.40**	.15	.04	.38**	−.24**
7. Spring Engagement								.02	.55**	−.05	−.02	.04
8. Picture Vocabulary									.13*	.21**	.54**	−.59**
9. Early Fall Engagement										−.11	.14*	−.04
10. Sex											.13	−.13
11. SES												−.46**
12. Hispanic Ethnicity												
Mean	0.0	0.0	5.0	3.0	442.8	428.5	2.7	97.7	2.8		−0.1	
SD	0.8	0.6	1.3	1.3	15.8	20.9	0.2	11.8	0.2		0.9	
N	301	301	293	293	290	289	294	297	283	301	301	284

Note: $N = 301$;

** $p < .01$;

* $p < .05$.

EC = Effortful Control; NEE = Negative Emotion. Means for children's temperament are 0 because Mplus automatically centers factor scores in calculation.

Table 3

Model Fit And Unstandardized Regression Estimates For Path Analysis Models.

	Direct Effects			Children EC X Peers' EC			Children EC X Peers' NEE			Children's NEE X Peers' EC			Children's NEE X Peers' NEE		
Adjustment Outcome	***b***	***z***	***p***	***b***	***z***	***p***	***b***	***z***	***p***	***b***	***z***	***p***	***b***	***z***	***p***
Applied Problems															
Children's EC	5.12	4.06	**	5.16	4.12	**	5.07	4.16	**	4.91	4.07	**	5.05	4.10	**
Children's NEE	1.32	0.88		1.45	0.92		1.45	0.94		1.21	0.77		1.28	0.83	
Peers' EC	−0.08	−0.08		−0.10	−0.11		−0.09	−0.09		−0.11	−0.12		−0.06	−0.06	
Peers' NEE	0.19	0.18		0.15	0.15		0.12	0.12		0.09	0.09		0.18	0.17	
Interaction	−1.57	−0.84		0.55	0.90		−0.63	−0.87		−1.33	−1.29		0.27	0.33	
Picture Vocabulary	0.44	5.99	**	0.44	5.87	**	0.44	5.94	**	0.45	5.97	**	0.44	6.10	**
Early Fall Engagement	−0.09	−0.02		0.01	0.00		0.46	0.10		−0.10	−0.02		0.01	0.00	
SES	3.74	4.51	**	3.68	4.40	**	3.65	4.45	**	3.66	4.45	**	3.70	4.55	**
Sex	4.19	2.32	.02	4.22	2.31	.02	4.18	2.27	.02	4.11	2.23	.03	4.15	2.32	.02
Hispanic Ethnicity	−1.57	−0.84		−1.64	−0.90		−1.56	−0.85		−1.50	−0.832		−1.54	−0.84	
Passage Comprehension															
Children's EC	3.79	2.13	.04	3.81	2.17	.04	3.69	2.11	.04	3.45	2.01	.05	3.39	1.95	.05
Children's NEE	−4.37	−1.52		−4.23	−1.46		−4.15	−1.45		−4.55	−1.61		−4.60	−1.57	
Peers' EC	0.80	0.64		0.78	0.63		0.79	0.63		0.75	0.63		0.90	0.74	
Peers' NEE	0.53	0.67		0.54	0.80		0.43	0.37		0.39	0.35		0.51	0.44	
Interaction				0.54	0.80		−1.04	−1.57		−2.08	−2.23	.02	1.61	1.34	
Picture Vocabulary	0.44	3.29	**	0.44	3.29	**	0.44	3.33	**	0.45	3.42	**	0.45	3.45	**
Early Fall Engagement	−4.67	−0.58		−4.45	−0.56		−3.62	−0.46		−4.62	−0.60		−4.10	−0.52	
SES	4.96	3.57	**	4.90	3.47	**	4.82	3.37	**	4.84	3.46	**	4.76	3.32	**
Sex	0.01	0.01		0.04	0.02		−0.01	−0.00		−0.12	−0.06		−0.26	−0.13	
Hispanic Ethnicity	−0.54	−0.23		−0.60	−0.26		−0.55	−0.24		−0.46	−0.20		−0.38	−0.17	
Engagement															
Children's EC	*0.04*	*1.78*		*0.04*	*1.85*		*0.04*	*1.67*		0.04	1.57		0.04	1.58	
Children's NEE	−0.07	−4.02	**	−0.07	−3.66	**	−0.07	−3.70	**	−0.07	−3.79	**	−0.07	−3.75	**
Peers' EC	0.00	−0.10		0.00	−0.17		0.00	−0.11		0.00	−0.14		0.00	0.02	

Adjustment Outcome	Direct Effects			Children EC X Peers' EC			Children EC X Peers' NEE			Children's NEE X Peers' EC			Children's NEE X Peers' NEE		
	b	***z***	***p***	***b***	***z***	***p***	***b***	***z***	***p***	***b***	***z***	***p***	***b***	***z***	***p***
Peers' NEE	0.00	0.04		0.00	−0.03		0.00	−0.74		0.00	−0.08		0.00	−0.47	
Interaction				0.02	1.49		−0.02	−2.22	.03	−0.02	−2.08	.04	0.02	2.00	.05
Picture Vocabulary	−0.00	−0.66		−0.00	−0.65		−0.00	−0.74		0.00	−0.56		−0.00	−0.47	
Early Fall Engagement	0.40	3.53	**	0.41	3.85	**	0.42	4.15	**	0.40	3.82	**	0.41	3.79	**
SES	−0.02	−1.51		−0.02	−1.62		−0.03	−1.66		−0.02	−1.67		−0.03	−1.63	
Sex	0.01	0.71		0.02	0.74		0.01	0.67		0.01	0.63		0.01	0.59	
Hispanic Ethnicity	0.00	−0.01		−0.00	−0.08		0.00	0.02		0.00	0.06		0.00	0.09	
Model Fit Estimates															
$\chi^2(df)$	24.60(6) **			15.83(12)			16.37(12)			16.86(12)			18.00(12)		
RMSEA [5%, 95%CI]	.10 [.06, .14]			.03 [.00, .07]			.04 [.00, .07]			.04 [.00, .07]			.04 [.00, .08]		
SRMR	0.04			0.04			0.04			0.04			0.04		
CFI	.97			.99			.99			.99			.99		

Note: $N = 301$;

** $p < .001$; the exact p value is specified for all other statistically significant effects (i.e., $p < .05$). p values > .05 are not listed.

EC = Effortful Control; NEE = Negative Emotion.