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Effortful Control and Extensive Observations of Negative Emotion as Joint Predictors of Teacher–Student Conflict in Childhood

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Abstract

Studies with extensive observations of real-life emotions at school are rare but might be especially useful for predicting school-related outcomes. This study evaluated observations of negative emotion expressivity in lunch and recreation settings across kindergarten, first grade, and second grade ($N = 301$), kindergarten teachers' reports of children's effortful control, and kindergarten and second grade teachers' reports of their perceived conflict with children. In latent growth curve analyses, we tested whether individual trajectories of negative expressivity from kindergarten to second grade, based on estimated slopes, predicted teacher–student conflict in second grade, and whether effortful control in kindergarten moderated this association.

Research findings: Negative expressivity levels in kindergarten significantly predicted higher levels of teacher–student conflict in second grade, controlling prior teacher–student conflict. Furthermore, greater increases in negative expressivity from kindergarten to second grade were associated with higher teacher–student conflict in second grade especially for children who had difficulties with effortful control in kindergarten.

Practice or Policy: Results from this study have the potential to inform programs focused on reducing teacher–student conflict. The findings highlight the possibility of targeting both effortful control and negative emotion in the early elementary school transition as a means to improve teacher–student relationships.

Teacher–student relationship quality plays a key role in supporting children and their development in a variety of domains. For instance, conflictual relationships between students and teachers have been associated with more behavioral problems, lower academic

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achievement, and lower engagement in children (e.g., Crockett, Wasserman, Rudasill, Hoffman, & Kalutskaya, 2018; Engels, Pakarinen, Lerkkanen, & Verschueren, 2019; Lei, Chui, & Chiu, 2016; Maldonado-Carreño & Votruba-Drzal, 2011). Particularly in early childhood, when children are first exposed to formal schooling, teacher–student relationships have the potential to propel students' academic trajectories (Hamre & Pianta, 2010). Given the links between teacher–student relationship conflict and children's developmental outcomes, we were interested in examining what factors during the transition to school predict teacher–student relationship conflict in early elementary school, when children experience increasing demands on their self-regulation and exposure to academic content (La Paro, Rimm-Kaufman, & Pianta, 2006; Rothbart & Jones, 1998).

Guided by a conceptual framework on temperament in the context of school (Rothbart & Jones, 1998) and dispositional and situation-behavior patterns of personality development (Mischel, 1999; Mischel & Shoda, 1998; Mischel, Shoda, & Mendoza-Denton, 2002), we focused on children's observed negative emotion expressivity trajectories from kindergarten (K) to second grade (G2) and K effortful control levels – the ability to willfully shift attention, focus attention, and adaptively activate and inhibit behavior (Rothbart, Ahadi, Hershey, & Fisher, 2001) – as potential temperamental predictors of teacher–student relationship conflict in G2. Regulatory (e.g., effortful control) and reactive components (e.g., negative emotion) of temperament function in synergy throughout the lifespan; reactive aspects of temperament, for instance, might be appropriately modulated when children have helpful regulatory skills to appropriately express reactive emotions (Eisenberg, Fabes, Guthrie, & Reiser, 2000; Valiente et al., 2003). Aligned with the proposition by Rothbart and Jones (1998) that interactions between children's self-regulation and reactivity have implications for school outcomes, we examined both direct and interactive longitudinal effects on teacher–student relationship conflict.

Methodological and Theoretical Considerations: Temperament in School Context

A key consideration for understanding the role of temperament-based reactivity and regulation in children's functioning is that children sometimes behave differently across settings (e.g., the classroom vs. the playground; Hernández et al., 2016), suggesting a need to consider the development of temperament as both dispositional and situational. Research has supported the proposal that personality shows stability in both disposition and situation-behavior patterns (Mischel, 1999; Mischel et al., 2002). Mischel et al. (2002) proposed that individual differences (including temperament) are as much dispositional as they are situational. Moreover, the expression of dispositional traits (temperament or personality) is believed to vary across contexts (Mischel & Shoda, 1998; Snyder & Ickes, 1985). In classrooms, peer interaction is often limited and constrained (Pianta & Walsh, 1996), thereby restraining the emotions and behaviors children typically express with peers during classroom time compared to during recreational time. Thus, it is reasonable to expect that dispositional aspects of temperament-based reactivity be more freely expressed in recreational settings, compared to classroom settings where structure constrains behavior and potentially helps students' regulation of expressed behaviors.

Children's emotions are proposed to be important markers of adjustment to the school environment (Rothbart & Jones, 1998). However, measuring students' global emotions presents various methodological challenges (Brownell, Lemerise, Pelphrey, & Roisman, 2015; Hayden, Klein, & Durbin, 2005), which might explain why some studies have found mixed results for academic outcomes (e.g., Lewis, Huebner, Reschly, & Valois, 2009). In most research on relations of children's emotion to school-based outcomes, emotion has been operationalized as a dispositional measure, often exclusively reported by teachers or parents in early childhood. Yet parents infrequently observe children's behavior at school and given the demands placed on teachers, it is not feasible for them to intentionally observe and record children's expression of emotion across multiple school settings (e.g., the main classroom, lunch/recess, and special classes). Moreover, reports of individual differences in emotionality might be influenced by raters' impressions of a child's overall temperament, for example, how agreeable or regulated a child is, or behaviors that are salient to the reporter (Hayden et al., 2005). Observations rather than adults' reports of emotion offer an assessment of behaviors elicited at school and facilitates comparisons with age-matched peers (Dougherty et al., 2011).

Negative Emotion Expressivity and Teacher–Student Conflict

Because students' interactions in school inform their situation-behavior or temperament patterns, we were interested in understanding how observed negative emotion across time, a reactive component of temperament, and effortful control, a regulatory component of temperament, relate to their relationships with teachers. Thus, we examined how observed negative emotion and effortful control relate to teacher–student conflict, one domain of school adjustment, because teachers have influential roles in children's everyday school activities, guiding children's learning activities, leading classroom management, and promoting school engagement (Pianta & Walsh, 1996). Because of teachers' important roles, having difficult relationships with teachers creates challenges for children's academic success and school experiences (e.g., Curby, Rimm-Kaufman, & Ponitz, 2009; Engels et al., 2019; Maldonado-Carreño & Votruba-Drzal, 2011; Pianta & Stuhlman, 2004).

Children exhibit individual differences in negative emotion, which is an emotional reactivity component of temperament, and typically negative emotionality declines across the early school years (Sallquist et al., 2009; Yew & O'Kearney, 2015). Rothbart and Jones (1998) proposed that children's temperament-related reactivity, including their negative emotion expressivity, affects their social and academic experiences in school. For instance, children who are prone to express more negative emotion typically show maladaptive behaviors such as social withdrawal or approach to conflict (Eisenberg et al., 1999; Valiente, Swanson, & Lemery-Chalfant, 2012). Accordingly, children's negative emotion expressivity and socio-emotional profiles including high levels of negative emotion expressivity have been positively associated with teacher–student conflict (e.g., Denham et al., 2012; Diaz et al., 2017; Hernández et al., 2017; Reschly, Huebner, Appleton, & Antaramian, 2008; Valiente, Swanson, & Lemery-Chalfant, 2012), although studies have not typically considered real-life observations of emotion (for an exception, refer to Denham et al., 2012) or the developmental trajectories of emotional expressivity as predictors of teacher–student conflict. Examining negative emotion trajectories, especially of real-life observed

emotionality across three years, would add to our understanding of how *changes* in emotion across time relate to school difficulties.

A few research studies examining trajectories of reactive temperament, primarily based on parents' and/or teachers' reports, suggest that children typically show declines in negative emotional expressivity toward the beginning of elementary school (Hernández, Eisenberg, Valiente, Thompson, et al., 2018; Sallquist et al., 2009; Yew & O'Kearney, 2015). Given that adults, including teachers, might expect children to decreasingly express their negative emotion as they transition into later grades, children who disrupt a perceived normative declining trend might form reputations for being difficult children. In lunch and recreational settings, teachers and staff supervise students; thus, children's negative expressivity in lunch and recreational settings (where anger is also more often expressed; Hernández et al., 2016) might also create more conflict between teachers and children or prime teachers to notice more anger exhibited by students. Increasing trajectories of negative emotion expressivity might also be an indicator that the children are not adapting well in the school environment. We predicted that higher kindergarten levels and increasing trajectories of children's negative emotion expressivity in school would predict higher teacher–student conflict levels in G2.

Effortful Control and Teacher–Student Conflict

Effortful control, encompassing regulatory features of temperament, differs across children (Rothbart & Jones, 1998), and is beneficial in the transition to the elementary school grades when there are often changing behavioral and academic expectations that require appropriate regulation of behavior and emotion (Entwisle & Alexander, 1998; La Paro et al., 2006). Effortful control has implications for developing positive relationships with teachers in school because regulation likely promotes appropriate classroom behavior (Eisenberg, Spinrad, & Valiente, 2016; Rothbart & Jones, 1998). Children with poor effortful control might have more difficulty connecting with teachers, negatively impacting their relationships over time. In general, researchers have found a negative association between children's effortful control and conflict with teachers across the early elementary school grades (Diaz et al., 2017; Portilla, Ballard, Adler, Boyce, & Obradović, 2014; Rudasill & Rimm-Kaufman, 2009). We examined this association from K to G2 and were primarily interested in whether effortful control moderates the proposed association between negative emotion expressivity and teacher–student conflict.

Researchers have found significant interactions between negative emotionality and effortful control when predicting children's social competence and maladjustment (Eisenberg et al., 2000; Valiente et al., 2003). Specifically, negative emotion has predicted higher levels of maladjustment, such as problem behaviors, particularly for children with low effortful control, likely because of their difficulties with modulating attention and behavior as needed to respond competently in social environments (Eisenberg et al., 2000; Valiente et al., 2003). A child's ability, for instance, to shift attention from a distressing incident is likely to help the child avoid overarousal that potentially disrupts the classroom setting. Because teachers highly value minimal disruption in the classroom (Bassok, Latham, & Rorem, 2016),

students' ability to appropriately modulate their emotional responses would be particularly relevant to preventing teacher–student conflict.

Rothbart and Jones (1998) proposed that temperament by temperament interactions predict school outcomes. In support of this proposal, in two separate studies, dispositional negative emotion or anger was negatively related to the positive quality of the student–teacher relationship at low and moderate levels of effortful control among kindergarteners (Diaz et al., 2017; Valiente, Swanson, & Lemery-Chalfant, 2012). However, researchers have not yet examined the trajectory of real-life observations of negative emotion in the transition to elementary school as a predictor of later teacher–student relationship conflict. Based on theories of the role of temperament in academic contexts (Rothbart & Jones, 1998; Valiente, Swanson, & Eisenberg, 2012), we also examined whether children's effortful control moderates the association between observed negative expressivity development and later teacher–student conflict, controlling for K levels of teacher–student conflict. We predicted that a positive association between increasing negative expressivity trajectories and teacher–student conflict in G2 would be strongest for children with lower effortful control compared to those with higher effortful control. The present study is positioned to extend research on temperament in the context of school by testing *trajectories* of observed negative emotion and their interaction with effortful control as predictors of later teacher–student relationship conflict.

Method

Participants

Participants were recruited from 26 classrooms in five schools in a southwestern metropolitan area in the United States at the beginning of K (N = 301; 52% girls; M_{age} = 5.48 years). Before participation, parents provided consent for their own and their children's participation, teachers provided consent for their participation, and research assistants obtained verbal assent from the target child before beginning each assessment session. Children in the recruitment classrooms whose parents did not provide consent were not observed or assessed. Participants' ethnic/racial backgrounds (53% Hispanic, 34% White non-Hispanic, 3% Asian, 2% American Indian/Alaska Native backgrounds, 2% Black, 1% Other, 6% Unknown [percentages are rounded]) were generally representative of the student racial background composition from the schools where recruitment occurred (47% Hispanic, 37% White, 3% Asian, 2% American Indian/Alaska Native backgrounds, 8% Black, 3% two or more races [percentages are rounded]).

In planning the study, we carefully considered a target sample size to exceed the preferred minimum sample size for estimating growth curve models (Curran, Obeidat, & Losardo, 2010). We also considered a target sample size for rejecting hypotheses of SEM model fit (MacCallum, Browne, & Sugawara, 1996) and for tests of difference in fit between nested models (MacCallum, Browne, & Cai, 2006) based on root mean square error of approximation (RMSEA). For instance, for a latent growth model with three timepoints similar to the one estimated in the current study, rejection of the model based on the hypothesis of not close fit (null hypothesis RMSEA ≥ .05 and alternative RMSEA = .01) required an N of 212. Beyond power, the study's target sample size appropriately supports

the computational intensity required for models such as the one estimated in the current study. Also, demographic covariates were included in analyses (e.g., socioeconomic status). The participants' parents had varied education attainment levels (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 family income levels (average: $50,000 to $69,999; range: < $9,999 to $100,000+). The Arizona State University's institutional review board approved this study, as part of the Peers Research Project.

Procedure

In the fall semester of K, teachers completed questionnaire items measuring children's effortful control levels. In the spring semesters of K, first grade (G1), and G2, teachers completed questionnaire items measuring their perceived level of conflict with students enrolled in the study. Similar to prior observation protocols (Fabes, Leonard, Kupanoff, & Martin, 2001), undergraduate students were trained by graduate student supervisors and faculty to observe and rate children's negative and positive emotional expressivity in school; only observations of negative emotion in recreational settings were used in this study. The training lasted 3-4 weeks and involved instruction and evaluation of the coding manual and observation procedures. As part of the training, observers rated child interactions in pilot preschool settings and from pre-recorded interactions from a preschool (separate from the study schools). All observers needed to meet at least a .80 reliability based on ICCs before conducting live observations in schools. Observers were provided with picture collages to identify the children enrolled in the study that they were to observe. These collages were updated as children aged. Before observations in school, observers were tested on matching the pictures with the students' names; correctly identifying the children was a prerequisite to conducting observations in school sites. Throughout the study, trained observers (41 in K, 35 in G1, and 39 in G2) conducted observations in schools with participating children.

To monitor and guarantee the quality of the observational coding, two reliability checks were conducted. On a bi-weekly basis, a reliability coder (one of two graduate student coding supervisors) and observer independently observed the same children in schools. On a weekly basis, observers also coded 10 observation segments from pre-recorded and pre-coded videos each week (these videos were separate from the training videos and rotated throughout the semesters so that videos were not repeated). These videos were recorded in a lab preschool (separate from study schools) and subsequently coded by the coding supervisors. This system guaranteed that observers were coding up to standard (ICC ≥ .80).

Observers were not privy to the purpose or hypotheses of the study and were instructed to sit or stand unobtrusively on the periphery of classrooms or recreational areas and avoid talking to students and teachers to minimize observers influencing children's behavior. Observers rotated through a randomly ordered roster of participating children in each class, observed each child for 30-s, and recorded the data with a pencil on paper scoring sheets attached to a clipboard (refer to Hernández et al., 2017, for more details). Observers kept track of 30-s intervals with a stopwatch attached to the clipboard. Once the observer completed the random roster, the observer began observing at the top of the roster. Observers may have

rated the same set of children across two semesters within the same school year because the Institutional Review Board required that observers be changed minimally within the school year to avoid possible distress for teachers and children resulting from having new people in the classroom. Across the course of the three-year study, 75,309 30-s observations were collected across all participating children.

In participating schools, observations were conducted approximately 3 hours a day, 2-3 times each week for 9-12 weeks in the fall and spring of K, G1, and G2. The average number of 30-s observations in K (M = 91.56; SD = 25.16; range: 37-195), G1 (M = 92.35; SD = 32.67; range: 31-219), and G2 (M = 112.54; SD = 39.40; range: 34-232) varied across children due to a variety of factors, including days absent, shortened school days, and school events (a minimum 25 30-s observations was met to be included in analyses). Background covariates were also measured and included in subsequent analyses.

Measures

Teacher–student relationship conflict.—In the spring semesters of K and G2, teachers rated their perceived level of conflict with study participants using the conflict subscale of the Student–Teacher Relationship Scale (1 = *definitely does not apply*; 5 = *definitely applies*; 7 items; e.g., “This child and I always seem to be struggling with each other," αs = .90 [K], .90 [G1]; Pianta et al., 1995). This measure has shown strong psychometric properties and stability over time for elementary school children (Birch & Ladd, 1997; Portilla et al., 2014). Items on this scale were averaged to create a manifest variable score.

Negative emotional expressivity.—Research assistants observed the intensity, frequency, and duration of children’s negative (e.g., anger, frustration, sadness) emotional expressivity exhibited during school (e.g., lunch, recess, classroom). Children were observed during 30-s intervals by 2-3 observers, in the fall and spring semesters of K, G1, and G2. Negative emotional expressivity indicators included frowned lips, pouted lips, negative behavior (e.g., brows down or arched in sadness, crying), negative vocal tone (e.g., whiny) and content (e.g., “She made me feel bad.”), and negative vocalizations (e.g., slow, gentle sighs). Negative emotional expression was coded 0 = *no evidence of emotion*; 1 = *minimal evidence* (e.g., indicator seen once, small intensity and brief [< 3-s]); 2 = moderate evidence (e.g., two indicators, small intensity, and brief; one indicator, 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 indicators, medium intensity, lasting more than 5-s; any high intensity indicator).

We observed negative emotions during both classroom/library time and recreational (e.g., lunch, recess) settings in school. Negative emotion expressivity scores in the classroom and lunch and recess were correlated within each grade (rs = .54-.59, p < .001). In this study, we excluded the use of observed negative emotions during classroom/library time because behaviors are often constrained in classroom settings (Pianta & Walsh, 1996), possibly restricting the range of observed negative emotions during classroom/library time. Data in our study parallel this observation; emotions observed during classroom/library time were

less frequent and less intense, with a smaller range in variability compared to emotions observed during recreational time. Furthermore, data on observed negative emotions during recreational settings fit latent growth curves adequately (described in the model specification) with significant variance in the growth curve estimates, whereas latent growth curves with negative emotions during classroom settings resulted in nonsignificant variance in the growth curves, as expected. Thus, latent growth curves adequately represented the data for recreational but not classroom settings.

Prior research has used the observational coding system of negative emotional expressivity (e.g., Fabes et al., 2001; Spinrad et al., 2004), demonstrating adequate predictive validity. There was also concurrent validity for observed negative emotional expressivity: observed negative emotional expressivity in lunch and recess was significantly correlated with teachers' reports of children's anger (*r*s = .21-.25). We used observed negative expressivity rather than teachers' reports of children's anger because teacher–student relationship conflict and children's effortful control were reported by teachers; thus, including observed negative expressivity avoids possible biases of having the same reporter for all variables in the estimated models. Reliability was calculated every year based on a random selection of live observation sessions, where, on a bi-weekly basis, the observer and reliability coder independently observed the same children, and weekly pre-coded videos used only to calculate reliability (amounting to 8.5% [K], 10% [G1], and 9.6% [G2] of live and pre-coded observations). Based on intraclass correlations (ICCs), inter-observer reliabilities were adequate for negative emotion in K (ICC = .96), G1 (ICC = .96), and G2 (ICC = .97). Observers' ratings of negative emotional expressivity in lunch/recess were averaged across observations for each participant in K, G1, and G2. We then multiplied the composite score by 10 to facilitate estimation in analyses.

Effortful control.—In the fall semester of K, teachers rated children's effortful control with the attention focusing, inhibitory control, and attention shifting subscales of the Children's Behavioral Questionnaire (CBQ; Putnam & Rothbart, 2006; Putnam, Rothbart, & Gartstein, 2008) on a scale from 1 (*extremely false*) to 7 (*extremely true*). Studies have used teachers' reports of the CBQ (e.g., Eisenberg et al., 1997; Eisenberg et al., 2007), supporting its use for measurement in school. Only CBQ items that were relevant to the school context were included. Attention focusing, the "capacity to maintain attentional focus on task-related channels" (Rothbart et al., 2001, p. 1406), was measured with 11 items (α = .93). Two attention focusing items were modified to appropriately reflect children's possible behavior in the classroom (e.g., "*When practicing an activity, has a hard time keeping her/his mind on it,*" was modified to "*When working on an activity, has a hard time keeping her/his mind on it.*"). Attention shifting, the ability to shift attention from one task to another (Putnam et al., 2008, p. 389), was measured with 12 items (α = .94; e.g., "Can easily change from one activity to another."). Inhibitory control, the "capacity to plan and to suppress inappropriate approach responses under instructions or in novel or uncertain situations" (Rothbart et al., 2001, p. 1406), was assessed with 13 items (α = .93). One inhibitory control item was modified to reflect classroom activities ("*Is very careful and cautious in crossing streets,*" was modified to "*Is very careful and cautious in crossing streets and other potentially dangerous situations.*"). The attention focusing, attention shifting, and inhibitory control

subscale composites (averaged across items), which were highly correlated (*r*s = .75-.85), were then averaged to create an effortful control manifest variable score.

Covariates.—Parents provided background information on their children and family at the start of the study (in K; the parental response rate on background variables was 100%). Children's date of birth was used to calculate children's age at the beginning of K. Children's gender was coded 1 = *boy* or 0 = *girl*. Parents' schooling level (1 = *less than a high school diploma*, 2 = *high school degree or equivalent*, 3 = *some college*, 4 = *college graduate or higher*) and family income (range: < $9,999 to $100,000+) were each standardized and then averaged to create a socioeconomic status variable.

Results

Preliminary Analyses

Table 1 provides the correlations and descriptive statistics for the study variables. At least some data were collected from 301 (in K), 251 (83%; in G1), and 232 (77%; in G2) children. There were no significant differences in demographic or study variables for those who did not participate in G1 or G2, compared to those who did participate.

Negative Emotional Expressivity Growth Model Specification and Selection

Latent growth curve models were tested using M*plus* Version 8.1 (Muthén & Muthén, 1998-2017). To assess model fit, we used the chi-square test of model fit (χ^2), Comparative Fit Index (CFI; Bentler, 1990; Little, 2013), and root mean square error of approximation (RMSEA; Browne & Cudeck, 1993). We used full-information maximum-likelihood estimation with robust standard errors (MLR) to account for missing data (Muthén & Muthén, 1998–2017). Additionally, to account for the non-independence of observations due to multiple students nested in each classroom cluster, we used the TYPE = COMPLEX command. We designated K classroom as the cluster variable because teachers reported on children's effortful control in K and this was the first time point in the study.

First, we fit growth models with no growth (i.e., a slope of zero) and linear trajectories to test the presence of random individual trajectories (Curran, Bauer, & Willoughby, 2004). In the linear trajectory, time was coded such that a value of zero represented K, a value of 1 represented G1, and a value of 2 represented G2; thus, positive slope parameter values represent expected growth in negative emotion per grade, whereas negative slope parameter values represent expected declines in negative emotion per grade. Based on the scaled χ^2 difference test (Satorra & Bentler, 2001), $\Delta\chi^2$ (1) = .07, p = .79, the no-growth and linear models fit the observed change trajectories equally well. Because the linear growth model demonstrated good fit, MLR χ^2 (1, N = 301) = 3.02, p = .08, CFI = .97, and RMSEA = .08, and there was significant variability across students in both the estimated intercept (.483, p = .002) and slope (.154, p = .017) of negative emotional expressivity, we chose the unconditional linear growth model as a baseline model for further analyses predicting teacher–student relationship conflict in G2. Thus, although the average rate of change by year was not different from zero for the overall sample (b = .016, p > .10), the rate of change significantly varied across individuals based on the slope variance; that is, although

there was not a significant trend in the average rate of change, the presence of a significant variance indicates that there were individual differences between participants such that individuals demonstrated increases, decreases, or no change in negative expressivity across grades (Figure 1). In Figure 1, the X-axis represents time (K, G1, and G2) and the Y-axis represents negative emotion scores. Each line represents a change in negative emotion for a child across K, G1, and G2. Having significant variance in change makes it possible to test the main research questions.

For this unconditional linear growth model, we specified a random intercept (centered in K) and a random slope (individual rate of change across the three school grades), and the residual variances were freely estimated across the measurement occasions. The predicted negative emotional expressivity score in K from the unconditional linear growth model was 0.953 (variance = .483, $p = .002$, [note that the original scale of negative emotional expressivity was multiplied by 10 to facilitate estimation]). The estimated negative emotional expressivity rate of change by year was not significant but demonstrated significant variability (rate of change = .016, $p = .795$; variance = .154, $p = .017$).

Main Effects

To address the first research question–whether regulatory and reactive aspects of temperament predicted teacher–student conflict across time–we tested whether the negative emotional expressivity intercept in K and slope from K to G2, as well as effortful control in K, additively predicted teacher–student conflict in G2, controlling for teacher–student conflict in K and background covariates, MLR χ^2 (7) = 7.92, $p = .34$, CFI = .99, RMSEA = .02 (Model 1A, Table 2). Negative expressivity levels (latent intercept, centered in K) directly predicted teacher–student conflict in G2 (b = .33, $p = .001$), and the latent slope directly predicted teacher–student conflict in G2 (b = .59, $p = .007$). Because the fixed factor loadings for the slope were based on time coded as 0 (K), 1 (G1), and 2 (G2), the positive regression coefficient between the slope factor and the outcome indicated that children with higher slope scores (or more positive growth in negative emotion over time) tended to have greater values on the teacher–student conflict outcome (Duncan & Duncan, 2009). Effortful control in K did not significantly predict teacher–student conflict (b = −.06, $p = .17$). Teacher–student conflict in the spring of K positively predicted teacher–student conflict in the spring of G2 (b = .46, $p < .001$).

Moderation Effects

An interaction between effortful control in K and the slope of negative expressivity was specified using a latent moderated structural technique (Klein & Moosbrugger, 2000; Muthén & Asparouhov, 2015) to address the second research question, which was whether effortful control moderated the association between the negative emotional expressivity slope from K to G2 and teacher–student conflict in G2. The interaction model showed improved fit compared to a model with the interaction effect set to zero, based on lowered Akaike Information Criterion (AIC) and Bayesian Information Criterion (BIC) values (ΔAIC = −61.79, ΔBIC = −58.09). The interaction between the slope of negative emotion and kindergartners' effortful control significantly predicted G2 teacher–student conflict ($b = -1.21$, $p < 0.001$; Model 1B, Table 2).

Simple slopes were calculated at the mean and one standard deviation (*SD*) above and below the mean of the effortful control manifest variable in K (Preacher, Curran, & Bauer, 2006). In Figure 2, the X-axis represents the estimated slopes from K to G2 (as depicted in Figure 1). For instance, the left-most value on the X-axis is −.20; this point represents children whose negative emotion decreased by a score of .20 every year. The right-most value on the X-axis is .30; this point represents children whose negative emotion increased by a score of .30 every year. Thus, more positive slopes (i.e., for low effortful control) in Figure 2 reflect a stronger positive relationship between rate of increase in negative emotion and level of teacher–student conflict. That is, in comparison with students with high effortful control, students with low effortful control experience greater teacher-student conflict in second grade for every unit increase in growth in negative emotion. When the model included the interaction to test for moderation, the slope of negative expressivity was positively associated with G2 teacher–student conflict for children who had lower effortful control ($b = 5.23$, $p < .001$; Figure 2). This association was weaker for those with average effortful control levels ($b = 3.77$, $p < .001$), followed by those with high effortful control levels ($b = 2.31$, $p < .001$). Thus, for children who had lower effortful control, increases in negative expressivity from K to G2 were more strongly associated with higher conflict with teachers in G2, suggesting that children's increasing negative expressivity in school combined with lower effortful control reflects adaptation difficulties that adversely impact interactions with teachers across time. We note that the simple slopes testing the association between the negative emotion trajectories and teacher–student conflict were significant at all levels of the effortful control moderator based on confidence bands derived using the Johnson-Neyman technique (Preacher et al., 2006); the degrees of strength for these simple slopes specifically address our research question.

Discussion

There is a growing body of research on the associations between emotions and academic achievement, largely in adolescence and college populations (Pekrun, 2006), and a large research literature focusing specifically on test anxiety and academic achievement (e.g., von der Embse, Jester, Roy, & Post, 2018). Similar research on emotions and academic achievement in younger children, from a temperament perspective, is gaining research attention (Eisenberg, Valiente, & Eggum, 2010). Our study contributes to research on emotional development and its association with teacher–student relationship quality in childhood using a longitudinal framework with measures from multiple sources and latent growth analysis, extending prior research based primarily on cross-sectional data or short-term longitudinal data. Specifically, the study's longitudinal approach to examining temperament by temperament interactions, with observations of negative emotion across three years, in predicting relationships in school provides an added perspective to this question. Additionally, the study's method of coding over 75,000 in situ observations of negative emotion in school across three years in the early elementary school grades provides a relatively unique method of assessing children's emotional expressivity that, to our knowledge, has not been conducted at such scope within the school environment. Notably, the observational measures of negative emotion in lunch and recreation settings offer an assessment that reflects children's everyday school experiences in the early elementary

school transitions, when children experience shifts in schooling and classroom expectations (La Paro et al., 2006). By testing whether negative emotion expressivity across K to G2 predicted teacher–student conflict and whether kindergartners' effortful control moderated this longitudinal association, this study focused on how *changes* in emotional expressivity in the school context relate to social functioning in school.

Main Effects Predicting Teacher–Student Conflict in the Early Elementary School Grades

Negative emotion expressivity levels in K predicted higher teacher–student relationship conflict in G2, controlling for teacher–student conflict in K. That is, higher levels of negative emotion in K were associated with higher teacher–student conflict two years later. This finding is consistent with previous studies (e.g., Diaz et al., 2017; Hernández et al., 2017; Valiente, Swanson, & Lemery-Chalfant, 2012), demonstrating a lasting association across two grade years. Positive growth in negative emotion across three years (or an increasing trajectory) was associated also with higher teacher–student conflict in G2, controlling for prior levels. Students who showed increasing levels of negative emotion from K to G2 had higher teacher–student conflict compared to students who showed unchanging or decreasing negative emotion levels from K to G2. Effortful control in K did not significantly predict G2 teacher–student conflict; some studies have found significant associations between effortful control and teacher–student conflict either concurrently, across semesters, and from one grade to the next (Diaz et al., 2017; Portilla et al., 2014; Rudasill & Rimm-Kaufman, 2009). Perhaps effortful control has stronger direct associations with teacher–student conflict across shorter grade spans, consistent with previous study designs (Diaz et al., 2017; Portilla et al., 2014; Rudasill & Rimm-Kaufman, 2009), compared to longer time cross-lags across grades. Given significant interaction findings, the association from effortful control to teacher–student conflict can also be interpreted with the combined role of negative emotion trajectories.

Interactions Between Negative Emotion Expressivity and Effortful Control

The interaction between effortful control and negative emotion expressivity trajectories predicted teacher–student conflict. Increasing negative emotion expressivity trajectories predicted higher teacher–student conflict in G2, especially for children who had lower levels of effortful control in K. Based on this finding, effortful control attenuated the strength of the association between negative emotion growth across three years and teacher–student conflict. Compared to children with higher effortful control, conflict with teachers among children with lower effortful control in K was better predicted by their negative emotion trajectories of from K to G2. This finding corresponds with previous studies examining this association within kindergarten (Diaz et al., 2017; Valiente, Swanson, & Lemery-Chalfant, 2012), as well as studies predicting social competence and well-being outcomes in childhood (Eisenberg et al., 2000; Valiente et al., 2003). Our study highlights the significance of children's effortful control in helping modulate increasing negative emotions in school.

Study Implications

Early kindergarten assessments of negative emotion predicted later teacher-student conflict, suggesting a possible early intervention strategy to improve teacher-student relationship

quality. The study's findings suggest that to help reduce teacher-student conflict in early elementary school, interventions might find it useful to target children's effortful control and negative emotion trajectories. Some interventions aimed to improve children's self-regulation show promising results (e.g., Schmitt, McClelland, Tominey, & Acock, 2015; Skibbe, Phillips, Day, Brophy-Herb, & Connor, 2012). The study findings also suggest a need for a multidimensional approach to understanding temperament by considering both the trajectories and situations in which children are expressing their emotions. Some interventions have used teacher-focused reflection and relational perspectives as a means to improve student–teacher relationship quality (Hughes, 2012; Sabol & Pianta, 2012). Given that this study identified trajectories of negative emotion as a predictor of student–teacher relationship conflict, and when children were low in effortful control, teacher reflection interventions might also include reflections on how teachers are forming relationships with their students based on their expectations for and perceptions children's temperament-related developmental history in the context of school and other settings.

Study Limitations and Future Research Directions

As typically done in studies of elementary school students, teachers reported on their level of conflict with students, offering a teacher-focused perspective on their relationship with students. We did not measure students' perspectives on their relationships with teachers, which might also have important implications for students' cumulative and formative experiences in school, as well as their developing academic self-concept.

We examined children's observations of negative emotion expressivity in school recreational settings. As part of the larger study, we also conducted observations of negative emotion in classroom settings, which were significantly correlated with observed negative emotion expressivity in lunch and recess. However, there was not enough variance across grades in expressivity in classroom settings to estimate trajectories, potentially because less negative emotion was expressed in classroom settings. Some researchers recommend (Pianta & Walsh, 1996) and have specifically chosen to observe children in recreational settings because these provide a less structured environment without teacher-led instruction (e.g., Denham et al., 2012). Only estimating the trajectories of negative emotion in recreational settings limited our ability to capture individual differences in patterns of expressivity in a wider variety of settings and our ability to test situation-behavior patterns across development; rather, we tested patterns of emotion situated in recreational settings across time.

To provide a relatively strong test on how negative emotion trajectories predicted teacher–student conflict, we controlled for prior teacher–student conflict. However, higher teacher–student relationship conflict might also predict children's negative emotion expressed in some grades (e.g., refer to Hernández, Eisenberg, Valiente, Spinrad, et al., 2018, for an analysis from K to G1), presenting a limitation based on the current study's design. To address this, we conducted post-hoc analyses testing whether teacher–student relationship conflict in K predicted the *slope* or rate of change of negative emotion expressivity and found no evidence of a significant association. Future research might examine the conditions under which the teacher–student relationship might predict children's negative

expressivity in school across different grades or for subgroups of children. There is some evidence, for example, suggesting that peer–student relationship quality predicts children's internalizing negative emotions in later childhood (Reijntjes, Kamphuis, Prinzie, & Telch, 2010), providing a basis for considering how both peer– and teacher–student relationship quality might relate to children's negative emotions.

Conclusion

Results from this study suggest that children's temperament-related regulation and emotional reactivity, as well as their emerging patterns, relate to their relationship quality with teachers in second grade. This study extends previous research by examining trajectories of negative emotion as potential predictors of teacher–student relationship conflict. The study's pattern of findings supports the importance of assessing children's effortful control as a potential moderating factor in children's emerging school experiences, as well as examining trends in real-life observations of negative emotion in early elementary school. Overall, the findings suggest that understanding the predictors of teacher–student relationship quality involves examining children's early and emerging temperament-related regulation and emotional expressivity.

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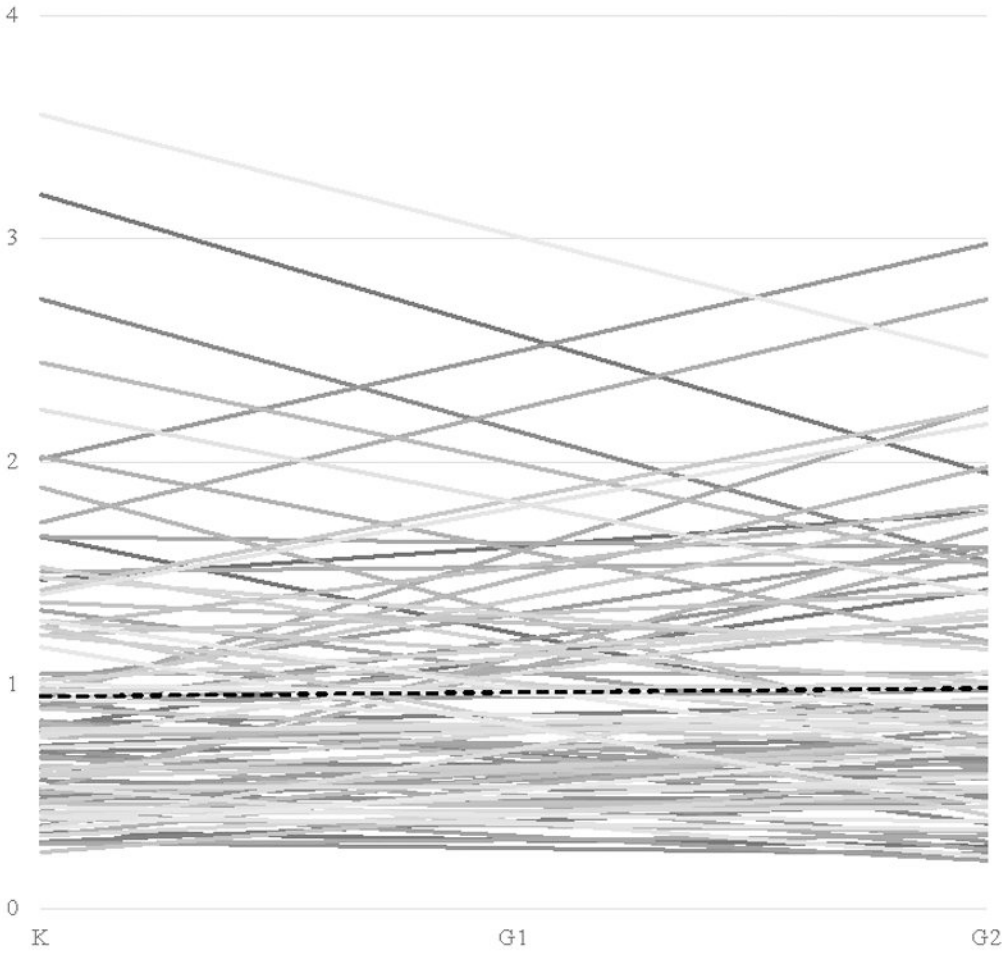

Figure 1. Estimated negative emotion expressivity trajectories

Note. Estimated slopes of negative emotional expressivity across K, G1, and G2 for a sample of 100 children. The Y-axis scale represents negative emotion scores multiplied by 10 to facilitate estimation in analyses. The solid lines represent individual estimated trajectories and the dashed line represents the average estimated trajectory across individuals ($b = .016$).

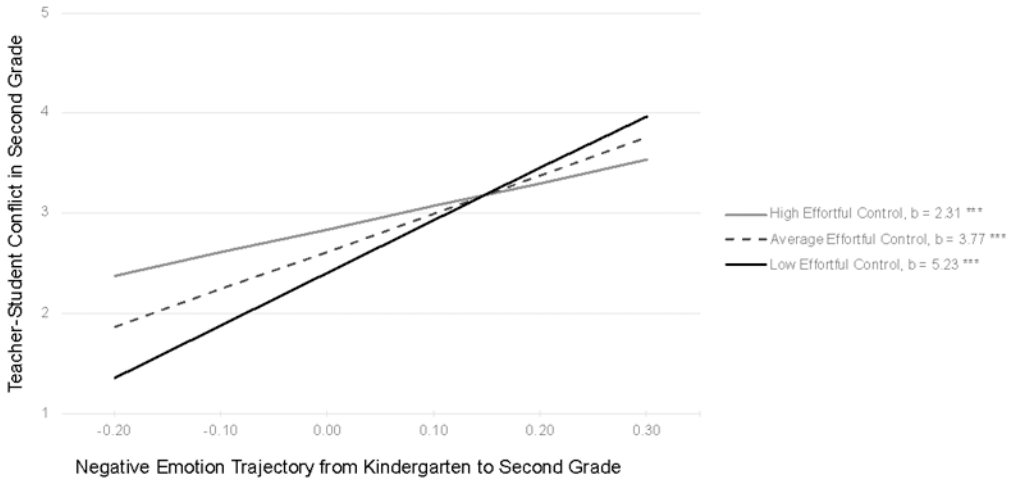

Figure 2. Negative emotion trajectory from kindergarten to second grade

Note. Results based on the interaction effect model. Plot depicts simple effects of negative emotional expressivity trajectory (estimated slopes from kindergarten to second grade listed on the X-axis) predicting teacher–student conflict in second grade (Y-axis) at varying levels of effortful control in kindergarten (moderator). Estimates are unstandardized. Covariates included family socioeconomic status, boy (versus girl), age, and teacher–student conflict in kindergarten.

*** $p \leq .001$.

Table 1

Correlations and Descriptive Statistics among Study Variables

	1	2	3	4	5	6	7	8	9
1. Teacher–student conflict (K)	---								
2. Teacher–student conflict (G2)	.53***	---							
3. Negative expressivity (K)	.30***	.19**	---						
4. Negative expressivity (G1)	.27***	.32***	.44***	---					
5. Negative expressivity (G2)	.12a	.25***	.27***	.47***	---				
6. Effortful control (K)	−.54***	−.37***	−.14*	−.18**	−.13a	---			
7. Age	.04	−.01	−.01	.00	−.04	.12*	---		
8. Boy	.03	.09	−.07	−.01	−.01	−.16**	.12*	---	
9. Socioeconomic status (K)	−.05	.04	.00	.07	.20**	.12*	−.10a	.10a	---
M	1.55	1.49	0.97	0.87	1.01	4.80	5.48	1.49	−0.05
SD	0.86	0.84	0.87	0.89	0.95	1.21	0.35	0.50	0.91

Note. K = kindergarten; G1 = first grade; G2 = second grade. The negative emotion expressivity scores presented in the table are the composite scores multiplied by 10 to facilitate estimation in analyses.

[a] $p < .10$

* $p < .05$

** $p < .01$

*** $p < .001$.

Table 2

Linear Growth Effects of Negative Emotion and Effortful Control Levels on Teacher–Student Conflict

	Model 1a. Teacher–Student Conflict Main Effects Model		Model 1b. Teacher–Student Conflict Moderation Model	
Parameter	***Estimate***	***S.E.***	***Estimate***	***S.E.***
Primary Linear Growth Estimates:				
Negative emotion intercept	0.327 ***	0.094	0.127 **	0.047
Negative emotion linear slope	0.586 **	0.217	9.587 ***	0.513
Kindergarten effortful control	− 0.063	0.045	0.180 ***	0.024
Negative emotion linear slope * effortful control	---	---	− 1.211 ***	0.122
Covariates:				
Teacher–student conflict in kindergarten	0.458 ***	0.082	0.797 ***	0.026
Socioeconomic status	− 0.011	0.060	− 0.011	0.027
Boy	0.138	0.111	− 0.046	0.054
Age	− 0.069	0.126	0.043	0.055

Note. Negative emotion expressivity was modeled with a linear function, allowing for individual differences in the level at intercept (centered in the spring of kindergarten) and the linear change rate. Estimates are unstandardized and were calculated using maximum likelihood with robust standard errors. Covariates included family socioeconomic status, boy (versus girl), age, and teacher–student conflict in kindergarten.

* $p \leq .05$

** $p \leq .01$

*** $p \leq .001$.