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Challenging Temperament, Teacher–Child Relationships, and Behavior Problems in Urban Low-Income Children: A Longitudinal Examination

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Research Findings: Racial/ethnic minority low-income children with temperaments high in negative reactivity are at heightened risk for developing disruptive behavior problems. Teacher–child relationships characterized by high levels of closeness and low levels of conflict may protect against the development of disruptive behaviors in school. The present study examined whether teacher–child closeness and conflict moderated the association between temperamental negative reactivity and growth in disruptive behaviors in low-income Black and Hispanic kindergarten and 1st-grade children. Findings revealed that negative reactivity predicted higher overall levels of in-school disruptive behavior problems at the beginning of kindergarten as well as growth in behavior problems over kindergarten and 1st grade. However, the effect of negative reactivity on disruptive behaviors was attenuated when children had relationships with teachers characterized by high levels of closeness and low levels of conflict. *Practice or Policy:* Implications for further research and practice are discussed.

Young children with temperaments high in negative reactivity—particularly low-income Black and Hispanic children attending urban schools—are at heightened risk for the development of disruptive behavior problems in elementary school (Kellam, Ling, Merisca, Brown, & Ialongo, 1998; Rothbart & Bates, 2006; Stright, Gallagher, & Kelley, 2008; Zentner & Shiner, 2012). Disruptive behaviors hamper the ability of teachers to teach and students to learn and have negative effects on broader classroom management and organization (Brackett, Reyes, Rivers, Elbertson, & Salovey, 2011). At-risk children may exhibit resilience, however, when they have teachers who foster classroom environments that support and appropriately respond to their temperament (Zentner & Shiner, 2012). Yet little work has examined the effects of temperamental negative reactivity and disruptive behaviors in samples of low-income Black and Hispanic children and the classroom factors that may protect against maladaptive behavioral development for these students. One such protective factor, teacher–child relationship quality, has been linked to positive behavioral development in early elementary school in a number of studies (Hamre & Pianta, 2001; Hamre, Pianta, Mashburn, & Downer, 2012; O'Connor, Dearing, & Collins, 2011). Thus, the present study aims to determine whether teacher–child closeness and conflict

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moderate the effects of temperamental negative reactivity on the development of disruptive behaviors in low-income racial/ethnic minority children during kindergarten and first grade.

TEMPERAMENT AND BEHAVIOR PROBLEMS IN URBAN ELEMENTARY SCHOOLS

Temperament is an individual's style of responding to people, events, and other environmental stimuli (Garcia-Coll, Kagan, & Reznick, 1984; Rothbart, Ahadi, & Evans, 2000; Zentner & Shiner, 2012). It is biologically based, relatively stable through childhood, and generally not malleable to intervention. Although studies vary in their definitions of temperament, a challenging temperament is usually characterized by the presence of negative emotionality or reactivity (Prior, 1992). *Negative reactivity* refers to the individual child's inclination to have an intense, negative reaction to situations through verbal or nonverbal expressions of displeasure or distress (Lyons-Thomas & McClowry, 2012).

Key to temperament theory is the notion that it is important to foster goodness of fit between a child's temperament and his or her proximal environment. *Goodness of fit* refers to the consonance of a child's temperament to the demands, expectations, and opportunities of the environment (Chess & Thomas, 1984). In other words, although temperament itself cannot be changed, the environment can be modified to appropriately respond to a child's temperament. When goodness of fit is fostered, children's behavioral outcomes are likely to be more adaptive (McClowry, Snow, & Tamis-LeMonda, 2005; McClowry, Snow, Tamis-LeMonda, & Rodriguez, 2010). Goodness of fit is critical, as a robust body of research has identified having a temperament high in negative reactivity as a risk factor for behavioral difficulties (Frick & Morris, 2004; Sanson, Hemphill, & Smart, 2004; Shaw, Owens, Giovannelli, & Winslow, 2001).

Indeed, *disruptive behavior problems*, defined as those that hamper the ability of teachers to teach and students to learn (e.g., not paying attention, hitting other children, teasing other children, yelling, crying, complaining) in early childhood, are of primary concern because they have significant implications not only for disruptive children themselves but also for their peers in learning. For example, even if only one or two students in a class engage in behaviors like acting defiant when told to do something, verbally fighting with other students, or being overactive and restless, they are likely to have a negative influence on the functioning of the classroom setting (Bronfenbrenner & Morris, 1998; El Nokali, Bachman, & Votruba-Drzal, 2010; Eyberg & Pincus, 1999). In addition, school-related problem behaviors at the transition to elementary school, such as inattentiveness or oppositional behavior, are negatively associated with school readiness (Fantuzzo et al., 2007). Disruptive behavior problems are of special concern to practitioners and researchers because of their association with later delinquency and school failure (Caspi, Moffitt, Newman, & Silva, 1996).

Even given the implications of temperament and disruptive behaviors in early school settings, little research has considered the association between negative reactivity and behavior problems specifically for samples of low-income Black and Hispanic students. Yet racial/ethnic minority children in urban contexts are at heightened risk for economic and other stressors that affect social-emotional development, such as implicit and explicit teacher bias regarding their behavior (McKown & Weinstein, 2008), violence in urban neighborhood contexts (McCoy, Roy, &

Sirkman, 2013), and higher rates of family and residential instability (Cooper, Osborne, Beck, & McLanahan, 2011). Thus, it may be that low-income Black and Hispanic children who are already at risk for suboptimal outcomes experience an additional stressor when they have a temperament high in negative reactivity that their school environment cannot effectively respond to and support. In addition, low-income early elementary school classrooms tend to have higher proportions of students with disruptive and inattentive behaviors and fewer resources to address student need (Bierman et al., 2010; Dodge & Pettit, 2003; Shernoff, Mehta, Atkins, Torf, & Spencer, 2011). Moreover, teachers working in urban public schools report that managing student behavior problems is a significant source of job stress and a reason for leaving the profession (Reinke, Stormont, Herman, Puri, & Goel, 2011; Shernoff et al., 2011). There is a need, particularly in urban elementary schools serving low-income racial/ethnic minority children, to understand the factors—like negative reactivity—that predict disruptive behaviors. However, perhaps more relevant to intervention strategies, there is also a need to identify the factors in urban schools that can help protect against maladaptive behavioral development at the transition to elementary school.

TEACHER–CHILD RELATIONSHIPS IN ELEMENTARY SCHOOL

A large body of research has identified associations between high-quality teacher–child relationships in early elementary school and positive child outcomes (Baker, 1999; Birch & Ladd, 1998; Roorda, Koomen, Spilt, & Oort, 2011). Teacher–child relationships are often conceptualized as composed of two distinct dimensions: closeness and conflict (Pianta, 1999). Relationships high in conflict are characterized by consistent antagonistic, disharmonious interactions between the teacher and child (O'Connor et al., 2011; O'Connor & McCartney, 2007). Teacher–child relationships characterized by closeness have consistent warm, positive interactions that encourage communication. Recent studies have shown that high levels of teacher–child closeness and low levels of teacher–child conflict are associated with fewer problem behaviors both within and across time (O'Connor et al., 2011; Silver, Measelle, Armstrong, & Essex, 2005). Recently these effects have been documented in samples of low-income racial/ethnic minority students (McCormick, O'Connor, Cappella, & McClowry, 2014; Silva et al., 2011).

Teacher–child relationships may be especially important for students transitioning into school with behavioral difficulties. Children who begin kindergarten exhibiting disruptive behaviors are more likely to maintain aggressive behavior over time and have more relational difficulties with teachers and peers (Berry & O'Connor, 2010; Ladd & Burgess, 1999). However, close teacher–child relationships have the potential to buffer effects of children's early problem behaviors (O'Connor et al., 2011). Indeed, research has documented associations between teacher–child relationship quality and students' behavioral trajectories in early elementary school (O'Connor et al., 2011). For example, in a majority White sample, Birch and Ladd (1998) found that kindergarten students who exhibited higher levels of behavior problems had lower levels of teacher–child relationship closeness and higher levels of conflict with both their kindergarten and first-grade teachers. Furthermore, using a majority White middle-income sample, Silver et al. (2005) found that early teacher–child conflict was associated with increases in externalizing behaviors during the transition from kindergarten *through* third grade. In contrast, teacher–child closeness was associated with declines in externalizing behaviors from kindergarten to

third grade, especially for children who initially exhibited higher levels of externalizing behaviors.

These findings are of critical importance given that effects of early teacher–child relationships can last into middle childhood. For example, using data from the National Institute of Child Health and Human Development Study of Early Child Care and Youth Development, which is made up largely of White middle-income children and their families, O'Connor et al. (2011) found that teacher–child relationships high in closeness and low in conflict at the transition to elementary school predicted lower levels of externalizing behaviors through fifth grade. Taken together, this extant research supports the contention that teacher–child relationships are one of the proximal environmental processes through which children's risk trajectories are altered (O'Connor et al., 2011).

TEMPERAMENT AND BEHAVIOR IN AN ECOLOGICAL FRAMEWORK

Ecological theories suggest that children's behavioral development is influenced independently by their individual temperament and the quality of the early teacher–child relationship, in addition to the *interactive* influence between temperament and the teacher–child relationship (Bronfenbrenner & Morris, 1998; El Nokali et al., 2010). For example, children who have temperaments high in negative reactivity are at risk for more behavioral difficulties during early elementary school. However, having a teacher–child relationship characterized by higher levels of closeness and lower levels of conflict may buffer that temperamental risk. Indeed, a relationship high in closeness and low in conflict is more likely to provide the type of contextual support that a student high in negative reactivity needs to be successful in his or her classroom environment. Because interactions between teachers and children are dynamic, the quality of the early teacher–child relationship may have a lasting impact, promoting resilient behavioral development over time.

As discussed by Bronfenbrenner and Morris (1998), the *proximal process* is the way in which children make sense of their world through the interactions they have with others. Proximal processes between teachers and children may explain how students entering school with problem behaviors have difficulty forming close and nonconflictual relationships with teachers. Indeed, in a recent national study of children in Grades 4 through 6, Rudasill, Reio, Stipanovic, and Taylor (2010) found that students with challenging temperaments were more likely to engage in risky behavior and have more conflict with their teachers. Closer teacher–child relationships among this temperamentally at-risk group, however, were associated with less risky behaviors.

Though there is abundant literature reviewing the association between temperamental reactivity and disruptive behaviors, fewer studies have explored the processes by which environmental factors buffer the impact of temperamental characteristics. Contextual factors—like student–teacher relationship quality—must be explored to understand whether an improvement in a proximal process can enhance behavioral development, particularly for children who are high in negative reactivity and attending low-income urban schools. Indeed, the hypothesis of organismic specificity (Wachs, 1991) suggests that individuals respond differently to the environment according to their own reactivity. This concept is echoed in Belsky's (2005) differential susceptibility and Boyce and Ellis's (2005) biological sensitivity hypotheses. These models

suggest that children with certain characteristics, particularly high negative reactivity, are more susceptible to contextual influences. As a result, they may be more adversely affected by high-risk influences but are also more likely to benefit from positive experiences, like a supportive relationship with their teacher. Additional research examining these processes within high-risk samples of low-income Black and Hispanic students is warranted.

THE CURRENT STUDY

The aim of the current study is to extend past research by examining the relationship between temperamental negative reactivity and growth in student behavior problems during kindergarten and first grade for a sample of low-income Black and Hispanic students. We first examine growth in disruptive behavior problems during kindergarten and first grade for all students in the sample. We hypothesize that on average students will exhibit growth in problematic behaviors over time. We then test the association between temperamental negative reactivity and growth in disruptive behavior problems. We hypothesize that although students in general will exhibit growth in problematic behaviors, students who are high in negative reactivity at baseline will demonstrate significantly faster rates of growth in problematic behaviors than students who are lower in negative reactivity. Finally, we explore whether teacher–child closeness and conflict moderate the association between high levels of negative reactivity and growth in behavior problems. We hypothesize that when teachers report higher levels of closeness with students, growth in behavior problems for students high in negative reactivity will be dampened. Conversely, we theorize that when teachers report more conflictual relationships with students, growth in behavior problems for students high in negative reactivity will accelerate. This investigation adds to the literature by using an ecological framework and longitudinal methods to examine temperament and behaviors specifically within a low-income Black and Hispanic sample of students making the critical transition to elementary school.

METHOD

Setting and Participants

The sample for the current study was derived from the comparison group used in the efficacy trial of INSIGHTS Into Children's Temperament (O'Connor, Cappella, McCormick, & McClowry, 2014). The present study included 192 children (~50% female) recruited into the study during the winter (December/January) of their kindergarten year with a completed parent and teacher report for the baseline kindergarten or baseline first-grade assessment period. The majority of student participants were Black (72.03%) and eligible for free or reduced lunch (85.44%). See Table 1 for a full list of demographic characteristics. Most parents who participated were biological mothers (80.7%), with a nominal group of fathers (8.5%), grandmothers (3.4%), and foster/adoptive mothers (2%). Children enrolled in the study were similar in terms of demographic characteristics to the other students at the schools who were invited but were not participants. According to school records, approximately 90% of the children in the partnering schools qualified for free or reduced lunch programs, and 78% of children were African American, 43% Hispanic/Latino, 1% White, and 6% other (New York City Department of

TABLE 1
Sample Characteristics

Demographic characteristic	M
Child characteristics	
Child age (years)	5.30
Child female (%)	48.66
Child Black (%)	72.03
Child Hispanic (%)	18.85
Child other ethnicity (%)	9.12
Eligible for free or reduced lunch (%)	85.44
Family and parent characteristics	
Parent age (years)	35.14
Parent graduated from high school (%)	75.58
Parent graduated from college (%)	19.77
Single-parent family (%)	53.20
Parent works full time (%)	11.21
Parent works part time (%)	34.21
Parent Black (%)	72.31
Parent Hispanic (%)	16.22
Parent other ethnicity (%)	11.48
Teacher characteristics	
Teacher female (%)	94.70
Average number of years teaching	13.67
Average number of years teaching in an urban school	10.90
Bachelor's degree (%)	100.00
Master's degree or working	96.00
Teacher Black (%)	54.40
Teacher Hispanic (%)	12.30
Teacher White (%)	26.30
Teacher other ethnicity (%)	7.00

Note. Child and Parent $N = 192$; teacher $N = 60$.

Education, 2011).[1] In addition, a total of 60 teachers enrolled in the study (95% female). Most teachers identified as Black (∼55%), with smaller percentages identifying as Hispanic, non-Black (∼12%), and White (∼26%).

Measures

There were five data collection points. Time 1 data were collected in the winter of the kindergarten year, and Time 2 data were collected in the late spring of the kindergarten year. Time 3 data were collected in the fall of first grade, and Times 4 and 5 data were collected in the early and late spring of the first-grade year. Researchers and field staff were provided group training on all procedures and measures prior to each of the data collection periods.

[1]Because the school district records only provide information on the census question regarding race/ethnicity, which identifies Hispanic as an ethnicity rather than a race, the race statistic in the study sample for Hispanic is not directly comparable to the race statistic for Hispanic from the school data.

Demographic background characteristics. Parents reported on a series of family-level demographic characteristics, including race/ethnicity (Black, Hispanic, White, other), parental education (in years), and marital status. They then provided information on a range of child-level characteristics, including child age at study entry, race, and gender. Parent education, parental marital status, parent work status, and child gender were used as covariates given their evidenced link to both highly reactive temperament and behavior problems (Amato & Cheadle, 2008; Cote, Borge, Geoffroy, Rutter, & Tremblay, 2008; Dubow, Boxer, & Huesmann, 2009; Green, Walker, Hoover-Dempsey, & Sandler, 2007; Pomerantz, Moorman, & Litwack, 2007).

Student behavior problems. Behavior problems were measured with the 36-item Sutter-Eyberg Student Behavior Inventory (SESBI), which is the teacher version of the Eyberg Child Behavior Inventory (Eyberg & Pincus, 1999). Using a 7-point Likert-type occurrence scale, teachers were asked to report on the frequency (1 = *never*, 4 = *sometimes*, 7 = *always*) with which each child participating in the study engaged in a range of problematic behaviors, such as ''acts defiant when told to do something,'' ''has temper tantrums,'' ''verbally fights with other students,'' and ''is overactive and restless.'' Querido and Eyberg (2003) examined the psychometric properties of the SESBI and found evidence of their reliability and validity. The mean of the items for the full 36-item scale was taken to operationalize the disruptive behavior problems construct. Internal reliability of the occurrence scale was found to be high across time points (current study average $\alpha = .97$).

Child temperament. Child temperament was measured with the 38-item School-Aged Temperament Inventory (SATI; McClowry, 2002). The SATI is a 5-point parent-report Likert-type scale (1 = *never*, 3 = *sometimes*, 5 = *always*) that was standardized with a diverse national sample of 883 parents reporting on their children. The instrument has four dimensions derived from principal components analysis with varimax rotation: negative reactivity (12 items; intensity and frequency with which the child expresses negative affect), task persistence (11 items; degree of self-direction that a child exhibits in fulfilling task responsibilities), withdrawal (nine items; child's initial response to new people and situations), and activity (six items; large motor activity). The means of the items within each subscale were taken to operationalize the dimensions of temperament. In the current study, Cronbach's alphas for the SATI measured at Time 1 were as follows: activity, $\alpha = .77$; withdrawal, $\alpha = .81$; task persistence, $\alpha = .85$; negative reactivity, $\alpha = .87$. The alphas were similar to those identified by McClowry (2002). The current study focused on the negative reactivity dimension of the SATI and the remaining dimensions of temperament were used as control variables.

Teacher–child relationships. The 15-item Student Teacher Relationship Scale (Pianta, 1992) was used to assess teacher perceptions of the quality of the teacher–child relationship at Times 1 through 5. Using a 5-point Likert scale (1 = *definitely does not apply*, 5 = *definitely applies*), teachers rated how applicable statements were to their current relationship with a particular child. The items are based on attachment theory and the Attachment Q-Set (Waters & Deane, 1985). The Student Teacher Relationship Scale has been widely used in studies with preschool and elementary school children. It is associated with children's and teachers' classroom behaviors and correlates with observational measures of quality of the teacher–child relationship (e.g., Birch & Ladd, 1997; Howes & Hamilton, 1992; Howes & Ritchie, 1999).

This scale contains two subdimensions: closeness and conflict. The closeness subscale consists of eight items and is an index of the amount of warmth and open communication present in

the relationship (e.g., ''I share an affectionate, warm relationship with this child''). The seven-item conflict subscale measures the extent to which the relationship is marked by antagonistic, disharmonious interactions (e.g., ''This child and I always seem to be struggling with each other''). To operationalize the variables for closeness and conflict we calculated a mean of the individual items for each subscale. There was good internal reliability at each time point of the study for both closeness (Time 1 $\alpha = .92$, Time 2 $\alpha = .91$, Time 3 $\alpha = .92$, Time 4 $\alpha = .90$, Time 5 $\alpha = .90$) and conflict (Time 1 $\alpha = .87$, Time 2 $\alpha = .86$, Time 3 $\alpha = .88$, Time 4 $\alpha = .87$, Time 5 $\alpha = .88$).

Procedure

Participant recruitment. Schools serving predominantly low-income students (more than 80% eligibility for free or reduced lunch) were specifically targeted for participation (O'Connor et al., 2014). The principal investigator and project staff contacted principals of targeted schools and informed them of the study and data collection procedures. A total of 23 principals agreed to participate over three waves; one dropped out of the study during baseline data collection. Teachers at the participating schools were recruited in small-group or individual meetings. Each of the three cohorts began with recruitment of the kindergarten teachers in September. Then at the beginning of the following year first-grade teachers were recruited from the same schools. In all, 96% of the kindergarten and first-grade teachers consented to participate; there was no teacher attrition. All schools maintained the same principal throughout the duration of the study.

Parents from the participating kindergarten teachers' classrooms were also recruited in September and October. Recruitment of parents took place at school and over the phone. After a parent consented, child assent was acquired. Because of resource limitations and concerns about teacher burden, recruitment at each school stopped after at least four students in each classroom were enrolled in the study. Because success in recruitment varied across classrooms, the number of students in each class enrolled in the study ranged from four to 10.

Data collection. Parents completed measures at their child's school via audio-enhanced computer-assisted self-interviewing software (Audio-CASI). The advantages of this technology include enabling respondents with low literacy levels to answer questions, limiting the tendency for socially desirable responses, and standardizing data collection (Cooley et al., 1996; Couper, Singer, & Tourangeau, 2003). During data collection, researchers were available to answer questions. Parent measures took approximately 30 min to complete, and parents received $20 to compensate them for their time.

Teachers received a set of questionnaires for each student with parental consent. Teachers completed the data packets using a traditional paper-and-pencil format and had access to researchers if questions arose. Teachers' reports took about 15 min to complete for each student and 1.5 hr total, on average. Teachers received $40 gift cards to purchase classroom supplies as compensation for their time.

Analytic Approach

Control group data. The purpose of the current study is to examine somewhat natural trajectories of disruptive behavior problems in urban elementary schools. Thus, the analyses

presented in this study capitalize on the longitudinal data collected from students and teachers participating in the comparison condition of the larger INSIGHTS intervention study and exclude data from schools where children and teachers were enrolled in INSIGHTS. Children in the comparison condition participated in a 10-week after-school reading program facilitated by an undergraduate student focused on teaching literacy competencies rather than behavior management and regulation. In addition, comparisons of control and treatment group participants indicated that the two groups were similar at Time 1 on a host of demographic characteristics and indicators of behavior, academic ability, and self-regulation. These findings suggested that children in the comparison group were similar to children in the treatment group at baseline.

Missing data analysis. Missingness on key variables included in predictive models ranged from 0% to 20%. In order to maintain power given the relatively small sample size, we imputed missing values for continuous variables using a Markov chain Monte Carlo method (Schafer, 1997) in SAS PROC MI. This was appropriate as the data were normally distributed (Graham & Donaldson, 1993; Kellam, Rebok, Ialongo, & Mayer, 1994). A prior option was specified, as several of the repeated time points were expected to be collinear and the default in SAS does not allow for a collinear covariance matrix. The Markov chain Monte Carlo method uses simulation from a Bayesian prediction distribution. Rubin's (1978) relative efficiency calculations were used to determine the appropriate number of imputations. Five imputations were performed with a burn-in period of 500. This burn-in period was used to prevent starting values for the imputation from effecting final parameter estimates (Pederson et al., 2003). Interaction terms were also created prior to imputation and imputed separately. All conditional analyses were run 10 separate times, and final parameter estimates were generated by calculating the mean of these 10 estimates using PROC MIANALYZE in SAS 9.2.

Growth curve modeling. Because data were collected at five time points during the kindergarten and first-grade years, individual growth modeling was used to examine change over time in teacher-reported disruptive behaviors. Individual growth modeling allows one to model change over time in an outcome with repeated measures (Singer & Willett, 2003). All models were fit with SAS PROC MIXED (Singer, 1998). The metric of time used was assessment point. Maximum likelihood estimation was used in all models. To accurately examine how contexts influence group trends in disruptive behavior, all continuous predictors at Level 1 (time) and Level 2 (time-invariant characteristics) were centered around their grand mean, also known as *between-person centering* (Raudenbush, 2009). Gender, single-parent status, and full-time work status, the three categorical predictors, were not centered.

Preliminary analyses consisting of unconditional models were run for disruptive behavior problems in order to determine whether there was significant between-individual and between-classroom variation in these predictors. Then, to address the substantive questions proposed in this study, we tested four sets of models. First, an unconditional baseline model with no predictors was run for behavior problems to determine the proportion of variance attributed to individual and classroom-level factors. Based on the estimates obtained from the unconditional model, intraclass correlations were computed. Intraclass correlations represent the proportion of total variance attributed to mean differences between individuals and classrooms. Unconditional models suggested that there was significant between-individual and between-classroom variation in these data. Thus, a random effect was included at both Level 2 and Level 3, allowing the intercept to vary for these two levels of nesting (Raudenbush, 2009). In addition, because children

were switching classroom contexts between Time 1 and Time 3, we also tested whether a cross-classified model was necessary. Variation in kindergarten and first-grade classrooms' disruptive behavior problems did not differ significantly, however, and we chose the more parsimonious three-level model based on assignment to kindergarten classroom. The equation for the unconditional means model was as follows:

$$\mathrm{DBP}_{\mathrm{tij}} = \gamma_{00} + u_{0\mathrm{ij}} + \upsilon_{0\mathrm{j}} + r_{\mathrm{tij}}. \quad (1)$$

The subscript *t* refers to repeated response variable observations (Level 1 units) collected from *i* children (Level 2 units) over time (Peugh, 2010) in classroom *j*. The model in Equation 1 is called an *unconditional means model* because the SESBI score for student *i* at time *t* is modeled as a function of (a) a grand mean behavior problem score for all children (γ_{00}), (b) a term that represents deviations in an individual's behavior problem mean around the grand disruptive behavior problem mean ($u_{0\mathrm{ij}}$), (c) a term that represents deviations in the classroom behavior problem mean ($\upsilon_{0\mathrm{j}}$), and (d) a time-specific residual term that demonstrates the differences between each individual's observed and predicted problem scores (r_{tij}; Peugh, 2010).

Second, an unconditional growth model was fitted to examine children's behavior problem scores from the first assessment point through Assessment Point 5:

$$\mathrm{DBP}_{\mathrm{ij}} = \gamma_{00} + \gamma_{10}\ (\text{Assessment point}_{ij}) + u_{0ij} + \upsilon_{0\mathrm{j}} + r_{\mathrm{tij}}. \quad (2)$$

As shown in Equation 2, each student's disruptive behavior problem score at the intercept is modeled as a grand mean disruptive behavior problem score at Assessment Point 1 (γ_{00}) as well as a residual term that demonstrates deviations in children's disruptive behavior problem scores at the first assessment point about the grand mean (u_{0ij}). In addition, each student's rate of behavior problem score change across time is modeled as a grand mean rate of disruptive behavior problem change (γ_{10}).

Third, a conditional model (Model 1) was run in which the Level 2 predictor, negative reactivity, was entered into the model. At the same time, a series of Level 2 covariates were added as Level 2 time-invariant predictors to account for between-child variation in disruptive behaviors within classrooms: (a) child female (male = 0, female = 1), (b) single-parent family (married = 0, single = 1), (c) parent education (years), (d) parent works full time (full time = 1, not full time = 0), (e) child negative reactivity, (f) child task persistence, (g) child withdrawal, and (h) child activity. The purpose of this study is to examine the effects of negative reactivity on behaviors over and above the effects of other temperamental characteristics like task persistence, motor activity, and withdrawal. Given that children who have temperaments high in negative reactivity may also have low task persistence and high motor activity (McClowry, 2002), we controlled for these other characteristics so as not to bias results and make effects of negative reactivity on behaviors appear larger than they actually are. Thus, any effects identified in the current study should be interpreted as conservative estimates.

No adjustments were made for race/ethnicity or free/reduced lunch status given the composition of the sample (i.e., the large majority of students were Black, with a smaller percentage of Hispanic students, and eligible for free/reduced price lunch).

And finally, a second conditional model (Model 2) was run in which cross-level interactions between teacher–child relationship closeness (Level 1) and negative reactivity (Level 2) and teacher–child conflict (Level 1) and negative reactivity (Level 2) were entered into the existing model. Significant cross-level interactions indicate that the time-varying relationship between

negative reactivity and disruptive behavior problems varies as a function of teacher–child closeness and conflict. The main effects of teacher–child closeness and conflict were also tested in this step. Results are reported on the interactions between teacher–child closeness and negative reactivity and teacher–child conflict and negative reactivity and on the main effects of student teacher closeness and conflict. The main effects highlight the within-time effect of teacher–child conflict and closeness on study behavior problems when negative reactivity is controlled. The interactions demonstrate differential growth in behavior problems over time for students high in negative reactivity as a function of teacher–child closeness and conflict.

RESULTS

Descriptive statistics for child variables are presented first. Next we describe findings from the preliminary analysis assessing variation in disruptive behavior problems and examine how disruptive behavior problems varied between children and classrooms. Lastly, we present results from the individual growth curve models that tested the substantive questions from this study. Note that we do not discuss the effects of the covariates in depth, but these findings are all presented.

Descriptive Statistics

Means and standard deviations for continuous variables and percentages for dichotomous variables are presented in Table 2. Means and standard deviations for time-varying variables are included for all five time points. Descriptive statistics indicated that disruptive behavior problems increased between Times 1 and 5. In addition, whereas teacher–child closeness increased initially and then stabilized, teacher–child conflict appeared to increase across time. Paired-samples *t* tests suggested that differences in Time 1 and Time 5 means were statistically significant for behavior problems, teacher–child closeness, and teacher–child conflict: behavior

TABLE 2
Descriptive Statistics for Variables of Interest

	Time 1		*Time 2*		*Time 3*		*Time 4*		*Time 5*	
Variable	M	SD	M	SD	M	SD	M	SD	M	SD
Child female	0.48									
Single-parent family	0.48									
Parent education (years)	13.62	2.90								
Parent works full time	0.23									
Child negative reactivity (1–5)	2.93	0.83								
Child task persistence (1–5)	3.69	0.97								
Child withdrawal (1–5)	2.65	0.88								
Child activity (1–5)	2.92	0.88								
Child disruptive behavior problems (1–7)	2.04	1.04	2.15	1.02	2.26	1.03	2.35	1.27	2.39	1.30
Teacher–child closeness (1–5)	3.98	0.77	4.03	0.72	4.13	0.63	4.17	0.64	4.13	0.72
Teacher–child conflict (1–5)	1.71	0.93	1.78	0.87	1.69	0.73	1.84	0.95	1.84	0.94

Note. $N = 192$. Paired-samples *t* tests indicated that behavior problems, teacher–child closeness, and teacher–child conflict were significantly different from each other at Times 1 and 5.

problems, $t(190) = 7.84$, $p < .01$; teacher–child closeness, $t(190) = -5.41$, $p < .01$; and teacher–child conflict, $t(190) = 4.62$, $p < .01$.

Unconditional Means Model

The results for the unconditional means model shown in Equation 1 are presented in the first panel of Table 3. Results revealed a significant grand mean disruptive behavior problem score ($\gamma_{00} = 2.22$, $p < .001$). In addition, children's mean disruptive behavior problem scores (i.e., the mean score across all assessments) varied significantly around the grand mean ($\tau_{00} = .69$, $p < .001$). Significant increases were shown between each child's observed and predicted disruptive behavior problems scores over time ($\sigma^2 = .82$, $p < .001$). Intraclass calculations indicated that 43% of the variation in disruptive behavior problems occurred across students, and 7% of variation in behavior problems occurred between kindergarten classrooms.

Unconditional Growth Model

The results for the unconditional growth model in Equation 2 are presented in the second panel of Table 3. Results showed a significant grand mean disruptive behavior problem score at

TABLE 3
Model Summary for Growth Models Examining Disruptive Behavior Problems

		Unconditional means		*Unconditional growth*		*Model 1*		*Model 2*	
Fixed effects	*Parameter*	B	SE	B	SE	B	SE	B	SE
Intercept	γ_{00}	2.22**	0.06	1.95**	0.12	1.97**	0.16	2.08**	0.13
Time	γ_{10}			0.15**	0.07	0.15**	0.07	0.04	0.07
Child female	γ_{01}					−0.23†	0.14	−0.06	0.09
Single-parent family	γ_{02}					0.28*	0.14	0.09	0.09
Parent education (years)	γ_{03}					0.04†	0.02	0.02	0.02
Parent works full time	γ_{04}					−0.06	0.21	−0.19	0.14
Child negative reactivity	γ_{05}					0.29**	0.09	0.12*	0.06
Child task persistence	γ_{06}					−0.31**	0.08	−0.27**	0.09
Child withdrawal	γ_{07}					−0.27**	0.05	−0.23**	0.06
Child activity	γ_{08}					0.13	0.14	0.11	0.10
Student–teacher closeness	γ_{20}							−0.05	0.05
Student–teacher conflict	γ_{30}							0.72**	0.05
Negative Reactivity × Teacher–Child Closeness	γ_{25}							−0.11†	0.06
Negative Reactivity × Teacher–Child Conflict	γ_{35}							0.16**	0.05
Variance components									
Residual	σ^2	0.82**	0.04	0.84**	0.11	0.09	0.39	0.05	0.12
Individual intercept	τ_{00}	0.69**	0.08	0.35**	0.28	0.56**	0.12	0.16**	0.05
Classroom intercept	τ_{10}			0.08	0.28	0.32	0.39	0.35	0.39

Note. Student $N = 192$; teacher $N = 60$.
†$p < .10$. *$p < .05$. **$p < .01$.

Assessment Point 1 ($\gamma_{00} = 1.95$, $p < .001$) that increased 0.15 points each time point on average ($\gamma_{10} = 0.15$, $p < .001$). Furthermore, variance component estimates demonstrated (a) significant variance in observed versus predicted disruptive behavior problems within students (Level 1 residual; $\sigma^2 = .84$, $p < .001$) and (b) nonsignificant variation in disruptive behavior problem scores across students at Assessment Point 5 ($\tau_{00} = .35$, $p = .35$).

Main Effects of Negative Reactivity

Given that the unconditional growth model demonstrated significant intercept variance in disruptive behavior problem scores across children, time-invariant predictor variables were added to Level 2 of the model to explain this variance. The values presented in panel 3 of Table 3 indicate the association between the Level 2 independent variables and disruptive behavior problems after the other effects in the model were controlled and can be interpreted as partial correlations. The intercept is now interpreted as the average disruptive behavior problem score for male students (i.e., the groups coded 0) with mean scores on all continuous predictors and scores of 0 on all dichotomous predictors. The slope is now the average change in that group's disruptive behavior problems. Several significant predictors of the intercept were found. Specifically, children with temperaments high in negative reactivity evidenced larger initial levels of disruptive behavior problems than children with temperaments low in negative reactivity ($\gamma_{05} = 0.29$, $p < .01$). In addition, this model demonstrated that children from single-parent households were more likely to engage in disruptive behaviors ($\gamma_{02} = 0.28$, $p < .05$). Two predictors—gender and parent education—demonstrated trend-level significance in predicting behavior problems. Although they are not the focus of the current study, it should also be noted that two additional dimensions of temperament—task persistence ($\gamma_{06} = -0.31$, $p < .05$) and withdrawal ($\gamma_{05} = -0.27$, $p < .05$)—were associated with fewer initial disruptive behavior problems. The findings of this analysis are instrumental to understanding later analyses examining the main research questions, as all coefficients are interpreted as they are associated with behavior problems *over and above* these demographic characteristics and initial rates of negative reactivity.

Variance component estimates demonstrated (a) nonsignificant variance in observed versus predicted disruptive behavior problem scores within students (Level 1 residual; $\sigma^2 = .09$, $p < .28$), (b) significant variation in disruptive behavior problem scores at Assessment Point 1 ($\tau_{00} = .56$, $p < .001$), and (c) nonsignificant variation in disruptive behavior problem scores between classrooms at Assessment Point 1 ($\tau_{10} = .32$, $p = .34$).

Cross-Level Interaction of Negative Reactivity and Teacher–Child Closeness and Conflict

The final panel of Table 3 presents the results of the growth curve predicting student behavior problems from negative reactivity, teacher–child closeness, teacher–child conflict, and the interactions of (a) negative reactivity and teacher–child closeness and (b) negative reactivity and teacher–child conflict. Results revealed a significant relation between teacher–child conflict and behavior problems ($\gamma_{30} = 0.72$, $p < .001$) and a nonsignificant relation between teacher–child closeness and behavior problems ($\gamma_{20} = -0.05$, $p < .24$). A positive interaction was identified between negative reactivity and teacher–child conflict ($\gamma_{35} = 0.16$, $p < .01$). This interaction indicated that children higher in negative reactivity and conflictual relationships with teachers

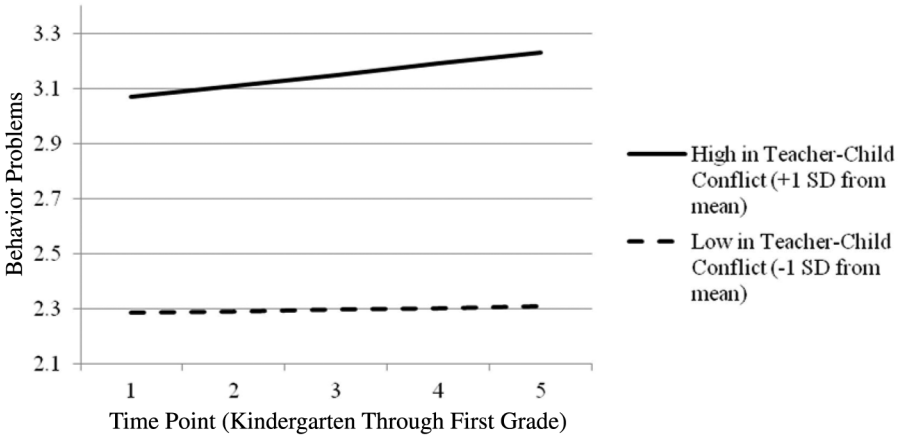

FIGURE 1 Differential trajectories of behavior problems for students with high levels of negative reactivity (+1 *SD*) by level of teacher–child conflict.

experienced significantly faster growth in behavior problems across time compared with students similar in negative reactivity but with less conflictual relationships with their teachers. Please see Figure 1 for a graphical illustration of this growth model. Another trend-level positive interaction was identified between negative reactivity and teacher–child closeness ($\gamma_{25} = -0.11$, $p = .07$). This interaction indicated, at a statistical trend level, that children with high levels of negative reactivity but closer relationships with their teachers experienced slower rates of growth in disruptive behavior problems compared with students who had less close relationships with teachers. Please interpret this finding as descriptive, given that it was significant only at a trend level. This growth model is illustrated in Figure 2.

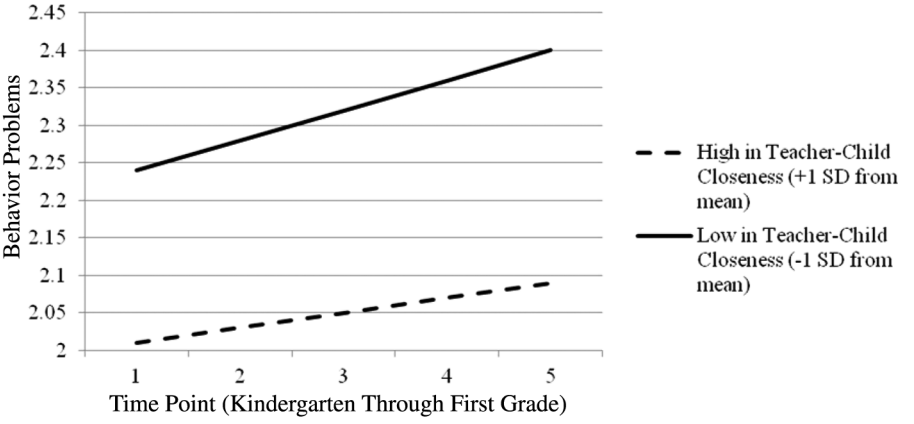

FIGURE 2 Differential trajectories of behavior problems for students with high levels of negative reactivity (+1 *SD*) by level of teacher–child closeness.

Variance component estimates demonstrated (a) nonsignificant variance in observed versus predicted disruptive behavior problem scores within students (Level 1 residual; $\sigma^2 = .05$, $p = .48$), (b) significant variation in disruptive behavior problem scores at Assessment Point 1 ($\tau_{00} = .16$, $p < .001$), and (c) nonsignificant variation in disruptive behavior problem scores between classrooms at Assessment Point 1 ($\tau_{10} = .35$, $p = .72$).

DISCUSSION

Using an ecological framework, the current study examined the relationship between a child temperament high in negative reactivity, teacher–child closeness and conflict, and disruptive behavior problems. We found that negative reactivity predicted higher levels of average behavior problems across kindergarten and first grade. However, for students high in negative reactivity, those with high levels of teacher–child conflict displayed significantly faster rates of growth in behavior problems over the course of kindergarten and first grade compared to their temperamentally similar peers who had less conflictual relationships with teachers. These results suggest that having a conflictual relationship with a teacher may actually exacerbate baseline and future risk for the development of disruptive behavior problems.

Negative Reactivity in Urban Schools

This study replicates a large body of research suggesting associations between children's negative reactivity and disruptive behavior problems (e.g., Eisenberg et al., 2000, 2001; Frick & Morris, 2004; Rothbart & Bates, 2006; Sanson et al., 2004; Shaw et al., 2001). The present findings are also consistent with Griggs, Glover, Huelsman, Kidder-Ashley, and Ballard's (2009) cross-sectional study that identified teacher–child relationship closeness as protecting against the development of behavior problems for children with challenging temperaments attending upper income preschools. Little research, however, has considered this relationship for low-income Black and Hispanic children attending urban schools. Thus, these findings may have unique implications for low-income schools with large proportions of racial/ethnic minority students.

Teachers in general are less likely to accept children's negative reactivity as a temperamental characteristic and more likely to perceive negative reactivity and other dispositional behaviors as deficits in the child's character (Buss, Gingles, & Price, 1993; Evans, 1996; Saft & Pianta, 2001; Stuhlman & Pianta, 2002). In addition, elementary school teachers in urban schools are more likely to cite behavior and classroom management as a sustained stressor compared to teachers in more affluent schools (Barth, Dunlap, Dane, Lochman, & Wells, 2004). Thus, these teachers may be quick to react to children high in negative reactivity, whom they may perceive to be difficult children (Barth et al., 2004; Lemov, 2010). This may be particularly problematic in low-income urban contexts during the transition to elementary school, as students' behavioral trajectories are largely open to outside influences during this period but will be less malleable over time (Alexander, Entwisle, Blyth, & McAdoo, 1988; Rimm-Kaufmann & Pianta, 2000). Thus, in conceptualizing methods to address gross disparities in later outcomes between low-income Black and Hispanic children and their more affluent peers, it may be essential to disentangle teachers' perceptions of students' negative reactivity from students' disruptive behaviors at this key transition point.

High-Quality Teacher–Child Relationships: A Protective Process

Guided by past literature (e.g., O'Connor et al., 2011; Silver et al., 2005), we hypothesized that students with temperaments high in negative reactivity who also had teacher–child relationships high in closeness would exhibit lower rates of disruptive behavior problems within and across time compared to similarly reactive students with less close teacher–child relationships. In contrast, we hypothesized that students high in negative reactivity with conflictual teacher–child relationships would exhibit higher rates of disruptive behavior problems within and across time.

Although our finding indicating that teacher–child closeness protects against the effect of negative reactivity when predicting behaviors was only established at a trend level, we argue that the results are nonetheless notable. Indeed, findings suggest that the protective nature of teacher–child closeness operates over time, thus representing a protective relational process that is important to maintain, especially as children transition between grades. This may be particularly vital in early elementary school, when children's behavioral and academic trajectories are most open to influence from contextual systems (Rimm-Kaufmann & Pianta, 2000). Moreover, it is likely that this protective process operates bidirectionally, as children are more likely to develop closer and less conflictual relationships with future teachers when they have already had high-quality relationships with teachers in earlier grades (Jerome, Hamre, & Pianta, 2009; O'Connor et al., 2011).

We also found evidence that teacher–child conflict exacerbates growth in disruptive behaviors for children high in negative reactivity. This finding is in line with research on more general samples showing that chronic conflict in early teacher–child relationships is associated with less cooperative participation in school and lower levels of school enjoyment (Ladd & Burgess, 2001). The result is concerning given work showing that children who have conflictual relationships with teachers in early elementary grades may be less likely to develop high-quality relationships with teachers later on (Jerome et al., 2009). Thus, relationship formation in kindergarten and first grade may be essential to promoting positive relationships in future grades. This may be particularly true for children with temperaments high in negative reactivity, as their disposition is likely to continue to put them at risk for externalizing behavior problems and poor self-regulation as they move through elementary school (e.g., Pluess & Belsky, 2009). Similarly, extant research has found that children with chronic conflict in early teacher–child relationships demonstrate less cooperative participation in school and lower levels of school enjoyment compared to children with high levels of teacher–child closeness (Ladd & Burgess, 2001).

Limitations

There are a number of limitations inherent to the design of this study. First, although the study included five time points of data collection and thus allowed us to provide more evidence for causality than would have been permitted by a cross-sectional design, we are still unable to make causal inferences. Moreover, it is important to acknowledge that the direction of effects between temperament, teacher–child relationships, and behavior problems is unclear. Future intervention studies and randomized controlled trials may begin to answer questions regarding the direction of effects. Second, the use of teacher-reported observations of both child behavior and teacher–child relationships is potentially problematic. However, the use of parent-rated observations of

temperament provided some control over rater bias. In addition, previous research has shown a correlation between teacher reports of teacher–child relationship quality and those of independent observers (Howes & Ritchie, 1999). Third, we used comparison group data from a larger intervention study wherein study participants were enrolled in a supplemental reading program. Although this program had few effects on student behaviors (see O'Connor et al., 2014), the generalizability of the findings may be limited. Fourth, only low-income urban kindergarten and first-grade students were enrolled in the study. Indeed, more than 70% of the sample was Black, and the remaining children were largely Hispanic. Although this sample addresses a limitation in the extant literature—the fact that there is little research on temperament within samples of low-income Black and Hispanic children—it is also true that findings from this study do not generalize to more diverse populations and ages. Finally, due in part to the relatively small sample—particularly of children with high-maintenance temperaments—we were only able to detect a trend-level finding for the buffering effect of student–teacher closeness on growth in behavior problems. Future studies with greater power should seek to replicate this finding in a way that allows for the detection of statistical significance.

Implications

Few studies have focused on how temperament may predict growth in behavior problems for low-income urban populations and how contextual factors may protect against this process (O'Connor et al., 2011). The results of the current study suggest that teachers can function as an intervening force for children who display temperaments high in negative reactivity, redirecting their developmental trajectories toward healthier outcomes (e.g., Baker, 2006; Shores et al., 1993). These findings have implications for preventive intervention programs as well as in-service and preservice teacher education programs. Preventive intervention programs focused on high-quality teacher–child relationships for children in urban elementary school settings, particularly those who are identified as high in negative reactivity, can support children's behavioral development (e.g., Cowen, Hightower, Work, Pedro-Carroll, & Wyman, 1996; Hughes & Cavell, 1999; Pianta & Hamre, 2001).

Individualized interventions targeted at children with temperaments high in negative reactivity may focus additional attention on the teacher–child relationship as a support to stem or deride problematic behavioral trajectories for high-risk children. With respect to teacher education, the current study demonstrates the importance of fostering elementary school teachers' awareness of the role of their relationships with students in children's behavioral development, particularly with respect to children who may have temperaments high in negative reactivity. Such teacher education programs should work to provide teachers with information to better support high-quality relationships with their students. Elementary school teachers often receive more instruction on how best to provide effective *instructional* interactions than on building relationships with students (Howes & Hamilton, 1992; O'Connor et al., 2011). Our findings demonstrate that teacher–child relationship development is important for promoting optimal student outcomes and, perhaps, an ideal goodness of fit between the child's temperament and the relationship with the teacher. Providing teachers with information regarding the protective role of high-quality teacher–child relationships for children with challenging temperaments may be especially important in preventing these children from engaging in maladaptive recursive cycles with their teachers over time.

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