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2017

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Acar, Ibrahim H.; Torquati, Julia C.; Encinger, Amy J.; and Colgrove, Amy, "The role of child temperament on low-income preschool children's relationships with their parents and teachers" (2017). *Faculty Publications, Department of Child, Youth, and Family Studies*. 177.

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Published in *Infant and Child Development* 2017; e2045.  
DOI: 10.1002/icd.2045  
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Submitted 3 December 2016; revised 8 May 2017; accepted 17 May 2017.

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# The role of child temperament on low-income preschool children's relationships with their parents and teachers

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## Abstract

The current study examined the associations between low-income preschool children's temperament (reactive and regulatory) and their relationships with parents and teachers. In particular, we focused on the moderating role of regulatory temperament on reactive temperament in the prediction of closeness and conflict with parents and teachers. Two hundred ninety-one children ( $M = 53.88$  months,  $SD = 6.44$  months), their parents, and teachers from 3 different preschools serving low-income children in 2 midwestern cities in the United States participated. Parents reported on temperament and parent-child relationships, and teachers reported on teacher-child relationships. Hierarchical regression models using SAS PROC MIXED were employed to allow for nesting of children within classrooms. After controlling for child age, gender, ethnicity, and parent education, children's reactive temperament was negatively associated with parent-child closeness and positively associated with parent-child conflict and teacher-child conflict. Children's regulatory temperament was positively related to teacher-child closeness and negatively associated with teacher-child conflict. Regulatory temperament moderated the association between reactive temperament and teacher-child closeness. These findings

suggest that although reactive temperament potentially undermines closeness in relationships with teachers, regulatory temperament can buffer the influence of reactive temperament on teacher–child closeness.

**Highlights:**

- This study examined the association between children’s temperament and their relationships with parents and teachers.
- Reactive temperament was positively associated with parent/ teacher–child conflict and negatively associated with parent–child closeness. Regulatory temperament was a moderator for the association between reactive temperament and teacher–child closeness.
- Improving children’s regulatory temperament may be helpful for children with the reactive temperament to have better social relationships with their teachers.

**Keywords:** low-income children, parent–child relationship, reactive temperament, regulatory temperament, teacher–child relationship

## 1 Introduction

Children’s quality of relationships with adults in early childhood, primarily parents and teachers, is an important foundation for concurrent and future social, cognitive, academic, and behavioral development. Warm, sensitive, close, and responsive relationships with adults support children’s development of social, cognitive, and academic skills that will be used throughout life (Baker, Fenning, & Crnic, 2011; Hamre & Pianta, 2001; Sabol & Pianta, 2012). Conversely, punitive, aversive, conflictual relationships in early childhood have detrimental effects on children’s concurrent and future development (Eisenberg et al., 1999).

Socialization at home and school is transactional, with characteristics of the child, others, and qualities of relationships all influencing the development of social and cognitive skills (Karreman, van Tuijl, van Aken, & Deković, 2006; Pianta, 1999). Previous research documented that children’s temperament is a characteristic that influences expression of parenting and teacher behaviors and relationships with children (Bates, Schermerhorn, & Petersen, 2012; Rimm-Kaufman et al., 2002; Rothbart, 2011; Rydell, Bohlin, & Thorell, 2005).

In general, research has shown that children’s regulatory temperament such as inhibitory control is positively associated with their relationships with parents and teachers (Laukkanen, Ojansuu, Tolvanen, Alatupa, & Aunola, 2014; Rudasill, Hawley, Molfese, Tu, Prokasky, & Sirota, 2016). For example, Lengua (2006) found that children’s early effortful control predicted less parental rejection in early adolescence. In addition, young children’s regulatory

temperament is positively associated with quality of teacher–child relations, whereas reactive or difficult temperament has negative associations with quality of teacher–child relations (Rimm-Kaufman et al., 2002; Rudasill & Rimm-Kaufman, 2009; Rydell et al., 2005). Notwithstanding the evidence, there is still need for understanding how regulatory and reactive temperament of low-income children are associated with their relationships with parents and teachers. Although there have been a few studies (e.g., Rydell, Berlin, & Bohlin, 2003; Valiente, Swanson, & Lemery-Chalfant, 2012) investigating how one temperamental characteristic moderates another temperamental characteristic as they predict children’s social outcomes such as social competence and externalizing behaviors, research examining the influence of temperament by temperament interactions on children’s relationships with teachers and parents is scarce (Rothbart & Bates, 2006), especially including children from disadvantaged backgrounds. Moreover, we need to examine these processes because qualities of relationships with parents and teachers are significantly associated with children’s positive development, and it is especially important to promote positive development for children who are vulnerable to lower academic achievement due to low SES.

The association between temperament and parenting depends on socioeconomic and cultural context (Crockenberg & Leerkes, 2003; Paulussen-Hoogeboom, Stams, Hermanns, & Peetsma, 2007). For example, the association between negative emotionality and less supportive parenting was stronger for families from low socioeconomic backgrounds than families from higher socioeconomic backgrounds (Paulussen-Hoogeboom et al., 2007). This difference in association between temperament and parenting may be due in part to higher levels of stressors and lack of resources in the home context that make it more challenging for parents to provide a supportive environment for children with difficult temperamental characteristics (e.g., higher negative emotionality; Bornstein, Hahn, Suwalsky, & Haynes, 2003).

In addition, teacher perceptions of children’s behaviors may vary according to children’s individual characteristics (e.g., temperament; Diaz et al., 2017; Rudasill, 2011) and socioeconomic backgrounds (Ewing & Taylor, 2009; Stuhlman & Pianta, 2001). For example, Rudasill (2011) found that children’s effortful control was related to interactions with teachers in third grade for White children from middle- and high-income socioeconomic backgrounds. However, there is still need for investigation whether the associations between child temperament and teacher–child relationships show similar results for children from low socioeconomic backgrounds. From these points of view, understanding low-income children’s reactive and regulatory temperamental characteristics may help parents and teachers to accommodate children’s needs depending on their temperament to facilitate development of children’s social relationships. Therefore, the current study

examined the associations between children's temperament and qualities of parent–child and teacher–child relationships. In addition, we examined the potential moderating role of children's regulatory temperament on the association between reactive temperament and parent–child and teacher–child relationships.

### **1.1 Regulatory and reactive components of temperament**

Temperament influences the ways in which children interact with their environment and the responses they evoke from those around them and thus shapes children's developmental outcomes (Rothbart, 2011). Temperament is defined as constitutionally based differences in reactivity and self-regulation that influence personality, emotionality, and sociability (Rothbart & Bates, 2006; Rothbart & Derryberry, 1981). Constitutional refers to the biological roots of temperament influenced by genes and experiences (Rothbart, Posner, & Kieras, 2006). The conceptualization of temperament used in this study is comprised of two primary dimensions: reactivity and regulation (Rothbart & Bates, 2006; Rothbart & Derryberry, 1981). Reactivity refers to an individual's response to environmental stimuli and involves arousability of the motor, affective, and sensory systems, whereas regulation refers to the processes that regulate reactivity—often conceptualized as effortful control (Rothbart & Bates, 2006; Rothbart & Derryberry, 1981). The reactive dimensions of temperament involve physiological responses to internal and external stimuli and include negative affect, which refers to the tendency to experience negative emotions (i.e., fear, anger, sadness, and/or discomfort), and surgency/extraversion, which is related to positive emotionality, activity level, risk taking, and impulsivity (Rothbart, 2011).

While reactivity traits are present at birth, effortful control develops later, largely between the ages of 2 and 7 years (Rothbart, 2011). Effortful control involves the ability to regulate emotions and behaviors and includes inhibitory control—the ability to inhibit a dominant response and/or initiate a subdominant response—and attentional focusing—the ability to focus or shift attention (Putnam & Rothbart, 2006; Rothbart, 2011).

### **1.2 Importance of children's relationships with parents**

Qualities of parent–child relationships influence children's social and emotional development (Denham, Bassett, & Wyatt, 2007). Parental warmth (e.g., supportiveness, responsiveness, and affection) and control (harshness and autonomy suppressing) are key parenting dimensions that influence children's prosocial behaviors (Bates et al., 2012). Children whose parents respond to their negative emotions in supportive ways are able to explore and process their emotions, which in turn helps them to learn how to regulate

their emotions and cope with difficult situations (Denham et al., 2007; Eisenberg, Cumberland, & Spinrad, 1998). Supportive parenting has been associated with children's social competence and emotion regulation, whereas nonsupportive parenting has been linked to higher levels of problem behaviors (Baker et al., 2011; Eisenberg et al., 2001).

Parental sensitivity and stimulation also are associated with children's social and cognitive skills at school entry (Downer & Pianta, 2006; National Institute of Child Health and Human Development, Early Child Care Research Network [NICHD ECCRN], 2003). Parent-child relationships characterized by closeness have been associated with positive child outcomes such as social competence and positive relationships with peers (Mashburn & Pianta, 2006; Rispoli, McGoey, Koziol, & Schreiber, 2013). In a longitudinal study, Rispoli et al. (2013) found a direct, long-term association between responsive parenting in infancy and children's social competence upon entry to kindergarten. On the other hand, conflictual parent-child relationships have been linked to negative social and academic outcomes for children (Driscoll & Pianta, 2011; Hastings & Rubin, 1999). Eisenberg et al. (2001) found that children of parents who display more negative emotionality struggle managing their own negative emotions and demonstrate poorer social skills.

### **1.3 Child temperament and parent-child relationships**

It is commonly accepted that parents' education and social competence play a role in the ways in which parents respond to children's behaviors (Collins, Maccoby, Steinberg, Hetherington, & Bornstein, 2000). Sameroff's (2009) Transactional Human Development Model recognizes the bidirectional interdependence between children and their environments, such that children's behavior influences the behavior of parents, and parental behavior likewise influences children's social development (Bates et al., 2012). Temperament is a child characteristic that can influence parenting behavior as well as children's development (Bates & Pettit, 2007; Rothbart & Bates, 2006).

Children who have a difficult temperament may display shyness with new environments or people, negative emotionality, high activity and impulsivity, and/or struggle with focusing and sustaining attention (Scaramella & Leve, 2004). Children with difficult temperaments may be at risk for negative and controlling parenting practices—especially from mothers; this process is reciprocal such that children with difficult temperament (e.g., emotional reactivity) may elicit harsher parenting (Scaramella & Leve, 2004). A meta-analysis showed that child negative emotionality (e.g., high-intensity negative reactions, irritability, and low soothability) was associated with less parental warmth among lower SES families (Paulussen-Hoogeboom et al., 2007). However, the opposite association was found among children from higher SES families (Paulussen-Hoogeboom et al., 2007). Conversely, children with

better regulatory temperament are more likely to have parents who are high in warmth and low in negative control (Bates et al., 2012). Previous research showed that children's effortful control was negatively associated with parenting rejection and maternal hostility (Lengua, 2006; Morris et al., 2002).

#### **1.4 Importance of children's relationships with teachers**

There is a large body of empirical evidence indicating that strong and supportive teacher–child relationships are important for children's social functioning and school adjustment (Denham et al., 2012; Ladd, Birch, & Buhs, 1999). For example, teacher–child relationship quality is significantly associated with preschool children's behavioral problems and social functioning (Graziano, Reavis, Keane, & Calkins, 2007; Hamre & Pianta, 2001; Ladd et al., 1999; O'Connor & McCartney, 2007) and predicts children's future social, behavioral, and academic success (Denham et al., 2012).

Children who experience warm or close relationships with their teachers tend to exhibit fewer behavioral problems, have better academic performance, and enjoy school more than their peers who experience more conflictual teacher–child relationships (Birch & Ladd, 1997; Hamre & Pianta, 2001; Mashburn & Pianta, 2006). Conflictual teacher–child relationships have been associated with children's social withdrawal, dislike of school, poorer academic performance, and aggressive behavior (Birch & Ladd, 1998; Graziano et al., 2007; O'Connor & McCartney, 2007). Research has found that teachers tend to spend more time talking with and providing instruction to children they view as more emotionally positive and less difficult to handle (Miller, Gouley, Seifer, Dickstein, & Shields, 2004; Stuhlman & Pianta, 2001). However, there is a growing body of research demonstrating that teacher–child relationships are also predicted by children's temperamental characteristics.

#### **1.5 Child temperament and teacher–child relationships**

A large body of research has demonstrated that behaviors and characteristics of children can influence qualities of teacher–child relationships (Graziano et al., 2007; Hamre, & Pianta, 2001; Ladd et al., 1999; O'Connor & McCartney, 2007; Rudasill, Rimm-Kaufman, Justice, & Pence, 2006). Children's temperament (e.g., shyness and effortful control), and the interactions between the reactive and regulatory temperamental dimensions specifically, may influence the quality of children's relationship with their teachers (Eisenhower, Baker, & Blacher, 2007; Rudasill & Rimm-Kaufman, 2009). Children's behavioral reactions to individuals or events are a result of interactions between the reactive and regulatory dimensions of temperament (Rothbart &

Bates, 2006), and these behavioral responses can influence their relationships with teachers.

Children who exhibit more shyness (a reactive dimension of temperament) are more likely to develop teacher–child relationships that are lower in closeness and conflict and higher in dependency than their peers who are less shy (Rudasill & Rimm-Kaufman, 2009; Rydell et al., 2005). In a longitudinal examination of behavioral characteristics and children’s relationship maladjustment in school, Ladd and Burgess (1999) found that children who exhibited socially withdrawn or aggressive behaviors were more likely to have lower levels of closeness and higher levels of dependency in their teacher–child relationship, and higher levels of conflict than their peers. Although shy children may be less likely to develop close teacher–child relationships, studies have found that close relationships with their teachers can serve as a protective factor for the social–emotional adjustment of some shy children (Arbeau, Coplan, & Weeks, 2010).

Research has also found that lower effortful control is associated with children’s externalizing behaviors and difficulty in forming positive relationships in school (Rothbart & Bates, 2006; Rothbart, Ahadi, & Hershey, 1994). In a study examining associations between children’s shyness and effortful control (at 4 and ½ years old) and the quality of the teacher–child relationships in first grade, Rudasill and Rimm-Kaufman (2009) found that children who had lower effortful control also had higher ratings of teacher–child conflict, and children who had higher effortful control also had higher ratings of teacher–child closeness. Diaz et al. (2017) found that children with high levels of parent-reported negative emotions showed higher levels conflict with teachers when they also had low levels of effortful control. Thus, the interaction between children’s temperamental dimensions of reactivity and regulation (i.e., shyness and effortful control) influences the quality of teacher–child relationships (Blair, Denham, Kochanoff, & Whipple, 2004; Rudasill, & Rimm-Kaufman, 2009).

### **1.6 Covariates for children’s relationships with parents and teachers**

Previous research has shown that parents and teachers perceive their relationships differently depending on the child’s gender (Birch & Ladd, 1997; Hamre & Pianta, 2001; Osborne & Fincham, 1996; Silver, Measelle, Armstrong, & Essex, 2005). Generally, parents and teachers perceive closer relationships with girls (Ewing & Taylor, 2009; Hamre & Pianta, 2001; Osborne & Fincham, 1996). In addition, teachers and parents also perceive their relationships differently across different ethnic groups of children (Ewing & Taylor, 2009; Toth & Xu, 1999). For example, teachers perceived relationships with Hispanic or White students more positively than with African American



students (Ewing & Taylor, 2009; Hamre & Pianta, 2001). Finally, parents' socioeconomic background is an important factor that may affect parent–child relationships (Davis-Kean, 2005; Moore, Kinghorn, & Bandy, 2011). In general, parents from low socioeconomic backgrounds face hardship with their daily life events (e.g., juggling between multiple jobs) so that they may have limited time and resources to direct toward parenting practices (e.g., having quality “down time”; consistency in parenting practices) that are positively associated with social development (Spera, 2005). Therefore, we controlled for child gender, age, ethnicity, and parent education as covariates in the current study.

### **1.7 The current study**

Although previous research has examined the associations between children's temperament and their relationships with parents (e.g., Laukkanen et al., 2014) and teachers (e.g., Rudasill & Rimm-Kaufman, 2009), little is known about how regulatory and reactive temperament work together to predict low-income children's relationships with their parents and teachers. Parallel to previous research, the current study examined the associations between temperament and qualities of parent–child and teacher–child relationships. We expected children's regulatory temperament would be positively associated with close parent–child and teacher–child relationships and negatively associated with conflictual relationships with parents and teachers. Conversely, children's reactive temperament was expected to be positively associated with conflictual relations with parents and teachers and inversely associated with close relations with parents and teachers (Rudasill et al., 2010, 2013). In addition, we examined the potential moderating role of regulatory temperament on reactive temperament in the prediction of relationship quality with parents and teachers. We expected that regulatory temperament would moderate the associations between reactive temperament and teacher–child and parent–child relationships such that regulatory temperament may attenuate the effect of reactive temperament on parent–child and teacher–child relationships.

## **2 Methods**

The purpose of this study was to examine the associations between low-income preschool children's temperament and their relationships with parents and teachers. Parents completed questionnaires about their relationship with their child and about their child's temperament. Teachers reported about their relationships with children in their classroom.

## **2.1 Participants**

Participants included 291 children (159 boys, 132 girls), their parents, and their teachers from 17 different classrooms across three different Educare programs in two midwestern cities. Educare programs were designed to provide early care and education for children from birth to age five who are living in poverty. No income information was collected from parents because all children in the current sample qualified for Educare programs by meeting federal poverty guidelines. Private donors and federal and state governmental organizations fund Educare programs. Forty-six percent of children were Hispanic, and 54% were non-Hispanic. A majority (57.9%) were White, 30.9% were Black/African American, 1.1% were Asian, 9.1% were biracial/multiracial, and 0.7% were other race. Children's ages ranged from 37 to 70 months ( $M = 53.88$  months,  $SD = 6.44$  months). Approximately 21.6% primary caregivers reported that they did not graduate from high school, 27.4% earned a high school degree, 24.3% completed some college, and 26.6% graduated from college. Most of the participating parents were mothers (88.5%). Twenty-eight percent of families had three children, 26.2% had two children, 19.6% of families had 1 child, and 7.5% had five or more children. Over half (53.9%) of children were from two-parent families, 43.8% were from single-parent families, and 2.3% were from other types of family structures. Mothers' ages ranged from 18 to 50 years ( $M = 30.04$ ,  $SD = 5.97$ ).

## **2.2 Measures**

### *2.2.1 Temperament*

The Very Short Form of Children's Behavior Questionnaire (CBQ-VSF; Putnam & Rothbart, 2006) was used in fall 2014 to assess children's temperament. The CBQ-VSF is a 36-item questionnaire with three dimensions (surgency, effortful control, and negative affectivity) to assess preschool children's temperament on a 7-point Likert-type scale ranging from 1 = "extremely untrue of your child" and 7 = "extremely true of your child." Each dimension contains 12 items. Higher scores on each scale indicate a higher level of that temperamental characteristic. The reactive component of temperament includes negative affectivity (anger/frustration, discomfort, fear, sadness, and low soothability) and extraversion/surgency (activity level, impulsivity, high-intensity pleasure, low shyness, approach/positive anticipation, and smiling/laughter; Putnam & Rothbart, 2006; Rothbart, 2011). Although these two factors are conceptually distinct, confirmatory factor analyses showed that items from negative affectivity load on surgency or vice versa (e.g., positive anticipation and shyness from surgency fall under negative affectivity; Teglasi et al., 2015 [U.S. sample]; Sleddens, Kremers,

Candel, De Vries, & Thijs, 2011 [Dutch sample]). Considering these findings, some items from surgency and negative affectivity may reflect different aspects of reactive temperament. In the current study, we conceptually and statistically (i.e., confirmatory factor analyses) operationalized reactive temperament using a combination of items reflecting a reactive response to the environmental stimuli in a social context (e.g., activity level: "seems always in a big hurry to get from one place to another"; and negative emotion: "gets quite frustrated when prevented from doing something s/he wants to do"). The measurement model was tested via confirmatory factor analysis using Mplus (Muthén & Muthén, 1998) and showed adequate model fit,  $\chi^2(53) = 87.937$ ,  $p < .05$ , Comparative Fit Index (CFI) = 0.91 (CFI > .90), Standardized Root Mean Square Residual (SRMR) = .05 (SRMR < .08), Root Mean Square Error of Approximation (RMSEA) = .05 (90% C.I. [0.032, 0.071]; Browne & Cudeck, 1992; MacCallum, Browne, & Sugawara, 1996). Based on the CFA and conceptual meaning of items (Rothbart, 2011), we used one item from surgency, activity level ("seems always in a big hurry to get from one place to another"), two items from anger (e.g., "gets angry when s/he can't find something s/he wants to play with"), and two items from soothability (e.g., "is very difficult to soothe when s/he has become upset"). For regulatory temperament, seven items from the effortful control dimension were used (e.g., "Is good at following instructions" and "when drawing or coloring in a book, shows strong concentration." We used only seven items out of 12 items in the original CBQ-VSF effortful control dimension as only these items loaded significantly on the regulatory component of temperament in the CFA. Using the very Short Form of the CBQ limited our ability to use more items from the three main dimensions of the CBQ (surgency, negative affectivity, and effortful control). Once items were selected for each temperamental construct, we averaged those items to create composite regulatory and reactive temperament scores for further analyses. Internal consistency for regulatory temperament was  $\alpha = .71$ , and reactive temperament was  $\alpha = .62$ .

### 2.2.2 *Children's relationships with parents*

The Short Form of the Child-Parent Relationship Scale (CPRS-SF; Pianta, 1992) was used to assess children's relationships with their parents via parent report during fall 2014. The CPRS-SF is a 15-item measure with subscales of closeness and conflict. The CPRS-SF has a 5-point rating scale in which 1 = "definitely does not apply" and 5 = "definitely applies." Example item for closeness is (seven items) "your child values his/her relationship with you" and for conflict (eight items) "dealing with your child drains your energy." Seven items for closeness and eight items for conflict were averaged to create each subscale. For the current study, the internal consistency was acceptable ( $\alpha = .71$  for parent-child closeness and  $\alpha = .82$  for parent-child conflict).

### 2.2.3 *Children's relationships with teachers*

Teachers reported on the qualities of their relationships with participating children using the Short Form of the Student–Teacher Relationship Scale (STRS-SF; Pianta, 2001). The STRS-SF is a 15-item scale with two subscales: closeness (eight items) and conflict (seven items). A sample item from the closeness subscale is “I share an affectionate, warm relationship with this child.” An example item for conflict is “This child and I always seem to be struggling with each other.” The STRS has a 5-point Likert-type scale in which 1 = “definitely does not apply” and 5 = “definitely applies.” Eight items for closeness and seven items of conflict were averaged to create each subscale. For the current study, the internal consistency of teacher–child closeness was  $\alpha = .85$  and teacher–child conflict was  $\alpha = .90$ .

## 2.3 *Data collection procedures*

Parents and teachers from three Educare programs in two midwestern cities were contacted to ask for their consent as part of the Educare Evaluation Project. After providing consent, parents were visited by Educare Family Engagement Specialists to have parents complete surveys assessing demographic information and the parent–child relationship scale (CPRS), as part of their Educare evaluation package during the fall semester in 2014. Teachers gave the CBQ-VSF to parents to report on their children’s temperament, which parents returned to teachers upon completion. After granting consent, teachers completed the STRS about all participating children in their classroom. Researchers provided instructions about how to complete the measures. Teachers completed the STRS on their teacher-training day towards the end of the fall semester in 2014, which allowed for sufficient time to develop relationships with the children in their classes.

## 2.4 *Data analysis*

Children’s regulatory and reactive temperament scales were centered at the sample mean (i.e., grand-mean centered) for main effects and interaction terms (Enders & Tofighi, 2007). For main and moderation effects (interaction terms), we used SAS PROC MIXED (SAS Institute Inc. 2011) to test the models to account for children nesting in classrooms (Raudenbush & Bryk, 2002; Singer & Willett, 2003; West, Welch, & Galecki, 2015). In unconditional models (e.g., empty model), the intraclass correlation for teacher–child closeness was .26 and for teacher–child conflict was .56. Simple slopes analysis was run to examine significant interactions terms in moderation models. Missing data can be attributed to incomplete parent and teacher participation. Participants with complete data did not show significant differences from children with incomplete data for gender  $\chi^2(1) = 2.03, p > .05$ , ethnicity  $\chi^2(1) = .395$ ,

$p > .05$ , or race  $\chi^2(1) = .782, p > .05$ . Missing data were handled using the Maximum Likelihood method, which allows use of any available data point on an examined variable (Muthén & Muthén, 1998). Satterthwaite was used in PROC MIXED as denominator degrees of freedom method to control for unbalanced classroom sizes in analysis (West et al., 2015).

### 3 Results

#### 3.1 Preliminary results

First, differences in children's temperament, parent-child and teacher-child relationships as a function of demographic variables were examined. Gender and ethnicity differences in temperament, parent-child and teacher-child relationships were examined by using independent sample  $t$  tests along with Cohen's  $d$  to represent corresponding effect sizes. Parents' report of girls' temperamental regulation ( $M = 5.72, SD = 0.85$ ) was significantly higher than boys ( $M = 5.35, SD = 0.89$ ),  $t(235) = -3.24, p < .05, d = -0.42$ . Teacher-child relationship also differed between girls and boys such that girls ( $M = 4.19, SD = 0.53$ ) scored significantly higher on closeness with teachers than boys did ( $M = 3.85, SD = 0.71$ ),  $t(283) = -4.45, p < .05, d = -0.54$ . Along the same line, boys ( $M = 2.18, SD = 0.94$ ) scored higher on conflict with teachers than girls did ( $M = 1.77, SD = 0.79$ ),  $t(283) = 3.95, p < .05, d = 0.47$ . In addition, non-Hispanic children ( $M = 2.11, SD = 0.98$ ) scored significantly higher than Hispanic children ( $M = 1.83, SD = 0.77$ ) on conflictual teacher-child relationship  $t(199) = -2.58, p < .05, d = -0.31$ .

Bivariate correlations (Pearson's correlation) were calculated for all study variables (see **Table 1**). Reactive temperament was positively correlated with parent-child conflict,  $r(217) = .24, p < .01$ , and negatively correlated with parent closeness,  $r(217) = -.18, p < .01$ . Similarly, reactive temperament was positively correlated with teacher conflict,  $r(237) = .23, p < .01$ . Regulatory temperament was positively correlated with teacher closeness,  $r(237) = .25, p < .01$ , and negatively correlated with teacher conflict,  $r(237) = -.26, p < .01$ .

#### 3.2 Main and interaction effects

##### 3.2.1 Temperament and parent-child closeness

Children's regulatory and reactive temperaments were regressed on parent-child closeness. There was a significant main effect of reactive temperament on parent-child closeness ( $\beta = -.06, t = -2.81, p = .005$ ). Thus, for every one unit increase in reactive temperament, parent-child closeness decreased by .06 units. Regulatory temperament did not significantly moderate

**Table 1.** Bivariate correlations and descriptive statistics for study variables

Variables	1	2	3	4	5	6	7	8	9
1. Regulatory temperament	–								
2. Reactive temperament	-.12	–							
3. Parent–child closeness	.12	-.18**	–						
4. Parent–child conflict	-.09	.31**	-.20**	–					
5. Teacher–child closeness	.25**	-.10	.09	-.04	–				
6. Teacher–child conflict	-.26**	.23**	-.08	.18**	-.29**	–			
7. Age	.06	.04	.06	-.02	.09	.02	–		
8. Gender	.21**	-.12	.08	-.01	.25**	-.22**	.04	–	
9. Ethnicity	-.01	-.07	-.06	-.06	-.08	.15*	-.01	-.03	–
<i>n</i>	240	240	254	254	285	285	291	291	287
<i>Mean</i>	5.52	4.10	4.68	2.09	4.01	1.99	53.88		
<i>SD</i>	.89	1.11	0.40	0.91	0.66	0.65	6.44		
<i>Range</i>	2–7	1.4–7	2–5	1–4.85	1.57–5	1–4.88	37–70		
<i>Skewness</i>	–0.80	–0.11	–2.19	0.84	–0.87	0.92			
<i>Kurtosis</i>	1.04	–0.40	8.15	–0.01	0.47	0.01			

\*  $p < .05$ , two-tailed\*\*  $p < .01$ , two-tailed

Gender: 1 = Female, 0 = Male

Ethnicity: 1 = Non-Hispanic, 0 = Hispanic

the association between reactive temperament and parent–child closeness ( $\beta = .01$ ,  $t = .49$ ,  $p = .62$ ). Hispanic children had higher scores on parent–child closeness than non-Hispanic children did,  $t(137) = 2.75$ ,  $p = .006$ . Children whose mothers have less than a high school degree had lower scores on parent–child closeness than children whose mothers were college graduates,  $t(213) = -2.59$ ,  $p = .01$ .

### 3.2.2 Temperament and parent–child conflict

As expected, there was a main effect of reactive temperament on parent–child conflict ( $\beta = .24$ ,  $t = 4.70$ ,  $p < .0001$ ). Thus, for every one unit increase in reactive temperament, parent–child conflict increased by .24 units. However, regulatory temperament did not significantly moderate the association between reactive temperament and parent–child conflict ( $\beta = .04$ ,  $t = .86$ ,  $p = .39$ ). Children whose mothers had less than a high school degree had lower scores on parent–child conflict than children whose mothers had a high school degree,  $t(202) = -1.99$ ,  $p = .04$ . In addition, children whose mothers had a high school degree had higher scores on parent–child conflict than children whose mothers had a college degree,  $t(213) = 3.23$ ,  $p = .001$ . See **Table 2** for complete results.

**Table 2.** Final model parameters for main effects model and moderation model for parent–child closeness and conflict

	<i>Parent–child closeness</i>				<i>Parent–child conflict</i>			
	<i>Main effect only</i>		<i>Interaction</i>		<i>Main effect only</i>		<i>Interaction</i>	
	<i>Estimate (SE)</i>	<i>t-stats</i>	<i>Estimate (SE)</i>	<i>t-stats</i>	<i>Estimate (SE)</i>	<i>t-stats</i>	<i>Estimate (SE)</i>	<i>t-stats</i>
Intercept	4.52(.22)**	20.23	4.52(.22)**	20.24	2.04(.49)**	4.12	2.03(.49)**	4.13
Gender (female)	-.08(.05)	-1.70	-.08(.05)	-1.71	-.06(.11)		-.06(.11)	-.60
Age	.01(.01)	1.00	.01(.01)	1.01	-.01(.01)	-.05	-.01(.01)	-.03
ME (college grad)								
No HS	-.18(.07)*	-2.58	-.18(.07)*	-2.59	.14(.15)	.90	.13(.15)	.89
HS	-.11(.06)	-1.84	-.11(.06)	-1.85	.46(.1)**	3.25	.45(.14)**	3.23
Ethnicity (non-Hispanic)	.16(.05)**	2.77	.15(.05)**	2.75	-.14(.12)	-1.11	-.14(.12)	-1.14
Temperament								
REG TEMP	.03(.02)	1.09	.02(.03)	.96	-.05(.06)	-.89	-.06(.06)	-1.05
REAC TEMP	-.06(.02)**	-2.83	-.06(.02)**	-2.81	.24(.05)**	4.66	.24(.05)**	4.70
Interaction								
REG-T*REAC-T			.01(.02)	.49			.04(.05)	.86
Model fit								
-2Log Likelihood	186.5		186.2		527.4		526.7	

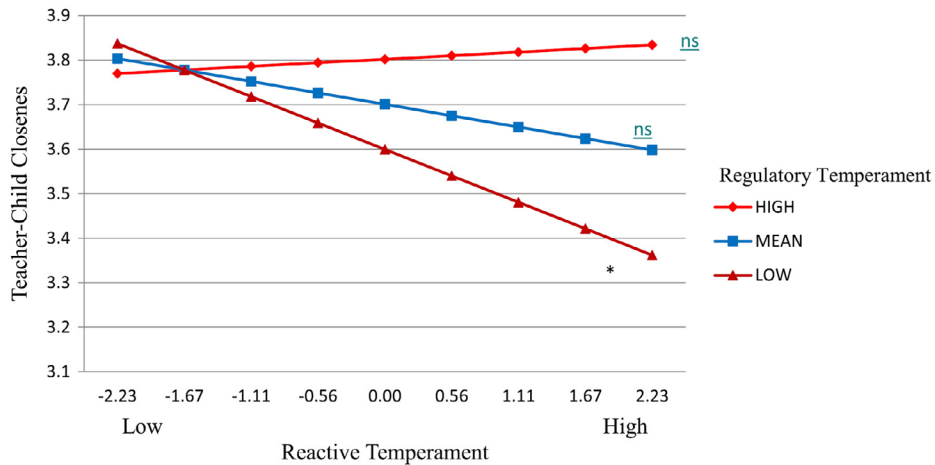
ME = mother education; HS = high school; REAC TEMP = reactive temperament; REG TEMP = regulatory temperament. Reference groups are in parenthesis.

\*  $p < .05$

\*\*  $p < .01$

### 3.2.3 Temperament and teacher-child closeness

There was a main effect of regulatory temperament on teacher–child closeness ( $\beta = .11$ ,  $t = 2.58$ ,  $p = .01$ ). Thus, for every one unit increase in regulatory temperament, teacher–child closeness increased by .11 units. Further, regulatory temperament significantly moderated the association between reactive temperament and teacher–child closeness ( $\beta = .06$ ,  $t = 2.10$ ,  $p = .03$ ). To examine the significant interaction between regulatory temperament and reactive temperament on teacher–child closeness, simple slopes analysis was run at three levels of regulatory temperament: high (1 SD above the mean), mean level, and low (1 SD below the mean; Aiken & West, 1991). Simple slope analysis showed that the slope for reactive temperament on teacher–child closeness when regulatory temperament was high and at mean level was not significantly different from zero ( $t = .32$ ,  $p = .74$  and  $t = -1.38$ ,  $p = .17$ , respectively). However, when regulatory temperament was low, the slope for reactive temperament on teacher–child closeness was significantly different from zero ( $t = -2.45$ ,  $p = .01$ ). Thus, when regulatory temperament was high or at mean level, reactive temperament was unrelated to teacher–child closeness. However, when regulatory temperament was low, higher levels of reactive temperament were related to lower levels of teacher–child closeness. See **Figure 1** for interaction plot. In addition, boys had lower levels of teacher–child closeness than girls



**Figure 1.** Reactive and regulatory temperaments predicting teacher–child closeness. \*  $p < .05$ , ns = nonsignificant

did,  $t(206) = -2.91, p = .004$ . Children whose mothers had less than a high school degree had lower scores on teacher–child closeness than children whose mothers were college graduates,  $t(211) = -2.31, p = .02$ .

### 3.2.4 Temperament and teacher-child conflict

There were main effects of regulatory and reactive temperament on teacher–child conflict ( $\beta = -.19, t = -3.12, p = .002$  and  $\beta = .12, t = 2.58, p = .01$ , respectively). Thus, for every one unit decrease in regulatory temperament, teacher–child conflict increased by .19 unit, and for one unit increase in reactive temperament, teacher–child conflict increased by .12. However, regulatory temperament did not significantly moderate the association between reactive temperament and teacher–child conflict ( $\beta = -.06, t = -1.39, p = .16$ ). In addition, boys had higher levels of teacher–child conflict than girls did,  $t(213) = 3.12, p = .002$ . See **Table 3** for complete results.

## 4 Discussion

In the current study, we examined the associations between low-income preschool children’s temperament and their relationships with parents and teachers. In particular, the moderating effects of regulatory temperament on the associations between reactive temperament and children’s relationships with parents and teachers were examined. Three main findings emerged from the current study. First, children’s reactive temperament was negatively associated with parent–child closeness and positively associated with parent–child conflict and teacher–child conflict. Second, children’s regulatory



**Table 3.** Final model parameters for main effects model and moderation model for teacher–child closeness and conflict

	<i>Teacher–child closeness</i>				<i>Teacher–child conflict</i>			
	<i>Main effect only</i>		<i>Interaction</i>		<i>Main effect only</i>		<i>Interaction</i>	
	<i>Estimate (SE)</i>	<i>t-stats</i>	<i>Estimate (SE)</i>	<i>t-stats</i>	<i>Estimate (SE)</i>	<i>t-stats</i>	<i>Estimate (SE)</i>	<i>t-stats</i>
Intercept	3.72(.03)**	10.91	3.70(.33)**	11.04	1.64(.47)**	3.44	1.65(.47)**	3.47
Gender (female)	-.214(.07)**	-2.69	-.21(.07)**	-2.91	.34(.11)**	3.09	.34(.11)**	3.12
Age	.01(.01)	1.70	.01(.01)	1.66	.01(.01)	.46	.01(.01)	.42
ME (college grad)								
No HS	-.21(.09)*	-2.23	-.22(.09)*	-2.31	-.20(.14)	-1.45	-.20(.14)	-1.42
HS	-.08(.08)	-.97	-.09(.08)	-1.04	-.10(.12)	-.80	-.09(.12)	-.76
Temperament								
REG TEMP	.14(.04)**	3.03	.11(.04)*	2.58	-.21(.06)**	-3.45	-.19(.06)**	-3.12
REAC TEMP	-.05(.03)	-1.41	-.04(.03)	-1.38	.13(.05)*	2.60	.12(.04)*	2.58
Interaction								
REG-T*REAC-T			.06(.03)*	2.10			-.06(.04)	-1.39
Model fit								
-2Log Likelihood	367.0		362.7		523.4		521.5	

ME = mother education; HS = high school; REAC TEMP = reactive temperament; REG TEMP = regulatory temperament. Reference groups are in parenthesis.

\*  $p < .05$

\*\*  $p < .05$

temperament was positively related to teacher–child closeness and negatively associated with teacher–child conflict. Third, regulatory temperament moderated the association between reactive temperament and teacher–child closeness, but not teacher–child conflict, or parent–child conflict and closeness. Each finding is discussed below.

First, we found that children’s reactive temperament was positively associated with conflictual relationships with parents and teachers and negatively associated with parent–child closeness. These findings are congruent with previous research demonstrating that child temperament is associated with children’s relationships with parents and teachers such that reactive temperament (e.g., negative emotionality) was associated with lower social skills with teachers and parents (Rudasill & Rimm-Kaufman, 2009; Rydell et al., 2005; Sanson, Hemphill, & Smart, 2004). Further, children’s high reactivity (e.g., negative emotionality) was associated with parents’ negative control (e.g., Gallagher, 2002; Lengua & Kovacs, 2005).

Second, we found that children’s regulatory temperament was positively associated with teacher–child closeness and negatively associated with teacher–child conflict, such that children with higher levels of regulatory temperament had closer and less conflictual relationships with their teachers. This finding is congruent with previous research (Blair, Denham, Kochanoff, & Whipple, 2004; Rudasill & Rimm-Kaufman, 2009; Rudasill et al., 2010)

showing that high effortful control (i.e., regulatory temperament) was positively associated with teacher–child closeness and negatively associated with teacher–child conflict. Children with high regulatory temperament are likely better able to respond to classroom demands such as requests by teachers (e.g., being quiet as a teacher reads a book), and consequently, teachers may perceive these children more positively, contributing to greater closeness and less conflict (Rudasill & Rimm-Kaufman, 2009).

Third, regulatory temperament moderated the effect of high reactive temperament on children’s closeness with teachers, such that when regulatory temperament was low, higher reactive temperament was related to lower teacher–child closeness; however, when regulatory temperament was high, reactive temperament was unrelated to teacher–child closeness. This finding is consistent with previous research showing that regulatory components of temperament such as attentional focusing and inhibitory control moderated the association between reactive components of temperament such as negative emotionality, shyness, and fearfulness on children’s social competence and prosocial behavior (Acar, Rudasill, Molfese, Torquati, & Prokasky, 2015; Eisenberg et al., 2000). However, the findings from previous research on temperament-by-temperament interactions predicting qualities of children’s relationships with teachers are inconsistent (e.g., Diaz et al., 2017; Valiente et al., 2012). For example, Valiente et al. (2012) found that high levels of effortful control (parent and teacher reported via the CBQ; Rothbart, Ahadi, Hersey, & Fisher, 2001) moderated the association between impulsivity and positive teacher–child relationships such that impulsivity was related to less positive student–teacher relationships at low and medium levels of observed effortful control (Valiente et al., 2012). In another study, Diaz et al. (2017) found that effortful control moderated the association between negative emotion and teacher–child conflict, such that children’s negative emotion was positively associated with teacher–child conflict when they had low or medium levels of effortful control. Thus, the varied results from different studies may be a consequence of using different types of measures for effortful control and negative affectivity (Diaz et al., 2017).

Another important finding to discuss is that regulatory temperament did not moderate the association between reactive temperament and parent–child relationships (closeness and conflict). Although there was a main effect of reactive temperament on parent–child conflict and closeness, the interaction term of regulatory and reactive temperament did not significantly predict parent–child conflict or closeness. Considering children’s relationships with their parents do not carry over to their relationships with teachers in classrooms (Zhang, 2011), one explanation for this finding may be children’s regulatory temperament is especially important when working with children in a group settings for teachers, whereas the parent can tolerate or

adapt to a child's reactive temperament (e.g., anger) even in the absence of high regulatory temperament better than a teacher can because the parent is dealing with one or a few children. In addition, it may be challenging for teachers to deal with unregulated children during large group activities.

Overall, we found evidence that reactive temperament was related to children's relationships with parents and teacher-child conflict and regulatory temperament were related to children's relations with teachers. Moreover, the combination of low regulation and high reactivity may undermine children's likelihood of developing close relationships with their teachers. These findings suggest that improving children's regulatory temperament may be a good approach to reduce negative effects of reactive temperament on teacher-child relationships. Close relationships with teachers may provide potential resources to enhance children's social-behavioral outcomes such as prosocial behavior and social competence as well as academic outcomes (Birch & Ladd, 1998; Hamre & Pianta, 2001).

#### **4.1 Implications of the current study**

When parents and teachers understand children's temperamental difficulties such as being overly reactive in the classroom context, they may provide compensatory scaffolding for children's reactive temperament so that children can develop positive behaviors with parents and teachers as well as pay attention during classroom learning. In addition, the findings from the current study indicated that regulatory temperament buffers the influence of reactive temperament on teacher-child closeness. This suggests that scaffolding regulatory temperament (i.e., self-regulation) can positively influence relationships. Further, it is noteworthy that children's reactive temperament was particularly problematic for their social relationships with parents and teachers. One approach to reduce detrimental effects of reactive temperament and improving regulatory temperament in children can be done by implementing *mindfulness-based* activities in classrooms and homes (Diamond, 2012). Recent research has shown that using mindfulness-based approaches in classrooms can help children to reduce their reactivity as well as support development of self-regulation (Burke, 2010; Zelazo & Lyons, 2012). For example, when a child is becoming reactive, teachers or parents can engage with the child and ask about her/his emotions and let the child process thoughts and emotions he or she is experiencing. This process can focus his/her attention to calming down as reactivity is reduced. As children become aware of their reactivity and learn how to better manage it, they can focus on classroom processes and become less disruptive during classroom activities and in social relationships (Zelazo & Lyons, 2012).

## 4.2 *Limitations and future directions*

Limitations of the current study point to future research directions. First, although the current study used confirmatory factor analysis to create composite scores for reactive and regulatory components of temperament, using the Very Short form of the CBQ limited examination of more fine-grained structure of child temperament. More specifically, the VSF of the CBQ does not include all the items or subscales (e.g., approach) that are conceptualized in the short or original versions of the CBQ (Putnam & Rothbart, 2006). Therefore, future research should use the short or original forms of the CBQ to capture more fine-grained structure of child temperament and examine main and moderating effects of regulatory temperament on reactive temperament in predicting quality of relationships with parents and teachers. Second, parents and teachers reported about their relationships with children. Therefore, these measures may include rater bias (Dobbs & Arnold, 2009; Wentzel & Looney, ). This could be particularly true for temperament and parent–child relationships as parents reported on these two constructs. Future research may benefit from using observations of children’s relationships with adults, especially teacher–child interactions in the classroom via using observational tools such as the Classroom Assessment Scoring System (CLASS; Pianta, La Paro, & Hamre, 2008). By using multiple informants, researchers can minimize common variance associated with informant. Third, reactive temperament had low internal consistency, which may be due to the small number of items on this scale. Lastly, despite the fact that this study was informed by Sameroff’s (2009) transactional model, the cross-sectional nature of our data precluded making inferences about how parent–child and teacher–child relationships may influence children’s temperament.

**Acknowledgments** — The findings reported here were from the Educare Implementation Study, funded by the Buffett Early Childhood Fund (Educare Omaha), and the College of Education and Human Sciences, University of Nebraska (Educare Lincoln), supplemented with data from a study of children’s self-regulation, supported by the University of Nebraska. The author wishes to thank Educare Lincoln and Omaha schools, as well as the Munroe Meyer Institute, University of Nebraska Medical Center, for assistance in data collection.

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