

Contributions of Children's or Teachers' Effortful Control to Academic Functioning in

Early Schooling

by

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A Dissertation Presented in Partial Fulfillment  
of the Requirements for the Degree  
Doctor of Philosophy

Approved November 2011 by the  
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ARIZONA STATE UNIVERSITY

December 2011

## ABSTRACT

I examined the role of children's or teacher's effortful control (EC) in children's academic functioning in early elementary school in two separate studies. In Study 1, I tested longitudinal relations between parents' reactions to children's displays of negative emotions in kindergarten, children's EC in first grade, and children's reading or math achievement in second grade ( $N = 291$ ). In the fall of each school year, parents reported their positive or negative reactions and parents and teachers reported on children's EC. Standardized achievement tests assessed achievement each spring. Results from autoregressive panel mediation models demonstrated that constructs exhibited consistency across study years. In addition, first-grade EC mediated relations between parents' reactions (i.e., a difference composite of positive minus negative reactions) at kindergarten and second-grade math, but not reading, achievement. Findings suggest that one method of promoting math achievement in early school is through the socialization of children's EC.

In Study 2, I examined relations between teachers' EC, teachers' reactions to children's negative emotions, the student-teacher relationship (STR), and children's externalizing behaviors or achievement among 289 second-graders and their 116 teachers. Results from mixed-model regressions showed that negative reactions and teacher-reported STR mediated relations between teachers' EC and math achievement. In addition, teacher-reported STR mediated links between teachers' EC and externalizing problems across reporters and between teachers' EC and reading achievement. Tests of moderated mediation indicated that a high-quality STR was negatively associated with externalizing problems and high levels of teachers' negative reactions were negatively related to math achievement only for students low in EC. In tests of moderation by social competence, teachers' reports of high-quality STRs tended to be negatively associated

with externalizing problems, but relations were strongest for students not high in social competence. For students low in social competence only, children's reports of a high-quality STR was related to lower reading achievement. These results highlight the utility of considering whether and how teachers' own intrinsic characteristics influence classroom dynamics and students' academic functioning outcomes.

For Nate:

I started this for me, but I finished it for you.

## ACKNOWLEDGMENTS

I must acknowledge a great deal of support, especially in the form of *time*, over the course of my doctoral education and in the writing of this dissertation. To my graduate advisor and dissertation Co-Chair, Dr. Carlos Valiente: I am sincerely grateful for and honored by your heartfelt dedication, for more than six years, to helping me train to become a professional in this field. Thank you for patiently teaching me and sharing your valuable knowledge and experiences so freely to better me professionally. To dissertation Co-Chair Dr. Bob Bradley: You displayed an uncommon knack for encouraging and energizing me to pursue excellence and keep moving forward. In every drop-in conversation, it felt as if you had no other concerns outside helping me untangle the conceptual conundrum I might be grappling with; thank you for such generosity. Thank you to Doctoral committee member Dr. Becky Kochenderfer-Ladd and Master's committee member Dr. Sandi Simpkins for supporting and guiding my ideas. To Dr. Kathy Lemery-Chalfant, Dr. Carol Martin, and Dr. Tracy Spinrad: I cherish your kindness in giving of your time, efforts, and expertise as caring fosterers and gracious women mentors of my professional – and personal – development. I strive to be a credit to you all.

Thank you to the countless friends and family members who aided our family, especially when we faced tremendous health hurdles. To my fellow graduate students: Thank you for enduring friendships sprung from shared ideas and good, honest work together. In particular, Becca Myers, Caitlin O'Brien, and Amy Pennar offered ready and unquestioning support on this path. I am grateful to the research staff members for sparkling enthusiasm and high-quality data collection and processing. Thank you to the parents, teachers, children, schools, and communities who gave of themselves toward a better understanding of how to help children succeed in school.

To my parents, Al and Betsy Cunningham – my first teachers: Thank you for your very fine example of unflinching determination in pursuit of ambitions and for instilling in me the sense that everything I wished to achieve or experience was attainable. Thank you for believing in me.

To my husband and best friend, John Paul Swanson: Thank you for your steadfastness through the journey. Your strength and unconditional love have made this possible.

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## Introduction

Childhood academic achievement is consistently related to healthy functioning across domains in later life (Duncan et al., 2007; Fiscella & Kitzman, 2009; Lee, 2010).

Educational reform in the United States (U.S.) and elsewhere has seen an unprecedented shift in the focus of academic research, policy, and practice to advance evidence-based knowledge of how to promote achievement especially at school entry and early in formal schooling years (Pianta, 2007). The National Education Goals Panel (1997), established by the U.S. President and 50 state governors, summarized the general competencies most relevant for success early in school as consisting of adequate physical health and motor development, attitudes in favor of and inclinations to learning, spoken and written communication usage, general cognitive ability, and social and emotional competence.

The role of students' *social-emotional skills*, in particular, has received extensive theoretical and evidence-based support, such that there is broad consensus that competence in these domains is critically important to academic functioning (Greenberg et al., 2003; NICHD Early Child Care Research Network, 2003a; Raver, 2002).

Accordingly, scholars have invested efforts toward clarifying which social-emotional factors and processes are related to achievement and why relations may exist. For example, students' intrinsic characteristics (e.g., features of temperament, motivation, persistence; Blair, 2002b; Rothbart & Bates, 2006; Valiente, Lemery-Chalfant, & Swanson, 2010), academic social relationships and social competence (Ladd, Birch, & Buhs, 1999; Myers & Pianta, 2008; Pianta, 1999), and self-initiated and cooperative engagement in classroom activities (Fredericks, Blumenfeld, & Paris, 2004; Valiente, Swanson, & Lemery-Chalfant, in press) significantly predict school performance. This literature is gaining momentum and has attracted attention partly because facets of these processes are presumed to be amenable to socialization (Miner & Clarke-Stewart, 2008;

NICHD Early Child Care Research Network, 2005; Ponitz, Rimm-Kaufman, Grimm, & Curby, 2009; Rimm-Kaufman et al., 2002).

In recent years, a burgeoning body of literature has demonstrated that children's *effortful control* (EC), their temperamental capacity for self-regulation (Eisenberg, Smith, & Spinrad, in press), is a regulatory facet of broader social-emotional competence important for academic success (Blair & Razza, 2007; Deater-Deckard, Mullineau, Petrill, & Thompson, 2009; Valiente, Lemery-Chalfant, Swanson, & Reiser, 2008). In addition, EC is consistently negatively related to externalizing and internalizing problem behaviors (e.g., Eisenberg, Cumberland, et al., 2001), which are likely to disrupt learning and teaching efforts in the classroom, as well as achievement outcomes (Myers & Pianta, 2008). EC involves the abilities to focus and shift attention, to manage emotions to accomplish a task, and to inhibit (or activate) behavior in favor of accomplishing a goal, especially when one would rather not (Rothbart & Bates, 2006).

Limited experimental evidence demonstrates that gains in EC-related skills predict preschoolers' social and academic school readiness. Among Head-Start-funded classrooms, training in attention skills and inhibitory control over the course of the final year of preschool has promoted gains in these skills, which predicted readiness for formal school (Bierman, Nix, Greenberg, Blair, & Domitrovich, 2008; Raver et al., 2011). Training methods include such activities as computer-assisted attention and memory activities and preschooler-led reading teams, in which one child reads a story aloud while others monitor attention to the story. In addition to enhancing self-regulatory skills, these intervention curricula have predicted gains in children's literacy and calculations abilities (Raver et al., 2011). The *Tools of the Mind* curriculum has received relatively extensive attention for its successful training of self-regulation skills by regular teachers at minimal cost (Bodrova & Leong, 2007). This curriculum has successfully improved 4- and 5-year-

olds' higher-order self-regulatory processes, including inhibitory control, working memory, and ability to cognitively adjust to change, and resulted in greater gains in social-emotional competence than school district-imposed programs (Diamond, Barnett, Thomas, & Munro, 2007). These findings point to EC as particularly important to academics and behaviors that promote learning at the transition to school; however, the processes involved in EC development during the early school years remain unclear.

Moreover, gaps in the literature make it difficult to form a more complete understanding of how EC influences children's academic functioning, especially during these first critical years of schooling. For example, researchers have rarely considered whether and how parents can promote children's developing EC skills and subsequent school performance over time in a comprehensive model. In addition, very little is known about the influence of the EC of other actors in the classroom. Despite reasons to expect that teachers' EC influences children's academic functioning, empirical tests of the influence of teachers' self-regulation are few and tests of classroom processes likely to be affected by teachers' EC are rare. The following two studies begin to address these gaps in the literature with investigations of (a) whether children's EC mediates the longitudinal relations of parents' response behaviors when children displayed negative emotions to children's achievement and (b) whether teachers' response behaviors when students displayed negative emotions or the student-teacher relationship (STR) mediate relations between teachers' EC and their students' externalizing behaviors or achievement.

### **Study 1**

Guided by an attachment framework and an heuristic model of emotion socialization constructed by Eisenberg, Cumberland, and Spinrad (1998), in the first study I investigated prospective relations between a balance composite of parents' positive-minus-negative reactions to their children's displays of negative emotions, children's EC,

and children's reading or math academic achievement across kindergarten to second grade. Decades of research have illustrated that various components of children's home environment, including parenting, the physical home environment, and family socioeconomics, are correlates of academic achievement (Brown & Low, 2008; Davis-Kean, 2005; Spera, 2005). Because EC appears to be important to all facets of academic functioning, including achievement and social competence in the classroom (NICHD Early Child Care Research Network, 2003a; Valiente et al., in press), EC may partly explain why parenting is related to academic outcomes. Tests of this premise are few and longitudinal evidence is lacking (Swanson, Valiente, & Lemery-Chalfant, in press). The goal of Study 1 was to test a three-wave autoregressive model in which first-grade EC was hypothesized to mediate relations between parents' reactions during kindergarten and second-grade achievement among 291 typically developing schoolchildren from middle-class families.

## **Study 2**

With the second study I utilized Raver, Blair, and Li-Grining's (in press) conceptual model of the influence of teachers' self-regulation on student-teacher dynamics to examine relations among second-grade teachers' EC, teachers' reactions to children's displays of negative emotions, the STR, and children's adjustment outcomes. Despite theoretical reasons to expect teachers' EC to affect student-teacher interactions and students' academic functioning, researchers have only begun to test how teachers' temperament may influence these processes. Teachers with optimal self-regulation can manage emotions to respond to students in ways consistent with long-term classroom goals (Sutton & Wheatley, 2003). In turn, teachers' sensitive response behaviors have been positively associated with students' on-task behaviors and negatively associated with disruptive behaviors (Rimm-Kaufman et al., 2002). With a sample of 289 typically

developing children from middle-class families and their second-grade teachers (66% had attained a Master's degree), the goal of Study 2 was to test whether teachers' reactions or the STR mediate relations between teachers' EC and children's externalizing behaviors or achievement, controlling for children's sex, family socioeconomic status (SES), and teachers' years of experience. Additionally, I sought to also investigate whether children might be differentially susceptible to teachers' influence based on their own EC or social competence.

### **Advancing the Literature**

The two studies comprising this investigation have the potential to contribute important evidence to developmental, educational, and psychological literatures regarding a fuller understanding of how EC is related to academics. Previous work has demonstrated that parenting practices generally, and parents' reactions to children's negative emotions specifically, are related to children's EC. Further, children's EC has important implications for their academic performance. Study 1 is among the first to test relations between these constructs longitudinally and in a sample of children in early-elementary-school years, when learning environments become more formalized. Study 2 is likely to extend findings regarding the role of teachers as socializers of children's developmental functioning. Though the importance of *children's* EC to their academics has growing support, little is known about the effects of teachers' EC. Findings from these studies may inform intervention and prevention efforts for children determined at early risk for poor academic performance or for teachers showing signs of burnout. Taken together, these studies offer important advances to scientific research of pathways to academic functioning in early elementary schooling involving self-regulation in the classroom.



**Study 1: Longitudinal Relations between Parents' Reactions to Children's Negative Emotions, Effortful Control, and Academic Achievement: A Three-Wave Study in Early Elementary School**

Academic achievement during childhood is consistently associated with healthy functioning across domains later in life (Duncan et al., 2007; Fiscella & Kitzman, 2009; Lee, 2010). In contrast, underachievers are at increased risk for delinquency, dropping out of high school, criminal activity, and chronic joblessness (Alexander, Entwisle, & Horsey, 1997; Bureau of Labor Statistics, 2010; Kasen, Cohen, & Brook, 1998). Fortunately, education reform efforts of the recent past have seen a general decline in U.S. high school dropouts (U.S. Department of Education, 2010). Nonetheless, U.S. students continue to lag behind peers in other industrialized nations in math and science performance (Mullis et al., 2008), and the U.S. ranks second in expenditures per student in attempts to propel overall achievement levels (i.e., 4% of U.S. gross domestic product spent on K-12 education; Aud et al., 2010). High-quality research efforts can inform policy to assist U.S. students to excel academically (Koretz, 2009; Zaff, 2011).

In an effort to elucidate specific areas for intervention, scholars have demonstrated that students' self-regulatory skills are important for school success (Greenberg et al., 2003; NICHD Early Child Care Research Network, 2003a). Children's *EC*, an attentional, behavioral, and emotional regulation component of temperament, is an aspect of self-regulation expected to be imperative for academic functioning (Blair, Calkins, & Kopp, 2010; Raver, 2002), including achievement, close relationships with teachers and schoolmates, and engagement in school (e.g., Blair & Razza, 2007; Deater-Deckard et al., 2009; Valiente et al., 2008). How caregivers may promote the normative development of *EC* and subsequent academic functioning is a timely research focus, with implications for practical significance to educators and legislators (Blair et al., 2010; Eisenberg, Valiente,

& Eggum, 2010). Moreover, fostering these skills during early formal schooling – when processes involved in motivation and affective connectedness to school are being established (Entwisle & Alexander, 1993; Entwisle & Hayduk, 1988) – may jump-start positive academic trajectories. Linkages between parenting processes to EC to academics have been rarely investigated in a comprehensive model or in early childhood. The purpose of this investigation was to test whether an index of parental socialization in kindergarten predicted first-graders' EC, which was expected to be related to second-grade achievement, using a three-wave longitudinal design in which all constructs were assessed at three time points.

### **Predicting Academic Achievement from Parenting**

Empirical relations between the home environment and children's academic achievement are well-established. Distal features, such as family SES, parents' education, and family size or structure have demonstrated a fairly consistent relation with academic functioning (Davis-Kean, 2005; Zill, 1996), perhaps because they affect proximal processes in the home, such as parenting styles and practices (Martini, 1995). Indeed, though a handful of researchers have reported null findings (Annunziata, Hogue, Faw, & Liddle, 2006; Scott, 2004), an extensive literature supports the premise that indices of parenting are associated with their children's achievement, often across time and beyond of the effects of SES. In fact, in some recent work, positive parenting practices in later childhood have predicted the likelihood of high school graduation (Blondal & Adalbjarnardottir, 2009; Robertson & Reynolds, 2010).

Children whose parents provide supportive, structured homes and refrain from using overly harsh or controlling practices appear to perform better academically (Dearing, 2004). Across the transition from preschool to early elementary grades, children of more supportive parents have shown better acquisition of academic skills (Burchinal, Peisner-

Feinberg, Pianta, & Howes, 2002; De Von Figueroa-Moseley, Ramey, Keltner, & Lanzi, 2006; Luster, Lekskul, & Oh, 2004; NICHD Early Child Care Research Network, 2008). These relations may exist because parents who respond to their children's needs in developmentally and contextually appropriate ways are open to children's desire to satisfy natural curiosity tendencies, instilling early engagement in learning processes. Caregivers who respond supportively, especially when children approach them in distress, likely reinforce their children's sense of security and structure at home, encouraging exploration in other settings, such as the classroom.

Conversely, practices that take little regard for the child's perspectives or developmental needs are linked with poorer school performance. Much of the work to date has been conducted with samples of students in middle school and adolescents only (Bronstein, Ginsburg, & Herrera, 2005; Doyle & Markiewicz, 2005). The limited evidence among children in early elementary grades indicates that highly negative parenting practices are associated with lower achievement scores during kindergarten through second-grade (Chen, Dong, & Zhou, 1997; Gadeyne, Ghesquiere, & Onghena, 2004). Parents who are predominantly controlling in parent-child interactions compel children to enact particular behaviors and typically emphasize unquestioning compliance. These practices are likely to weaken children's personal sense of responsibility and discovery of knowledge, which can undermine learning and academic motivation (Grolnick, 2003; Gurland & Grolnick, 2005).

Some theorists have explained the direct relation between parenting and achievement in terms of parents' and children's academic expectations and perceptions. Eccles (e.g., Eccles et al., 1983; Wigfield & Eccles, 2002) proposed that parents' beliefs and behaviors and children's perceptions of these are likely to influence children's achievement-oriented expectations, including their motivation. In turn, children's own expectations for

achievement begin to influence how well they perform, how much they persist, and what they choose academically. Building upon expectation and motivation models, Grolnick and colleagues (Pomerantz, Grolnick, & Price, 2005; Grolnick & Ryan, 2005; Gurland & Grolnick, 2005) theorized that parents contribute to how children perceive their own achievement – and bring about its actualization – through parents’ individualized practices, beliefs, and sense of parent-child affective relatedness. In this way, parents and children jointly contribute to how children approach achievement over the course of development.

Despite an extensive literature suggesting that direct relations exist between parental behavior and children’s achievement, the magnitudes of these relations are generally modest. Child-level constructs related to well-being have been shown to mediate these relations (e.g., adaptive classroom behaviors, coping strategies, ego resilience; DeGarmo, Forgatch, & Martinez, 1999; Kim, Brody, & Murry, 2003; Swanson, Valiente, Lemery-Chalfant, & O’Brien, 2011; Valiente, Lemery-Chalfant, & Swanson, 2009). Aspects of children’s temperament, especially their self-regulation, are hypothesized to account for some of the association between parenting practices and achievement (Rothbart & Bates, 2006).

### **The Mediating Role of Effortful Control**

EC is likely to partially explain why the home environment is linked to academics. Defined as the capacity to inhibit a dominant response in favor of a subdominant response, especially when one does not want to, as well as to sustain attention and to plan (Eisenberg et al., in press; Rothbart & Bates, 2006), it appears to be a component of overall self-regulation that is important for childhood development across domains (Shonkoff & Phillips, 2000). EC integrates skills to focus and shift attention, to manage emotions to accomplish a task, to inhibit behavior in favor of achieving a goal, and to

initiate and complete tasks proactively. Researchers have measured EC via indices of reported and observed sustained attention, persistence, delayed gratification, and inhibited (or activated) behavior (Kochanska, Murray, & Harlan, 2000; Rothbart & Bates, 2006), and via neurological, biological, and genotypic markers specific to EC (Sheese, Voelker, Posner, & Rothbart, 2009).

EC is expected to be influenced by parental behavior (Eisenberg, Cumberland, et al., 1998; Lemery-Chalfant, Doelger, & Goldsmith, 2008), and empirical work supports this premise (Posner, 2009; Rothbart, 2007; Stormshak, Fosco, & Dishion, 2010). Typically, EC emerges early in the second year of life, around the time parents form expectations that children begin demonstrating voluntary control (Kochanska & Aksan, 2006). Responsive parenting may foster the development of EC because children are less likely to be overaroused and exhibit dysregulated behavior when parents are sensitive to their needs (Eisenberg, Zhou, et al., 2005).

An attachment framework highlights the components of EC involved in the regulation of *emotion* as particularly susceptible to parental behavior. The establishment of a secure attachment relationship is thought to advance the instigation and development of an infant's regulatory abilities, contributing to the eventual transition to self-regulation (Calkins, 2004; Schore, 2000). Especially in the context of emotion-rich circumstances, the ways in which caregivers respond may contribute to a child's acquisition and internalization of what kinds of regulatory strategies to employ and when (Sroufe, 1996). The open emotional communication between a securely attached infant and caregiver permits the infant to freely express emotions in a safe environment. Grusec and Davidov (2010) categorized this type of socialization in a protection domain, in which sensitive, responsive caregivers seek to protect children from distress. Over time, the child tries out a range of self-regulating strategies and, through trial and error and proximity to a

responsive caregiver, utilizes effective strategies as necessary (Cassidy, 1994; Grusec, 2011). Similarly, insecurely attached infants are also thought to employ regulation strategies, but these are likely to be poorer, inefficient means of meeting regulatory needs because they stem from an unsupportive caregiving context.

Beyond infancy, parents are expected to influence their children's EC into and across childhood. Eisenberg, Cumberland, et al. (1998) theorized that parental personality and general parenting style influence socialization practices related to emotions and emotion-regulation, termed *emotion-related socializing behaviors* (ERSBs), and this includes socialization of EC. The ERSB utilized in the present study is parents' reactions to children's displays of negative emotions. Some parents' reactions validate a child's experience or expression of negative emotions, perhaps to protect the child from the distress of feeling embarrassed in displaying emotions (Grusec, 2011). Harsh reactions focus on the hierarchical relationship between caregiver and child, in which the caregiver is an authority figure seeking to correct or alter the child's behavior, a type of responding within the control domain of socialization (Grusec & Davidov, 2010). Eisenberg et al. suggested that ERSBs imply the socializer's message of what is and is not an appropriate expression and regulation of emotion for a particular context. ERSBs that exhibit optimal arousal levels are expected to offer children opportunities to learn and experience appropriate engagement of EC skills.

The neural substrate for EC develops significantly during toddlerhood and preschool years, and during this period particularly, a child's capacity for socialization of self-regulation deepens (Rothbart, Ellis, Rueda, & Posner, 2003). Accordingly, the majority of empirical tests of relations between parental (primarily *mothers'*) behavior and EC involve samples of children prior to elementary school. High levels of maternal responsiveness and low levels of maternal hostility during playtime interactions

significantly predicted toddlers' more optimal EC (Kochanska et al., 2000; Poehlmann et al., 2010; Spinrad et al., 2007), and mothers' warm responsiveness and mother-child connectedness has predicted EC in preschool (Chang, Olson, Sameroff, & Sexton, 2011; Lengua, Honorado, & Bush, 2007; Li-Grining, 2007; Mistry, Benner, Biesanz, Clark, & Howes, 2010). In contrast, parental negative control and family hostility were negatively related to three-year-olds' observed EC (Karreman, Tujil, van Aken, & Dekovic, 2008), and corporal punishment and insensitive parenting were negatively related to preschoolers' reported and observed EC (Booth-LaForce & Oxford, 2008; Chang et al., 2011).

Researchers have also demonstrated associations between parental behavior and EC among school-aged children. Maternal sensitivity prior to first grade predicted first-grade performance on an index of observed EC (NICHD Early Child Care Research Network, 2005), and authoritative parenting and low corporal punishment have been related to first- and second-graders' EC (Eisenberg, Chang, Ma, & Huang, 2009; Zhou, Eisenberg, Wang, & Reiser, 2004). In formal tests of the neural network responsible for EC, Rothbart and colleagues (Rothbart, Ellis, & Posner, 2004) found that the executive attention network developed substantially among children between four and seven years old. In combination with the start of formal school for most children, this period is likely to be particularly important for the socialization of skills pertaining to sustained attention and inhibition of inappropriate emotions and behaviors across settings. Increased investigations are necessary to better understand the continued development of EC during early schooling. In summary, supportive parenting appears to foster children's EC, particularly during the sensitive periods before and across the transition to formal schooling. Parenting characterized by negativity can undermine EC.

The majority of investigators present directions of effects in which parental behavior practices are assumed to influence EC, but bidirectional relations may exist. That is, a well-regulated child may elicit sensitivity and nurturing from a caregiver. Eisenberg and colleagues have addressed this issue of directionality with what they have termed *child-driven models* (Valiente & Eisenberg, 2006), in which structural equation models (SEMs) were tested for fit and significance of path relations both from parental behavior to EC and vice versa. In most cases, child-driven models do not fit the underlying structure of the data as well as models in line with theory and hypotheses (e.g., *parent-driven models*; Eisenberg, Gershoff, et al., 2001; Eisenberg, Losoya, et al., 2001; Eisenberg et al., 2003; Hofer, Eisenberg, & Reiser, 2010; Valiente et al., 2006). Nonetheless, accounting for paths in both directions across multiple data waves, indices of children's regulation have sometimes predicted parents' reactions across time (Eisenberg et al., 1999). In recent work, EC predicted mothers' cognitive assistance and directive teaching strategies with their toddlers, but relations were not significant in the reverse directions (Eisenberg, Vidmar, et al., 2010). Mixed results and a lack of experimental evidence delay conclusions regarding causality and necessitate further research (Eisenberg, Champion, & Ma, 2004). SEMs in the present study extend work on the socialization of EC and the potential for bidirectional relations by including paths in both directions between parents' reactions and children's EC to explore the direction of effects across the years of early schooling.

### **Predicting Academic Achievement from Effortful Control**

In recent years, scholars have demonstrated that children's EC in preschool and elementary school is important for academic success during elementary school. EC has been related to achievement and social skills in pre-K and across the transition to kindergarten (Fabes, Martin, Hanish, Anders, & Madden-Derdich, 2003; Harris,



Robinson, Chang, & Burns, 2007; McClelland et al., 2007; Obradovic, 2010). In addition, EC has significantly predicted indices of reading or math achievement (or both) in elementary school, controlling for previous performance, in numerous studies conducted in the U.S. and China (Blair & Razza, 2007; Deater-Deckard et al., 2009; Duncan et al., 2007; Liew, McTigue, Barrois, & Hughes, 2008; Rudasill, Gallagher, & White, 2010; Valiente et al., 2008; Valiente et al., 2010; Zhou, Main, & Wang, 2010). Limited experimental evidence that gains in EC-related skills predict preschoolers' achievement at school entry corroborates correlational findings reviewed above (Bierman et al., 2008; Diamond et al., 2007; Raver et al., 2011), though the processes involved in EC development during the early school years remain unclear. That EC is related to academic functioning is not surprising, because students must deploy EC skills to accomplish academic goals.

Children high in EC may incorporate parents' behaviors and academic expectations to inform the construction of achievement goals (Zimmerman, 2000). EC has been shown to mediate relations between parenting and social functioning outcomes in diverse samples of elementary-school children and adolescents (Chang et al., 2011; Eiden, Edwards, & Leonard, 2007; Eisenberg, Zhou, et al., 2005; Eisenberg, Chang, et al., 2009; Hofer et al., 2010; Valiente, Lemery-Chalfant, & Reiser, 2007; Zhou et al., 2004), yet evidence regarding the mediating role of EC between parenting (or the broader home environment) and academic achievement is rare (for exceptions, see Kim et al., 2003; NICHD Early Child Care Research Network, 2003a; Swanson et al., in press). To date, a single investigation has specifically tested this model across more than two time points: Kim et al. (2003) found that African American single mothers' parent-child interactions, monitoring, and arguing predicted their 11-year-olds' self-regulation across ages 11, 12, and 13, which in turn, predicted academic achievement at age 14.

Self-regulation skills and academic achievement are expected to be mutually reinforcing, perhaps because self-regulated learning increases children's perceptions of the control they can exert over their academic success (Blair et al., 2010). High achievement may improve regulatory skills because students who consistently perform well academically are motivated to attend more to learning or to manage negative emotions in the classroom to maximize benefits from school experiences. Reciprocal relations between EC and achievement or learning-related processes have been only recently empirically examined (Ning & Downing, 2010; Poehlmann et al., 2010), but findings among elementary schoolchildren are limited. For example, a single set of results indicated that how students are instructed in and acquire math skills over the kindergarten year may play a specific role in their emergent self-regulation (Bell & Morrison, 2011). Cognitive capacities associated with the promotion of achievement are likely to foster the development of EC, particularly in early childhood (Blair et al., 2010). Models in the current study include simultaneous bidirectional paths across time to begin unraveling questions of directionality regarding EC and achievement in samples of young children.

### **The Present Study**

With this study, I investigated prospective relations between parents' reactions to their children's displays of negative emotions, EC, and reading or math achievement using three-wave autoregressive panel mediation models, according to procedures outlined by Cole and Maxwell (2003). I also examined the stability of parents' reactions, children's EC, and children's achievement from kindergarten (K) through first grade (Grade 1; G1) to second grade (Grade 2; G2). The primary aim of this study was to test the hypothesis that G1 EC mediates the relation between parents' K reactions and G2

achievement. A secondary aim was to examine directionality between the constructs of interest during the developmental time period of interest.

Sex or SES may influence EC or academic performance. Sex differences in EC are well-documented across early childhood (Else-Quest, Hyde, Goldsmith, & Van Hulle, 2006; Kochanska, Murray, & Coy, 1997). Girls tend to out-perform boys on observable assessments of their EC and are rated as significantly higher than boys in EC on self- and other-reports, but findings are sometimes inconsistent (Li-Grining, 2007). Girls also typically score higher than boys across academic subjects in early grades (for a review, see Halpern & LaMay, 2000), but not always (Spelke & Grace, 2007). Despite mean differences, processes linking indices of parenting to EC or EC to achievement have been shown to operate similarly for girls and boys (Swanson et al., in press; Valiente, Lemery-Chalfant, & Castro, 2007; Valiente, Lemery-Chalfant, & Reiser, 2007; Valiente et al., 2010; Valiente et al., 2008; Valiente et al., in press; Zhou et al., 2010). Similarly, although family income and parents' education is related to achievement (Davis-Kean, 2005; NICHD Early Child Care Research Network, 2005), relations are typically similar across SES levels (Smith, 2001; Smith & Walden, 2001; Valiente, Lemery-Chalfant, & Reiser, 2007). Thus, although I did not expect the pattern of findings to differ across groups, I computed Box's Ms (Winer, 1971) to test for moderation by sex or SES.

## **Method**

### **Participants**

Participants were 291 elementary school children (42% girls), recruited from regular education kindergarten classrooms in public southwestern U.S. schools in a large metropolitan city, and their parents and primary teachers. All parents and teachers provided consent and children provided assent. Children were 5.66 years old ( $SD = .39$  year), on average, at recruitment. Parents' reports of children's sex and race or ethnicity

showed that the sample represented the sex and racial population of the school classrooms from which participants were recruited. Forty percent of all eligible kindergartners were girls. At K, seventy-five percent of participants were White (kindergarten classroom population percentages are in parentheses; 70%), 14% (17%) were Latino/a, 8% (8%) were Asian American, 3% (4%) were Black, and less than 1% (2%) were American Indian. Children resided in predominantly two-parent homes (89% of homes at K, 90% at G1, 89% at G2) of middle- to upper-middle income (*M* annual family income ranges = \$70,000 to \$80,000 at K and \$80,000 to \$90,000 at G1 and G2; range = below \$10,000 to above \$100,000). The primary caregiver was the child's mother (95%, 91%, 90%). Almost all caregivers (94%, 97%, and 96% of primary caregivers and 90%, 89%, and 92% of secondary caregivers) had attained a two-year college degree or higher. Parental educational attainment ranged from less than a high school diploma (less than 2% of the sample) to some graduate school attendance (14% of the sample). Census values for the county from which participants were sampled show that this sample was more affluent and educated than the surrounding metropolitan county at large, but ethnicity values were similar: Median household income = \$53,284; Percentage of White persons = 73%; Percentage of high school graduates aged 25+ = 84%.

### **Procedure**

Prior to the start of the academic year, all parents of incoming kindergarten children received an introductory letter describing the study. During kindergarten orientation, research assistants presented the study to parents more formally and enrolled them in the study. To increase the reliability of the constructs and to reduce shared-method variance, we used a multi-reporter, multi-method assessment schedule. Of the 291 parents who provided consent for themselves and their children to participate, 85% ( $n = 248$ ) submitted questionnaires via postal mail at K, 79% ( $n = 229$ ) submitted questionnaires at

G1, and 73% ( $n = 213$ ) submitted questionnaires at G2. We obtained teachers' reports of data via postal mail for 100% ( $n = 291$ ) of children whose parents had consented to their participation at K, 98% ( $n = 284$ ) at G1, and 95% ( $n = 277$ ) at G2. Finally, we obtained data on standardized achievement assessments for 100% ( $n = 291$ ) of children in the study at K, 97% ( $n = 281$ ) at G1, and 92% ( $n = 269$ ) at G2. We continued to conduct assessments with children when they transferred classrooms or schools statewide but not when children transferred to schools in other states. Of the original 291 students and their parents enrolled at the start of K, five dropped out of the study between recruitment and the start of first grade. An additional eight (total dropped  $n = 13$ ) out of the study between first grade and second grade. To examine attrition, I predicted a dummy variable for missingness versus present data on study variables assessed in fall and spring of G1 and G2 from families' SES, children's sex, ethnicity, and K variables in the model.

According to results from nonparametric Kolmogorov-Smirnov tests, which are robust against unequal group sizes and test whether two groups have significantly different measures of central tendency and distributions (Magel & Wibowo, 1997), children who dropped after the initial wave did not significantly differ from those who remained in the study.

Parents and teachers completed questionnaires in the fall of each academic year. Parents' questionnaires assessed family demographics, their reactions to children's negative emotions, and children's EC. The 29 kindergarten, 94 first grade, and 116 second grade teachers also reported on children's EC for an average of 10, 3, and 3 children per classroom, respectively. Near their primary classroom, children worked with research assistants individually during the school day in the spring of each year to complete standardized achievement tests. Parents and teachers received a modest

monetary compensation per questionnaire completed and children received a small toy at each assessment as a token of appreciation.

## Measures

**Family demographics.** In fall of each year, parents reported primary and secondary caregivers' highest educational attainment, as well as annual household income.

Educational attainment and household income were significantly correlated ( $r$ s[within-time  $d$ fs 187-240]  $> .29, p < .01$ ), so I created a mean composite of the standardized  $z$ -scores of these variables as an index of SES at K, G1, and G2. Parents also reported child's sex and birthdate at recruitment.

**Parents' reactions to children's negative emotions.** In fall of each year, parents reported on an index of their parenting during 11 typical situations that young children experience that evoke distress and negative affect with the Coping with Children's Negative Emotions Scale (CCNES; Fabes, Eisenberg, & Bergzweig, 1990; Fabes, Hanish, Martin, & Eisenberg, 2002). Using the CCNES, adults rate the nature of their reactions during circumstances in which children have displayed negative emotions, such as losing a prized possession and reacting with tears (see Appendix A for reported measures used in Study 1). Parents reported the likelihood of their emotion-focused (eight items; "I would encourage my child to talk about his/her fears";  $\alpha$ s = .71, .75, .75 for K, G1, and G2, respectively), expressive-encouragement (seven items; "I would tell him/her it's okay to cry when you feel unhappy";  $\alpha$ s = .79, .79, .80), minimization (eight items; "I would tell my child not to make a big deal out of it";  $\alpha$ s = .75, .83, .78), problem-focused (eight items; "I would talk to my child about ways to make it hurt less";  $\alpha$ s = .72, .75, .76), and punitive (eight items; "I would tell him/her to shape up or he/she won't be allowed to do something he/she likes to do [e.g., watch TV]";  $\alpha$ s = .80, .84, .86) reactions on a 7-point Likert scale (1 = *very unlikely* to 7 = *very likely*).

I computed a principal components analysis of the CCNES subscale mean composites for each time point. In line with previous work (e.g., Valiente, Lemery-Chalfant, & Reiser, 2007), results indicated that two components had an initial eigen value greater than one. These accounted for 73%, 75%, and 72% of the variance at K, G1, and G2, respectively. With all five reactions composites entered into the principal components analysis, emotion-focused (loadings = .88, .88, .85 for K, G1, and G2, respectively), expressive-encouragement (.76, .77, .73), and problem-focused (.83, .82, .84) reactions loaded on the first component, *parents' positive reactions*. Minimization (.87, .90, .88) and punitive (.84, .89, .88) reactions loaded on the second component, *parents' negative reactions*. There were no cross-loadings greater than .08 at any time point. I created a mean composite of positive or negative reactions from the scale scores comprising each component. Because the affective balance of reactions is expected to be important for children's normatively developing EC and achievement, and to decrease the number and complexity of the structural models, I computed an affective balance composite by subtracting the negative reactions score from the positive reactions score at each time point, following a precedent from related work (Denham, Mitchell-Copeland, Strandberg, Auerbach, & Blair, 1997; Valiente et al., 2006). These net-positive composites are hereafter referred to as K, G1, or G2 *parents' positive reactions*.

**Effortful control.** In fall of each year, parents and teachers reported on children's EC using all items from the attention focusing (e.g., "This child, when picking up toys or doing other jobs, usually keeps at the task until it's done") and inhibitory control (e.g., "This child can wait before entering into new activities if she or he is asked to") scales of the Children's Behavior Questionnaire (CBQ; Rothbart, Ahadi, Hershey, & Fisher, 2001) on a 7-point, Likert scale from 1 = *extremely false* to 7 = *extremely true*. As with previous reports of the CBQ (Eisenberg, Valiente, et al., 2009; Morris et al., 2002) and because

scale mean composite scores were significantly correlated (across-scale, within-reporter, within-time  $r_s > .52$  and  $.80$ ,  $p_s < .01$ , for parents and teachers, respectively), I created mean composites as indices of *parent-reported* and *teacher-reported effortful control* ( $as = .87$ ,  $.87$ , and  $.86$  for parents at K, G1, and G2, respectively;  $as = .94$ ,  $.94$ , and  $.94$  for K, G1, and G2 teachers, respectively).

**Academic achievement.** In spring of each year, children completed three subtests from the Woodcock-Johnson III Tests of Achievement (WJ-III; Woodcock, McGrew, & Mather, 2000): *Letter-Word Identification*, a measure of pre-reading language skills to identify letters and sight words; and *Passage Comprehension*, which assesses language comprehension and reading skills, including the ability to supply missing keywords that make semantic and contextual sense in a written passage; and *Applied Problems*, which assesses analytical and practical mathematical problem-solving skills. Respondents to the WJ-III test of intellectual ability may range in age from 2 to 90 years, and the test provides a normative score for comparison of a respondent's score against the national average for that respondent's age. Scoring procedures require that researchers administer each WJ-III subtest until the respondent has failed to answer a predetermined number of items correctly. In total, administration of all three subtests for students in this sample lasted 40 minutes, on average. With WJ-III computerized scoring technology, children's raw scores for each test (i.e., the sum of correct answers within a given subtest) are converted to standardized scores or *W* scores, interval-scaled measures of ability unique to the Woodcock-Johnson tests, which are similar to standardized scores. Scores reported in this study are *W* scores.

### **Analytic Strategy**

Prior to hypothesis testing, I conducted a series of preliminary descriptive analyses to test for mean-level sex differences, to test for relations between study variables and



children's age or SES, and to confirm that the variables were normally distributed. Next, I conducted zero-order correlation analyses among the study variables. I tested a cross-time measurement model in Mplus Version 6 (Muthén & Muthén, 1998-2010) to confirm that indicators loaded on hypothesized latent factors. Guided by Cole and Maxwell's (2003) and MacKinnon's (2008) specifications regarding testing panel mediational models with longitudinal data, I estimated SEMs separately by achievement outcome to test the hypothesis that EC mediates the relations between reactions and academic achievement. To formally test for indirect effects, I obtained confidence intervals via the statistical program PRODCLIN (distribution of the PRODUCT Confidence Limits for INDIRECT effects; MacKinnon, 2008; MacKinnon, Fritz, Williams, & Lockwood, 2007). Finally, I computed Box's Ms to test whether the model relations differed for girls versus boys or for families of higher versus lower SES.

Procedural safeguards were necessary to meet statistical assumptions. First, complete data were not available for all participants, particularly across time. Accordingly, I estimated models using the Missing at Random (MAR) option in Mplus. The MAR option estimates parameters directly with all available data via a full information maximum likelihood (FIML) estimation procedure to handle missingness. Second, participants were clustered within schools. As a result, I estimated all models using the "type=complex" option in Mplus, which produces fit statistics and parameter estimates that account for this clustered data structure. All models were estimated with children's kindergarten schools as the clustering agent ( $N = 11$ ), because children were most clustered in classrooms and schools in kindergarten and children were clustered more by schools than by classrooms across time. The number of cases within a cluster diminished over time, because many participants transferred schools.<sup>1</sup>

## Results

### Preliminary and Zero-order Correlation Analyses

I computed separate MANOVAs to examine sex differences among the parent-reported and achievement measures, and I conducted a *t*-test for sex differences on teacher-reported EC. There were no significant multivariate effects at K, G1, or G2 (Hotelling's *T*) for parent-reported measures (i.e., positive reactions and parent-reported EC;  $F_s[2, 242; 2, 224; 2, 209] = .64, .04, \text{ and } .15, p_s = .53, .96, \text{ and } .86$ ) or for achievement measures (i.e., Letter-Word, Passage Comprehension, and Applied Problems WJ-III subtests;  $F_s[3, 285; 3, 274; 3, 263] = .43, .17, \text{ and } .62, p_s = .73, .92, \text{ and } .60$ ). Across study years, teachers did not rate girls and boys significantly differently on EC,  $t_s(287, 277, \text{ and } 275) = .92, -.05, \text{ and } .21, p_s = .36, .96, \text{ and } .84$ .

Children's age was significantly positively related only to their G1 and G2 teacher-reported EC,  $r_s(287 \text{ and } 277) = .12 \text{ and } .15, p_s < .05$ , and significantly negatively related to K positive reactions,  $r(243) = -.15, p = .02$ . At K, family SES was significantly positively associated with parent-reported EC, teacher-reported EC, and Letter-Word, Passage Comprehension, and Applied Problems achievement measures,  $r_s(243, 245, 244, 244, 244, \text{ and } 244) = .18, .17, .13, .29, .19, \text{ and } .35, p_s < .05$ . Family SES at G1 was significantly related to parents' reports of G1 EC and all G1 achievement measures,  $r_s(227, 218, 218, \text{ and } 218) = .19, .23, .29, \text{ and } .31, p_s < .01$ . At G2, SES was significantly related to all G2 achievement measures,  $r_s(197, 204, 201, \text{ and } 201) = .21, .24, .25, \text{ and } .22, p_s < .01$ . None of the study variables exceeded West, Finch, and Curran's (1995) recommended cut-offs for skewness, kurtosis, or outliers.

Table 1 contains means, standard deviations, and zero-order correlations for study variables. Concurrently, K positive reactions were unrelated to EC, but G1 reactions were significantly positively related to parents' reports of EC at G1. Unexpectedly, at G2,

positive reactions were significantly negatively related to teacher-reported EC (and unrelated to parent-reported EC). G1 and G2 reactions were negatively associated with concurrent math achievement. As anticipated, at each time point, significant positive relations were apparent between EC and all achievement measures.

Across time, all constructs exhibited significant within-construct stability. In addition, parent- and teacher-reported EC were significantly inter-related across time, as were reading and math achievement measures. When mediation is present, the predictor must be significantly related to the mediators, and the mediators must be significantly related to the outcome with the predictor in the model (MacKinnon, Lockwood, Hoffman, West, & Sheets, 2002). In line with these specifications, K positive reactions were positively related to G1 parent-reported (but not teacher-reported) EC. In turn, G1 parent- and teacher-reported EC was positively associated with all measures of G2 achievement. This pattern of zero-order correlations provides initial support for testing the hypothesized process of mediation, in addition to examining the direction of relations among constructs during this developmental period.

### **Structural Equation Modeling**

Within each grade, parents' and teachers' reports served as indicators of the construct of Children's Effortful Control, and Letter-Word and Passage Comprehension WJ-III scores served to indicate Reading Achievement. The affective balance of parents' reports of their positive reactions minus their reported negative reactions served to indicate the constructs of Positive Reactions to Children's Negative Emotions. Because this resulted in a single indicator for each parental behavior latent factor, I used scale reliabilities to estimate measurement error variances separately and included these estimates in the SEMs as fixed parameters (see Joreskog & Sorbom, 1989). The math achievement score itself at K, G1, or G2 served as a manifest variable in the panel model predicting Math

Achievement. I conducted a confirmatory factor analysis to ascertain whether the multiple EC and Reading Achievement construct indicators loaded on corresponding latent factors. Constructs with fewer than two indicators were excluded from the model. The model fit well,  $\chi^2(27, N = 291) = 42.59, p = .03$ ; CFI = .99; RMSEA = .05; SRMR = .03, and all EC and reading achievement indicators loaded significantly on their respective latent factors. Therefore, I proceeded with the tests of the SEMs.

I estimated two separate SEMs to test the hypothesis that EC mediates relations between parents' reactions and reading or math achievement and to investigate the direction of relations between constructs. I constrained factor loadings among corresponding indicators to be equal because I desired to compare relations across time. I included correlations between corresponding within-source error terms across time as a method of accounting for potential biases due to shared method variance, and all models included within-time correlations of constructs (Cole & Maxwell, 2003). For example, I permitted inter-correlations to estimate freely between K positive reactions, K EC, and K reading achievement. To control for the effect of the association between the predictor and outcome variable after accounting for the mediator (i.e., the direct effect), I included a direct path between parents' K positive reactions and G2 achievement in each model (see MacKinnon, 2008).<sup>2</sup>

**Predicting reading achievement.** In the reading model, although indicators for the EC latent factor were constrained without problems, constraining Passage Comprehension indicator loadings to be equal resulted in poor fit on some indices. Releasing this factor loading did not result in a significantly different model fit from a model with all indicator loadings fixed, ( $\Delta\chi^2[1] = .27, p = .60$ ), so I present the model with Passage Comprehension indicator loadings released. The model predicting reading achievement fit the underlying structure of the data well,  $\chi^2(58, N = 291) = 73.49, p =$

.08; CFI = .99; RMSEA = .03; SRMR = .04. Figure 1 shows that all autoregressive paths were significant; however, results do not support the hypothesized process of mediation. K positive reactions were not significantly related to EC, and G1 EC was not related to G2 reading achievement. The association between reading achievement at K and G1 EC was the only significant path to emerge beyond stability paths.

**Predicting math achievement.** The model predicting math achievement fit adequately,  $\chi^2(31, N = 291) = 51.84, p = .01$ ; CFI = .99; RMSEA = .05; SRMR = .04, but modification indices suggested that allowing error terms between EC at K and math achievement at G2 to correlate would substantially improve model fit. Because this correlation was theoretically and empirically justified, I added this parameter to the model. The final model displayed in Figure 2 fit the underlying structure of the data well,  $\chi^2(30, N = 291) = 41.91, p = .07$ ; CFI = .99; RMSEA = .04; SRMR = .04, and was a significant improvement over the prior model ( $\Delta\chi^2[1] = 9.93, p < .01$ ). The covariance coefficient between K EC and G2 math achievement was  $B = -1.66, \beta = -.34, p < .01$ . As displayed in Figure 2, all autoregressive paths were significant. In line with hypothesized mediation, K positive reactions were positively associated with G1 EC, and in turn, G1 EC was positively related to G2 math achievement. In addition, EC and math achievement were transactionally positively associated with one another at K and G1.

### **Tests of Mediation**

To formally test for mediation of the hypothesized paths, I used the statistical program PRODCLIN to examine confidence intervals for indirect effects for the SEMs. Confidence intervals provide a range of possible values for the mediated effect and demonstrate the variability of the effect size, and PRODCLIN accounts for possible non-normal distributions of the indirect effect (MacKinnon et al., 2007). This method, compared to normal theory tests of mediation, reduces Type I error, increases statistical

power, and produces more accurate confidence limits (MacKinnon, Lockwood, & Williams, 2004). Evidence was not obtained to support the premise that G1 EC mediated relations between positive reactions at K and reading achievement at G2; however, G1 EC mediated relations between K positive reactions and G2 math achievement at the 95% confidence limits level (see Table 2).

### **Tests of Moderation**

I computed Box's Ms to examine whether model relations differed by child's sex or by family SES (based on a median split). A non-significant Box's M result indicates that covariance/variances matrices are similar across groups, but a significant Box's M warrants follow-up tests to probe the possibility of moderation of paths. Results suggested that relations between variables were similar for girls and boys ( $F[190, 80145] = 1.06, p = .28$ ) and for families of different SES at K, G1, and G2 ( $Fs[190, 73804; 190, 78741; \text{and } 190, 84794] = 1.13, 1.15, \text{ and } 1.13, ps = .10, .08, \text{ and } .11$ ); however, because results for SES approached or met significance at  $p < .10$ , I conducted multiple groups analyses to test Chi-square differences for the possibility of moderation. With indicator loadings constrained across groups, I first constrained all model paths to be equal across groups, and then I permitted paths to freely vary. Several models with freed paths failed to converge or exhibited identification problems, which is not unexpected in models with smaller sample sizes and a high number of parameters. Therefore, I conducted a series of regressions in which I predicted each dependent variable in the model (or a composite term of both indicators for applicable latent factors) from an interaction term with K, G1, or G2 SES. None of the results from these follow-up tests were significant; thus, I did not obtain evidence that children's sex or family SES moderated the hypothesized models.

## Discussion

The critical importance of academic achievement to positive outcomes later in life (Fiscella & Kitzman, 2009) has prompted investigators to explore traits and skills associated with academic success, such as self-regulation, and whether these are susceptible to socialization (Eisenberg, Valiente, et al., 2010; Greenberg et al., 2003). In this study, I utilized three waves of longitudinal data, each one year apart with all constructs assessed at each time point, to test mediated relations between parents' reactions to their children's displays of negative emotions and reading or math achievement. I also examined the possibility for bidirectional relations between parents' reactions and EC or between EC and achievement. I offer new evidence that children's first-grade EC mediated relations between parents' positive reactions at kindergarten and second-grade math, but not reading, achievement. Bidirectional paths showed that parents' reactions were not predicted from EC, but kindergarten achievement predicted first-grade EC.

### Mediated Effects

Consistent with expectations for the primary aim of this study, G1 EC mediated relations between parents' positive reactions at K and math (but not reading) achievement at G2. Supportive parenting practices generally, and ERSBs specifically, have been linked to EC among older elementary- and middle-school students (e.g., Eisenberg et al., 1999; Valiente et al., 2006), and EC has been shown to predict school success across a growing literature (see Eisenberg, Valiente, et al., 2010); however, relations among these constructs have rarely been tested simultaneously in a longitudinal model. Findings from this study, among children in the first three years of elementary school, are an important extension of previous work. All constructs were assessed at each of three data waves, and models allowed for cross-lag predictions from parents' reactions to EC (and *vice versa*)

and from EC to achievement (and *vice versa*), according to recommendations set forth by Cole and Maxwell (2003) and MacKinnon (2008) for testing mediation longitudinally. This methodology permits tests of a specific directional mediation hypothesis and of directions of effects alternative to those hypothesized. The nonsignificant direct path from parents' reactions at K to achievement at G2 indicates that EC fully mediated the relation from reactions to math achievement across K-G2 years. Finally, the lack of significant relations from EC to reactions at both lags and from G1 math achievement to G2 EC offer strong support for the hypothesized direction of effects.

Findings from this study support the premise that, early in formal schooling, parental behavior involving emotionally supportive practices are associated with children's EC. ERSBs are expected to especially model the regulatory facet of EC related to emotion (Eisenberg, Cumberland, et al., 1998). Whereas previous work has often tested relations with parents' emotional expressivity, I included a lesser-studied ERSB expected to be important for the socialization of self-regulatory competence, parents' in-context reactions when children displayed negative emotions. Results from this study represent an important step forward in clarifying the nature of relations among these constructs and the stability of EC during this developmental period. Although a handful of studies have demonstrated links between positive parenting practices, such as sensitivity and low levels of corporal punishment, and EC into the first years of school (e.g., Eisenberg, Chang, et al., 2009), the majority of investigations have been among samples of parents and their toddlers and preschoolers, at the point when EC emerges (Rothbart et al., 2003; Spinrad et al., 2007).

In line with expectations, K reactions were positively associated with G1 EC in the math model, though G1 reactions were not related to G2 EC. This replicates some previous findings linking ERSBs to EC (Valiente et al., 2006). Zero-order correlations



demonstrated that, across time, parents' reactions and EC grew unrelated or were even negatively related on some indices. Parents' frequency of explicitly emotionally validating reactions may change as children age and require less self-regulatory guidance and modeling of emotion regulation. The lack of a significant positive link across time in both the zero-order correlations and in the SEMs suggests that efforts to promote children's developing EC should be in place at school entry and transition, when children are introduced to novel environments and tasks and the social influences of others. In support of this idea, much of the prior research linking parental behaviors to EC has been conducted with samples of toddlers and preschoolers (Kochanska et al., 2000; Li-Grining, 2007), perhaps because EC develops substantially during this period (Rothbart et al., 2003). The present study provides important evidence to suggest that parents' reactions when their children display negative emotions are one form of parental behaviors that foster EC into formal schooling years. Investigators can extend these findings by integrating varied parenting practices or comparing practices across caregivers to elucidate under what circumstances parents may promote EC.

Current findings replicate work that children's EC is associated with academic performance. EC has been significantly associated with reading or math (or both) among elementary-schoolers, controlling for previous achievement, in studies across the U.S. and China (Duncan et al., 2007; Liew et al., 2008; Valiente et al., 2010; Zhou et al., 2010). Indeed, correlational analyses in this study showed that EC was positively related to all measures of reading and math achievement concurrently and longitudinally at similar magnitudes, and EC predicted math achievement at both lags of the model. Learning-related skills including self-regulatory abilities have predicted reading and math scores between kindergarten and sixth grade and growth in reading and math between kindergarten and second grade (McClelland, Acock, & Morrison, 2006). A growing

literature has highlighted the contributions of executive functioning – self-regulatory cognitive control comprised of components related to EC, including attention shifting and inhibitory control (Liew, in press) – to emergent mathematics skills specifically (Andersson, 2008; Blair, Knipe, & Gamson, 2008; Espy et al., 2004; Vandervert, 2003). In neuroimaging studies conducted with adults, mathematical ability is related to activation of the prefrontal cortex (Dehaene, Molko, Cohen, & Wilson, 2004; Fullbright et al., 2000), the location of the neural network responsible for EC (Simonds, Kieras, Rueda, & Rothbart, 2007; Rothbart et al., 2004). Executive cognitive functions are expected to operate in conjunction with conceptual knowledge to uniquely influence problem-solving skills as children begin to learn math (Blair et al., 2008). Individuals are expected to employ similar regulatory skills when reading, including maintaining focused attention during a story to recall plot progression and inhibiting external distractions (Spinrad, Valiente, & Eisenberg, in press), so the incongruent pattern of current findings for reading versus math in the SEMs was unexpected. The autoregressive path coefficient magnitudes for reading were much larger than for math – especially between G1 and G2, which may indicate that the amount of explainable variance available for reading was substantially reduced, evidenced by the higher  $R^2$ s for reading. Some longitudinal evidence suggests that students' general trajectories regarding word knowledge and literacy are largely in place by the end of first grade (see Torgeson, 2002). Additional investigations which account for within-achievement construct consistency and explore reasons why EC and related self-regulation capacities may operate differently across academic domains are needed.

### **Directions of Effects**

A secondary aim of this study was to examine directionality of effects between parents' reactions and children's EC and between EC and achievement. Scholars have

increasingly focused efforts on analyzing the extent to which parent-child interactions are comprised of bidirectional processes (see Maccoby, 1992, for a review), and it is possible that individual differences in self-regulation influence how positively or negatively parents respond in context (see Bugental & Goodnow, 1998). Indeed, controlling for relations from parental behaviors to EC, there is some support for this premise from interactions between parents and toddlers (Eisenberg, Vidmar, et al., 2010) and parents and older children (Eisenberg et al., 1999).

Like the majority of investigations of links between parental behavior and EC (see Valiente & Eisenberg, 2006), there was no evidence in either model that EC predicted positive reactions one year later. Further, positive reactions and EC were not related in paths linking G1 and G2. Zero-order correlations supported the pattern of significant findings in the SEMs, suggesting that over time, positive reactions and EC grew unrelated. Perhaps in the three-year period under study here, children begin to take the self-regulation reins from their parents more often (Calkins, 2004), requiring (or utilizing) direct guidance and emotion-regulation modeling less and less when experiencing negative emotions. At school, parents' immediate emotionally supportive socialization in-context is usually not available. Children and parents may jointly perceive that children are increasingly responsible for enacting self-regulatory processes independently. Although this study did not indicate that early-elementary schoolers' EC predicted their parents' later positive reactions, the literature lacks a consistent pattern of relations between parental behavior and EC. It is possible that tests of relations between constructs with lags of one year or more provide a general idea of directionality, but dilutes the meaning of day-to-day and context-specific parent-child interactions. Shortening the window between assessments may offer insights regarding precisely when

and why parental behaviors foster EC versus when and why children's regulatory capacities elicit particular types of responding.

Mastery of early regulatory skills and achievement are theorized to be mutually reinforced (Blair et al., 2010), yet empirical tests of reciprocal relations are few and currently limited to older children (Ning & Downing, 2010; Poehlmann et al., 2010). Present findings show some evidence that early achievement predicted later EC at the first lag only. In both models, achievement at K significantly predicted G1 EC, and in the math model only, transactional relations were apparent between EC and math achievement at K and G1. In fact, math achievement at K predicted G1 EC, which in turn was positively associated with G2 math achievement. Blair and colleagues (2010) posited that the regulating self, an intentional agent (Bandura, 2001), influences the development of processes associated with achievement (e.g., memory, inhibitory control, content knowledge, motivation) as a function of feedback from the environment. Reciprocal relations between the self, the environment, and developmental functioning are thought to eventually reach a stable maintenance point. Variation across individuals on a particular functioning domain (e.g., self-regulation, achievement) results from the point at which past experiences constrain reciprocal relations to be stable, and this constraint affects future experiences and construct stability.

In the context of the present study, achievement in K predicted later EC, and K EC predicted G1 math, but achievement at G1 did not predict G2 EC. This may suggest that for this particular period and sample, the reciprocal relations between EC and achievement had reached a point of stability. At school entry, students are introduced simultaneously to learning opportunities regarding academic content and regarding the regulation of attention, behavior, and emotions in a novel environment with unfamiliar actors. As children begin to understand methods of mastering content-specific

schoolwork, such as addition calculations, they are likely to also better understand how to employ such EC skills as attending to the teacher, tuning out distractions, and controlling frustration while in the classroom. Empirical considerations of reciprocal relations between EC and academics are very few and rarely consist of tests of relations at the point of emergent literacy or mathematical skills. Alternative modeling techniques have the potential to more precisely detect reciprocal relations between these constructs. For example, one could test relations across time in models similar to those in this study, but excluding parenting behavior constructs, to further draw out some of the explainable variance. In addition, longitudinal growth models offer opportunities to extend tests from related work (McClelland et al., 2006) to explore whether growth in EC predicts achievement and to test whether growth in achievement predicts EC over the first years of schooling. Heightened attention to methods of testing reciprocal relations between social-emotional competence and academic functioning would benefit this line of research.

### **Study Limitations and Future Directions**

Results from this study extend previous work investigating relations of ERSBs to children's EC and of EC to achievement (Eisenberg et al., 1999; Rudasill et al., 2010) by testing associations in three-wave autoregressive panel models. To my knowledge, this study is the first to include comprehensive, longitudinal mediation models testing links between parenting, EC, and achievement while accounting for assessments of all constructs at each time point. The fact that cross-time prediction of constructs was obtained beyond the strong within-construct stabilities lends support to the premise that EC mediates relations between parents' reactions and math across time and makes the possibility for alternative arguments difficult. In addition, exploring relations among these constructs during this developmental period is novel and relevant, given the

expected importance of EC to general school success and of early achievement to positive academic trajectories. The inclusion of multiple reporters and strict analytical controls on the structural models reduced the likelihood that shared method variance accounted for relations. The fact that the pattern of findings did not change when the model was tested several ways according to varied clustering scenarios and with and without bidirectional relations demonstrates the findings are robust.

Despite strengths of this investigation's methodological design and statistical strategy, some facets of the study limit the impact of the findings. First, the sample was comprised of predominantly White, middle-class, educated families. Despite that relations among related constructs have been shown to be similar among more ethnically and culturally diverse samples (Swanson et al., in press; Valiente, Lemery-Chalfant, & Reiser, 2007; Zhou et al., 2004), the extent to which parents' reactions to children's displays of negative emotions influence children's EC is likely dependent upon the meaning parents attribute to the context and to responding, which is culturally influenced (Eisenberg, Cumberland, et al., 1998). Results from the present study may or may not generalize across groups. Next, only one index of parenting served for the parental behavior construct, and this represented only one ERSB. Future investigations would benefit from considering a combination of ERSBs or of parenting practices. It will be important to test whether other ERSBs and practices are related to EC in the same ways, particularly during this developmental period. Third, although reliable, valid, and well-established, measures of parents' reactions and EC constructs were questionnaire assessments only. Integrating multiple informational sources beyond reports, such as observational and behavioral assessments of parent-child interactions or of EC skills, would be a beneficial means of ensuring construct validity. Last, EC is partly heritable, though significantly environmentally influenced (Lemery-Chalfant et al., 2008). Genetic

links between parents and children likely account for a portion of the relations between positive reactions and EC. Examining relations while accounting for genetic influence could firm up conclusions regarding parents' socialization of EC.

In summary, results from this study offer important novel empirical evidence regarding the nature of relations between parental behavior, self-regulation, and achievement in the first years of formal schooling. By fostering children's normatively developing EC in the years prior to and during kindergarten, parents may enhance academic performance in mathematics across early school years.

**Study 2: Predicting Second-grade Students' Externalizing Problem Behaviors and Academic Achievement from Teachers' Effortful Control, Teachers' Reactions to Students' Negative Emotions, and the Student-teacher Relationship**

Performance in the early years of school has implications for students' academic trajectories and later life outcomes (Fiscella & Kitzman, 2009; Lee, 2010). Early mastery of literacy, math skills, and social and regulatory competence prime children to gain the most from learning opportunities (Blair & Razza, 2007; Breslau et al., 2009; Hughes & Ensor, 2011). Conversely, children who fail to meet academic benchmarks and who demonstrate frequent externalizing behaviors in elementary school are likely to continue to underachieve and disrupt classroom processes as they progress through school (Breslau et al., 2009; Myers & Pianta, 2008; National Institute for Literacy, 2008).

Teachers' dispositional characteristics are expected to be related to their students' success in school (Brown, Jones, LaRusso, & Aber, 2010; Keogh, 2003). Developmental and educational scholars have called for increased investigation of how teachers' social-emotional functioning affects dynamics in the classroom and students' outcomes, to delineate why some teachers are especially effective when others are less so (Brown et al., 2010; Hanushek, 2009; La Paro et al., 2009; Sutton & Wheatley, 2003). Children's *EC*, temperament-based attentional, behavioral, and emotional self-regulation (Eisenberg et al., in press), appears to be important for achievement and relationships with teachers (Blair & Razza, 2007; Valiente et al., 2008). In addition, the limited work on adults' *EC* shows that parents' *EC* affects parent-child interactions (Valiente, Lemery-Chalfant, & Reiser, 2007), yet researchers have little considered the role of *teachers'* own self-regulation ability in classroom dynamics and students' developmental functioning (Raver et al., in press). I sought to empirically test recent theoretical propositions and to build on extant literature with an investigation of whether second-grade teachers' *EC* influences



their reactions to students' displays of negative emotions or the STR, which were expected to affect students' externalizing behaviors and achievement.

## **The Importance of Teachers' Self-regulation to Classroom Dynamics and Students'**

### **Academic Functioning**

Teachers matter to elementary school students' academic functioning (Blair et al., 2010). The positive effects of high-quality teachers persist from kindergarten through sixth grade for achievement in reading, mathematics, and science (Konstantopoulos & Chang, 2011) and for consistent decreases in externalizing behavior problems (Maldonado-Carreño & Votruba-Drzal, 2011). During early school years, students typically spend the majority of the school day with a single lead teacher, who is responsible for instruction across academic subjects. An understanding of characteristics intrinsic to these teachers which result in high-quality interactions and high performance is important for shaping professional development for teachers and interventions for academically at-risk students. Consequently, investigators have begun identifying social-emotional characteristics and beliefs of teachers as potential sources of influence in classroom dynamics, including emotional expression (La Paro et al., 2009; Sutton & Wheatley, 2003), affect (Moore, 1988; Pianta, La Paro, Payne, Cox, & Bradley, 2002), personality (Daugherty, Logan, Turner, & Compton, 2003; Fisher & Kent, 1998; Klusmann, Kunter, Trautwein, Ludtke, & Baumert, 2008; Novojenova & Sawilowsky, 1999; Teven, 2007), self-efficacy (Guo, Piasta, Justice, & Kaderavek, 2010), sense of responsibility for students' learning (Guskev, 1989), and adult-centered versus child-centered attitudes (Fang, 1996; Pajares, 1992; La Paro et al., 2009).

Only recently have investigators considered the importance of teachers' self-regulation to classroom dynamics and students' academic functioning. Optimally regulated teachers can inhibit the tendency to react with immediate, emotionally driven

behaviors in favor of supportive responses consistent with long-term classroom goals (Sutton & Wheatley, 2003). For example, third-grade teachers' emotional ability, including their ability to regulate their own emotions, significantly predicted the observed instructional support they provided students and their classroom management (Brown et al., 2010). In contrast, expressing high levels of anger or frustration in the classroom elevates conflict between teachers and their students (Sutton, 2004), whereas overly inhibited emotional expression is likely to curb the closeness of the STR (Sutton, 2005).

Raver and colleagues (in press) have posited that teachers' self-regulation proficiency may be particularly important for managing students' externalizing behaviors, which disrupt learning and teaching efforts in the classroom (Myers & Pianta, 2008). When teachers are called upon to respond to individual students' requests or behaviors in the moment, teachers' regulatory skills in conjunction with cognitive attributional biases shape their response behaviors, which can socialize appropriate self-regulation and compliance behaviors (Eisenberg, Cumberland, et al., 1998; Raver et al., in press). Dysregulated teachers, especially those experiencing high levels of work-related or personal stress (Dennis & Chen, 2007), are likely to have difficulty attending to the varied, complex details of the classroom and lesson goals. Often prone to higher levels of negative emotions and student-teacher conflict than better-regulated colleagues, these teachers are more easily distracted by classroom disruptions. As the teacher becomes mired in attending to a visitor or controlling the behavior of one or two students, a lack of supervision and reinforcement of the positive behaviors of others in the class leads to increased numbers of acting-out behaviors generally in the classroom, derailing the academic lesson (Raver et al.).

Persons high in EC can focus and shift their attention, maintain control over inappropriate emotions or behaviors, and take on and complete tasks proactively

(Rothbart & Bates, 2006). These types of skills are likely to be particularly important when teaching. A teacher must administer numerous interacting components, such as steering academic content, maximizing learning time, monitoring students' performance, and managing student-student and student-teacher interactions (Hall & Smith, 2006). In addition, teachers are estimated to make thousands of conscious decisions every day in their classrooms regarding planning, time-management, behavior management, and short- and long-term goals for students (Barth, 1986). When acting on these decisions, effective teachers engage EC skills to supervise classrooms, avoid conflict, and avoid burnout (Raver et al., in press). That is, the extent to which individual teachers are able to keep their own emotions and behavior in check during the school day is likely to influence how teachers interact with students. In turn, student-teacher interactions may affect how much students are invested in classroom learning processes and their subsequent academic functioning.

An index of teachers' reactions to students' displays of negative emotions at school and STR-quality were selected to assess teacher-child interactions in the present study. Teachers' EC is expected to especially affect how they respond in potentially stressful situations when students are already in a heightened state of emotional arousal (Eisenberg, Cumberland, et al., 1998). For example, teachers with high EC are likely to react calmly and in a manner that minimizes student-teacher conflict. These teachers maintain control over their own emotions and behaviors while validating the child's experience or expression of negative emotions or steering the child toward a solution. Poorly regulated teachers might be more likely to react harshly or in a manner that seeks to deter the hassle caused by the child's negative emotional display. The limited evidence available from studies of parents suggests that parents' EC was significantly related to the quality of their reactions to their children's negative emotions, and these, in turn, were

associated with children's externalizing problems (Cumberland-Li, Eisenberg, Champion, Gershoff, & Fabes, 2003; Valiente, Lemery-Chalfant, & Reiser, 2007). Whether teachers' EC may influence their interactions with children has not been tested.

### **Relating Student-teacher Interactions to Social and Academic Functioning**

Clarifying processes that contribute to student-teacher interaction quality is of value, because an impressive body of evidence illustrates that high-quality interactions between teachers and students are associated with social and academic adjustment in and out of the classroom. Teachers' supportive interactions with preschoolers were related to lower levels of parent-reported problem behaviors (Lambert, Abbott-Shim, & McCarty, 2002) and increased social competence (Brophy-Herb, Lee, Nievar, & Stollak, 2007; Curby, LoCasale-Crouch, et al., 2009), and teachers' sensitive responses were positively related to kindergartners' academic performance (Rimm-Kaufman et al., 2002). Likewise, students of emotionally supportive first-grade teachers showed significantly better social competence (NICHD Early Child Care Research Network, 2003b; Perry, Donohue, & Weinstein, 2007). In contrast, teachers' use of harsh, aggressive techniques to gain compliance has been significantly associated with students' externalizing behaviors across elementary school (Lewis, 2001; NICHD Early Child Care Research Network, 2003b).

Teachers' supportive interactions with students are also important for academic performance. Preschool teachers' supportiveness predicted reading skills across the school year (Guo et al., 2010) and into kindergarten (Curby, LoCasale-Crouch, et al., 2009). First-grade teachers' social-emotional support and instructional support were related to reading achievement (Cadima, Leal, & Burchinal, 2010; Curby, Rimm-Kaufman, & Ponitz, 2009), as well as math skills (Perry et al., 2007). Emotional support has also predicted students' academic performance in third grade (Elias & Haynes, 2008;

Rudasill et al., 2010) and later elementary grades (Buriel, 1983). Conversely, high levels of intrusiveness in interactions between toddlers and teachers were negatively related to cognitive skills (Klein & Feldman, 2007), and interactions characterized by criticism were negatively related to fourth- and fifth-graders' achievement (Buriel, 1983).

STRs characterized by support and trust are related to low frequencies of behavioral problems, and many recent investigations have tracked the effects of high-quality relationships across several academic years. For example, close STRs in first grade have predicted better social and psychological adjustment through third grade (Buyse, Verschueren, Verachtert, & Van Damme, 2009) to fifth grade (O'Connor, Dearing, & Collins, 2011). On the other hand, student-teacher-relationship conflict during the transition to school predicted faster increases in externalizing behaviors from kindergarten through third grade (Silver, Measelle, Armstrong, & Essex, 2005) and also increased the likelihood of having chronically high externalizing behavior through fifth grade (Baker, 2006; Maldonado-Carreño & Votruba-Drzal, 2011; Silver, Measelle, Armstrong, & Essex, 2010).

Though some relations are mixed or null in a handful of cases (Cadima et al., 2010; Elias & Haynes, 2008; Iruka, Burchinal, & Cai, 2010; Shin, Lee, & Kim, 2009; Trentacosta & Izard, 2007), findings across literatures support the premise that close relationships with teachers are also positively related to students' achievement. As students progress through school, evidence suggests that STR-quality is important for academic competence in kindergarten (Graziano, Reavis, Keane, & Calkins, 2007), first-grade (Hamre & Pianta, 2005; Hughes, Gleason, & Zhang, 2005; Liew, Chen, & Hughes, 2010), and second-grade (Topor, Keane, Shelton, & Calkins, 2010), as well as upper elementary school and middle school (DiLalla, Marcus, & Wright-Phillips, 2004; Lewis, Romi, Katz, & Qui, 2008; Swanson et al., in press; Valiente et al., 2008), often beyond

the effects of such controls as IQ, demographics, or previous assessments. Students whose relationships with teachers are close and supportive may feel more connected to school, refraining from disruptive behaviors in favor of capitalizing on learning opportunities. The present study offers an investigation into processes associated with why some teachers consistently interact positively and maintain highly fruitful relationships with their students, when others do not.

### **The Potential for Students' Differential Susceptibility to Teachers' Influence**

It is possible that the influence of teachers' EC and student-teacher interactions may be especially important for some students' academic functioning but less important for others'. Belsky and colleagues (2007) commented that researchers have traditionally tested whether socialization effects apply to all children concerned, failing to examine the potential for interactions with children's individual characteristics, such as facets of temperament. According to the differential susceptibility hypothesis (Belsky, 1997; Belsky, Bakermans-Kranenburg, & van IJzendoorn, 2007), children vary in whether and how much they are susceptible to environmental influences, and particularly socialization, as a function of intrinsic characteristics. Unique to this perspective is the proposition that those children most likely to be adversely affected by aspects of an unsupportive environment are also most likely to benefit from supportive environments (Ellis et al., 2011).

With respect to this study, individual students in a given elementary-school classroom may be differentially susceptible to the influence of a teacher's high levels of (dys)regulation or proneness to positive or negative interactions with students. For example, children who arrive to the classroom unequipped with assets expected to be critical to school performance, such as high levels of their own regulatory or social skills, may benefit from positive classroom dynamics more than less vulnerable – or less

susceptible – peers (see, for example, Pluess & Belsky, 2009). Limited evidence from randomized trials conducted with families and in disadvantaged early childhood classrooms offers support for this idea (Blair, 2002a; Tominey & McClelland, 2011). Alternatively, children’s individual self-regulatory or social competencies may buffer detrimental effects of a dysregulated teacher or conflictual student-teacher interactions. A growing literature demonstrates that children’s own EC is significantly associated with academic relationships and performance across groups and classrooms (e.g., Valiente et al., 2008). Similarly, positive relationships with peers are expected to promote interpersonal and school success, because supportive acquaintances and friendships may increasingly expose students to learning resources (Ladd, 2003). Separate from the teacher’s influence, then, there is evidence that EC and social competence are important for school success.

### **The Present Study**

Relative to examinations of students’ intrinsic characteristics, researchers have rarely considered characteristics that may influence *teachers’* contribution to student-teacher interactions, such as teachers’ EC. Further, process models testing classroom-specific mediators between teachers’ characteristics and students’ adjustment are rare. The purpose of this study was to examine two potential paths linking teachers’ EC to students’ externalizing problems or achievement: (a) mediated through teachers’ reactions to children’s displays of negative emotions or (b) mediated through the STR. I expected teachers’ EC to be positively related to their positive reactions and to the STR and negatively related to their negative reactions. In turn, I expected positive reactions and the STR to be negatively associated with externalizing problems and positively associated with achievement. The reversed pattern was expected for negative reactions. Finally, to begin to address potential differential effects of teachers’ EC and student-

teacher interactions on students' academic functioning, as a function of children's differential competencies, I tested whether children's own EC or social competence moderated the hypothesized mediated paths.

Demographic characteristics of students and teachers influence classroom dynamics and students' academic performance. Across developmental periods, caregivers report that boys are higher in externalizing problems than girls (Crijnen, Achenbach, & Verhulst, 1997), and girls typically score higher than boys across academic subjects in early grades (for a review, see Halpern & LaMay, 2000), but this is not always the case (Spelke & Grace, 2007). In addition, in coeducational classrooms teachers generally attend more to boys (Beaman, Wheldall, & Kemp, 2006) and report lower-quality relationships with boys (Jerome, Hamre, & Pianta, 2009) than girls. A broad literature demonstrates that family income and parents' education are associated with the overall classroom environment and to individual achievement (Davis-Kean, 2005; NICHD Early Child Care Research Network, 2005). Finally, significant associations are most consistent between teachers' years of teaching experience and students' reading and math outcomes (Clotfelter, Ladd, & Vigdor, 2007; Croninger, Rice, Rathbun, & Nishio, 2007; Rockoff, 2004), over teacher training or credentials. Thus, in all hypothesis tests, I controlled for children's sex and family SES, as well as teachers' years of experience. When predicting achievement, I also included an index of students' cognitive/linguistic maturity, to test whether relations exist when controlling for verbal ability.

## **Method**

### **Participants**

We recruited 291 kindergartners (42% girls) and their parents from regular education kindergarten classrooms in public southwestern U.S. schools in a large metropolitan city as part of a larger longitudinal study of early academic competence. Primary construct



data for the present cross-sectional study were assessed when children were in second grade ( $M$  age in fall of second grade = 7.66 years;  $SD$  = .39 year). All parents and the 116 second-grade teachers (97% women) provided consent and children provided assent. Parents' reports of children's sex and race or ethnicity showed that the sample represented the sex and racial population of the school classrooms from which participants were recruited: Forty percent of all eligible kindergartners were girls, and 75% of participants were White (kindergarten classroom population percentages are in parentheses; 70%), 14% (17%) were Latino/a, 8% (8%) were Asian American, 3% (4%) were Black, and less than 1% (2%) were American Indian.

Second-graders resided in predominantly two-parent homes (89%) of middle- to upper-middle income ( $M$  annual family income range = \$80,000 to \$90,000; parent-reported annual family income across sample ranged from below \$10,000 to above \$100,000). The primary caregiver was the child's mother (90%). The majority of caregivers (i.e., 96% of primary caregivers and 92% of secondary caregivers) had attained a two-year college degree or higher, but parental educational attainment ranged from less than a high school diploma (less than 2% of the sample) to graduate school attendance (14% of the sample). Census values for the county from which participants were sampled show that this sample was more affluent and educated than the surrounding county at large, but ethnicity values were similar: Median household income = \$53,284; Percentage of White persons = 73%; Percentage of high school graduates aged 25+ = 84%.

The majority of second-grade teachers had attained a Master's degree (66%), but teachers' reported educational attainment ranged from a Bachelor's degree (20%) to a doctoral degree (less than 1%). On average, teachers were in their twelfth years of teaching ( $M$  = 11.84 years,  $SD$  = 7.07 years), but teaching experience ranged from the

first year (5%) to more than 20 years (22%). Second-grade classrooms were comprised of about 22 students ( $M = 22.45$  students,  $SD = 2.32$  students), comprised of about 12 boys and 11 girls ( $M_s = 11.74$  boys and 10.68 girls,  $SD_s = 1.95$  boys and 2.27 girls).

Classrooms ranged from 18 students (4% of classrooms) to 32 students (less than 1%), with 3 boys (less than 1%) to 16 boys (2%), and with 5 girls (2%) to 17 girls (less than 1%).

### **Procedure**

Families were recruited at the start of the kindergarten year. Researchers collected data from families and teachers during each academic year through the completion of second grade. Seventy-four percent ( $n = 213$ ) of parents who consented for their own and their children's participation at recruitment submitted questionnaires during fall of second grade. Parents' questionnaires assessed primary and secondary caregivers' education; annual household income; and children's sex, EC, social competence, and externalizing problems. Data were obtained from second-grade teachers for 93% ( $n = 269$ ) of participating children during fall of second grade. Second-grade teachers ( $N = 116$ ; teachers reported on an average of three children per classroom) reported on their EC; their reactions to children's negative emotions; the STR; and children's EC, social competence, and externalizing problems. Children worked with research assistants (a) to complete tasks that assessed verbal ability (fall of kindergarten), (b) to report on the STR (fall of second grade), and (c) to complete standardized achievement tests (spring of second grade). Across these assessments, complete data were available for 100%, 93%, and 92% ( $n_s = 289, 269, \text{ and } 267$ ) of participating second-graders, respectively. As a token of appreciation for participating, parents and teachers received a modest monetary compensation and children received a small toy at each assessment.

## Measures

**Family demographics.** Parents reported their highest educational attainment, as well as annual household income range. These were significantly correlated ( $r_s > .29, p < .01$ ), so I created a mean composite of the standardized  $z$ -scores of these variables as an index of SES. Parents also reported child's sex and birthdate.

**Years of teaching experience.** Teachers reported years of teaching experience with the item "Including this current school year, how many years have you been teaching?" from 1 = *first year* to 21 = *more than 20 years*.

**Verbal ability.** In fall of kindergarten, children completed the Peabody Picture Vocabulary Test – Revised (PPVT-R; Dunn & Dunn, 1981) as an index of receptive vocabulary, a component of verbal intelligence and an estimate of verbal ability. The PPVT-R is comprised of 175 single plates, each with four pictures, and difficulty increases with each plate. Children state or point to a given image requested by a research assistant depicting a given vocabulary word (e.g., *painting*). All children in this sample successfully indicated verbally or physically the number corresponding to their response (e.g., "2"). Respondents to the PPVT-R can range from 2.5 years old to adulthood; scores demonstrate high internal consistency, sufficient test-retest reliability, and adequate criterion-related validity (Williams & Wang, 1997).

**Effortful control.** Teachers reported on their own EC using 19 items from the activation control (e.g., "If I think of something that needs to be done, I usually get right to work on it"; seven items), attention shifting (e.g., "When interrupted or distracted, I usually can easily shift my attention back to whatever I was doing before"; five items), and inhibitory control (e.g., "I can easily resist talking out of turn, even when I'm excited and want to express an idea"; seven items) scales from the Adult Temperament Questionnaire (ATQ; Derryberry & Rothbart, 1988) on a 7-point Likert scale from 1 =

*extremely untrue of you* to 7 = *extremely true of you* (see Appendix B for reported measures used in Study 2). The authors of the scale have reported that scores from this scale demonstrate convergent validity and test-retest reliability. Scale composite scores were significantly correlated ( $r_s > .33, p_s < .01$ ), so I created a mean composite of *teacher's effortful control* ( $\alpha = .74$ ).

Children's EC was assessed with parents' and teachers' reports on all items from the attention focusing (e.g., "This child, when picking up toys or doing other jobs, usually keeps at the task until it's done") and inhibitory control (e.g., "This child can wait before entering into new activities if she or he is asked to") scales of the Children's Behavior Questionnaire (CBQ; Rothbart et al., 2001) on a 7-point, Likert scale from 1 = *extremely false* to 7 = *extremely true*. As with previous reports of the CBQ (Eisenberg, Valiente, et al., 2009; Morris et al., 2002) and because scale mean composite scores were significantly correlated (across-scale, within-reporter  $r_s > .56$  and  $.80, p_s < .01$ , for parents and teachers, respectively), I created mean composites as indices of parent-reported and teacher-reported EC ( $\alpha_s = .86$  and  $.94$  for parents and teachers, respectively). These were significantly correlated ( $r[206] = .38, p < .01$ ), so I created a single mean composite of *children's effortful control* to reduce the number of moderated mediation analyses.

**Teachers' reactions to children's negative emotions.** Teachers reported their likely reactions during 11 typical situations that young children might experience at school that evoke distress and negative affect with the Coping with Children's Negative Emotions Scale (CCNES; Fabes et al., 1990; Fabes et al., 2002). Using the CCNES, adults rate the nature of their reactions during circumstances in which children have displayed negative emotions, such as trembling and becoming fearful when classmates call the child names. Teachers reported the likelihood of their emotion-focused (e.g., "I would encourage the

child to talk about his/her fears”; nine items), expressive-encouragement (e.g., “I would tell him/her it’s okay to cry when you feel unhappy”; nine items), minimization (e.g., “I would tell the child not to make a big deal of it”; nine items), problem-focused (e.g., “I would talk to the child about ways to make it hurt less”; eight items), and punitive (e.g., “I would tell him/her to shape up or he/she won’t be allowed to do something he/she likes to do”; nine items) reactions. Subscale  $\alpha$ s averaged .69. Respondents rated items on a 7-point Likert scale (1 = *very unlikely* to 7 = *very likely*).

I computed principal components analyses of the CCNES subscale mean composites; two components had an initial eigen value greater than one, and these accounted for 67% of the variance among composites, respectively. Consistent with previous research conducted with the CCNES (e.g., Valiente, Lemery-Chalfant, & Reiser, 2007), with all five reactions composites entered into the principal components analysis, emotion-focused, expressive-encouragement, and problem-focused reactions loaded on the first component (loadings = .67, .81, and .77, respectively), *positive reactions* ( $\alpha = .86$ ). Minimization and punitive reactions loaded on the second component (loadings = .89 and .83, respectively), *negative reactions* ( $\alpha = .73$ ). There were no cross-loadings greater than .19. I created mean composites of positive or negative reactions from the scale scores comprising each component.

**Student-teacher relationship.** Teachers used 15 items from the Student-Teacher Relationship Scale (Hamre & Pianta, 2001; 1 = *definitely does not apply* to 5 = *definitely applies*) to report on the closeness (e.g., “I have a warm, caring relationship with this child”) or conflict (e.g., “This child and I always seem to be struggling with each other”) of their relationships with students. Closeness and conflict scores were significantly negatively correlated ( $r[275] = -.35, p < .01$ ). I reverse-coded the conflict scores and created a mean composite of *teacher-reported student-teacher relationship* ( $\alpha = .88$ ),

such that higher scores represented closer (i.e., higher-quality) STRs. Children rated the closeness of the STR with 18 items using an age-appropriate version of this measure (e.g., “Does your teacher make you feel better if you’re having a bad day?”) on a 3-point scale (1 = *no* to 3 = *a lot of the time*;  $\alpha = .87$ ). The average of the items served as an index of *child-reported student-teacher relationship*. Scores from this measure correlate in the expected directions with later academic performance, attitudes, and classroom involvement, supporting the convergent validity of scores from this scale (Birch & Ladd, 1997).

**Social competence.** Parents and teachers reported on students’ social competence using the Perceived Competence Scale for Children developed by Harter (1982), as modified by Eisenberg and colleagues (1997; 2000). *Popularity* (three items; e.g., “This child has a lot of friends”;  $\alpha$ s = .84 and .92 for parents and teachers, respectively) and *socially appropriate behavior* (four items; e.g., “This child is really well-behaved”;  $\alpha$ s = .67 and .83) were rated on a scale of 1 = *really false* to 4 = *really true*. Scale scores were significantly positively related,  $r$ s(211 and 275) = .45 and .58,  $p$ s < .01, and averaged into composites of parent-reported and teacher-reported social competence. To reduce the number of moderated mediation analyses, I created a single mean composite of *children’s social competence* ( $r$ [206] = .44,  $p$  < .01).

**Externalizing problems.** Using the MacArthur Health and Behavior Questionnaire (HBQ; Armstrong, Goldstein, & The MacArthur Working Group on Outcome Assessment, 2003), parents and teachers rated children’s externalizing behavior problems with the defiance (e.g., “This child has argues a lot with adults”; nine items), conduct problems (e.g., “This child steals; takes things that don’t belong to him/her”; 12 items for parents and 11 items for teachers), hostility (e.g., “This child kicks, bites, or hits other children”; four items), and aggression (e.g., “This child verbally threatens to keep a peer

out of the play group if the peer doesn't do what he/she wants"; six items) scales. Items were rated on a 3-point Likert-type scale (1 = *never or not true* to 3 = *often or very true*). I created mean composites of *parent-reported* and *teacher-reported externalizing problems* from scale mean composite scores within reporter ( $r_s > .50$  and  $.53$ ,  $p_s < .01$ ;  $\alpha_s = .92$  and  $.93$  for parents and teachers, respectively).

**Academic achievement.** Children completed three subtests from the Woodcock-Johnson III Tests of Achievement (WJ-III; Woodcock et al., 2000): *Letter-Word Identification*, a measure of pre-reading language skills to identify letters and sight words; and *Passage Comprehension*, which assesses language comprehension and reading skills, including the ability to supply missing keywords that make semantic and contextual sense in a written passage; and *Applied Problems*, which assesses analytical and practical mathematical problem-solving skills. Respondents to the WJ-III test of intellectual ability may range in age from 2 to 90 years, and the test provides a normative score for comparison of a respondent's score against the national average for that respondent's age. Scoring procedures require that researchers administer each WJ-III subtest until the respondent has failed to answer a predetermined number of items correctly. In total, administration of all three subtests for students in this sample lasted 40 minutes, on average. With WJ-III computerized scoring technology, children's raw scores for each test (i.e., the sum of correct answers within a given subtest) are converted to standardized scores or *W* scores, interval-scaled measures of ability unique to the Woodcock-Johnson tests, which are similar to standardized scores. Scores reported in this study are *W* scores.

### **Analytic Strategy**

Prior to hypothesis testing, I conducted a series of multivariate analyses of variance (MANOVAs) to test for sex differences. Next, I conducted zero-order correlation

analyses among the demographic and study variables. I conducted mixed-model regressions, which take into account the clustered structure of the data (i.e., teachers clustered within schools) to test a series of models: (a) predicting teachers' reactions or the STR from teachers' EC, (b) predicting externalizing problems or achievement from teachers' reactions or the STR, (c) predicting externalizing problems or achievement from teachers' EC and teachers' reactions, and (d) predicting externalizing problems or achievement from teachers' EC and the STR. In all models I included controls for children's sex and SES and teachers' years of experience. In models predicting achievement outcomes, I also controlled for verbal ability.

To formally test whether teachers' reactions (or the STR) mediate the relations between teachers' EC and children's adjustment, I obtained confidence intervals for the indirect effect via the statistical program PRODCLIN (distribution of the PRODUCT Confidence Limits for INdirect effects; MacKinnon et al., 2007). Confidence intervals provide a range of possible values for the mediated effect and demonstrate the variability of the effect size (MacKinnon, 2008). When confidence intervals do not contain zero, one can reject the null hypothesis of no indirect effect. This method, compared to normal theory tests of mediation, reduces Type I error, increases statistical power, and produces more accurate confidence limits (MacKinnon et al., 2004).

To explore potential differential effects on students' academics, I tested whether children's EC or social competence moderated the hypothesized mediated paths, using MacKinnon's (2008) specifications for moderated mediation with continuous moderators. These tests extend single mediator models by including terms for the moderator variable (e.g., children's EC) and its interactions with both the predictor and putative mediator in the mediation model regression. Results indicate whether path coefficients differ across



values of the moderator and are algebraically equivalent to models estimated separately by groups.

## Results

### Preliminary and Zero-order Correlation Analyses

I computed separate MANOVAs to examine sex differences among the teacher-reported or achievement measures, and I conducted *t*-tests for sex differences on verbal ability, children's reports of the STR, children's EC or social competence, and parents' reports of externalizing problems. There were no significant multivariate effects (Hotelling's *T*) for teacher-reported measures ( $F[6, 262] = .18, p = .98$ ) or achievement measures ( $F[2, 264] = .18, p = .84$ ), and girls and boys did not significantly differ on verbal ability, child-reported STR, EC, social competence, or parent-reported externalizing problems (*ts* averaged  $-.14, ps \geq .44$ ). Children's age was significantly positively associated with verbal ability and teachers' negative reactions ( $rs[286 \text{ and } 267] = .19 \text{ and } .12, ps < .05$ ).

Table 3 contains means, standard deviations, and zero-order correlations for the demographic and study variables. When mediation is present, the predictor must be significantly related to the mediator (the *a* path), and the mediator must be significantly related to the outcome with the predictor in the model (the *b* path; MacKinnon et al., 2002). In line with these specifications, teachers' EC was positively related to both their positive reactions and to teachers' reports of the STR, but not to child-reported STR. Teachers' EC was negatively related to teachers' negative reactions, as well as to externalizing problems across reporters. In turn, negative reactions were positively related to teacher-reported externalizing problems and negatively related to math achievement. Teacher-reported (but in most cases, not child-reported) STR was

negatively associated with externalizing problems and positively associated with achievement measures.

### **Mixed Model Regression Analyses**

Data that are not independent (e.g., data derived from several teachers within a single school, a *cluster*) may demonstrate substantial *intracluster correlations* (ICCs). ICCs reflect the expected correlations of scores between two individuals within a cluster and offer inference regarding the proportion of variance that is attributable to cluster membership. Failure to account for cluster effects may result in biased standard errors and significance tests, because findings partly reflect cluster differences instead of specific individual differences. According to Hox (2002), .05, .10, and .15 are small, medium, and large ICC values, respectively, and ICCs of at least .10 can bias results. Because several ICCs in the present study ranged from moderate to large ( $M = .07$ ), analyses that account for cluster effects are necessary. Teachers were clustered within schools; thus, I conducted all hypotheses tests with mixed model regressions in PASW Statistics 18, Release Version 18.0.0 (© SPSS, Inc., 2009, Chicago, IL, [www.spss.com](http://www.spss.com)), treating *second-grade school* as a random effect.

**Tests of mediation.** I first tested whether teachers' EC significantly predicted either teachers' reactions or the STR. Table 4 shows that, controlling for the effects of children's sex and SES and teachers' years of teaching experience, teachers' EC was positively associated with their positive reactions and their (but not children's) reports of the STR. Teachers' EC was significantly negatively related to their negative reactions.

Next, I examined whether teachers' reactions or the STR predicted adjustment outcomes beyond the effects of covariates and teachers' EC (see Tables 5 and 6). Analyses predicting achievement outcomes also included controls for children's verbal ability. Teachers' reactions were not significant predictors of externalizing problem

behaviors, but negative reactions were negatively related to math achievement with teachers' EC in the model. Also accounting for the effects of teachers' EC, teachers' reports of the STR were significantly negatively associated with externalizing problems across reporters and significantly positively associated with reading and math achievement. Child-reported STR was negatively related to teacher-reported externalizing problems.

Finally, I obtained confidence intervals from PRODCLIN as a formal test for the presence of mediated effects. Results indicated that teachers' negative reactions mediated the relation between teachers' EC and math achievement because the 95% confidence limits did not include the value zero (see Table 7). In addition, teacher-reported STR mediated the relations between teachers' EC and externalizing problem behaviors (teacher- or parent-reported) and between teachers' EC and reading or math achievement.

**Tests of moderated mediation.** To test whether children's EC or social competence moderated hypothesized mediated pathways, I conducted mixed model regression analyses for each possible *a* or *b* path (MacKinnon, 2008). When conducting these tests, I grand-mean-centered predictors and plotted simple slopes according to Aiken and West's (1991) guidelines. Children's EC did not significantly interact with teachers' EC to predict mediators (i.e., moderation of the *a* path):  $B_s = .06, .04, -.09, \text{ and } -.06, p_s \geq .13$ , predicting positive reactions, negative reactions, teacher-reported STR, or child-reported STR, respectively. Likewise, children's social competence did not moderate the *a* path to predict any mediator:  $B_s = .01, .02, .02, \text{ and } .01, p_s \geq .58$ .

Children's EC significantly moderated 3 of 16 possible tests of *b*-path moderation (see Table 8). First, EC moderated relations between STR (teacher- and child-reported) and teacher-reported externalizing problems, accounting for the effects of teachers' EC. Teacher-reported STR-quality was negatively related to teachers' reports of externalizing

problems only for students not high in EC (see Figure 3, Panel A). Similarly, child-reported STR-quality was negatively associated with teacher-reported externalizing problems, but only for students low in EC (Figure 4, Panel A). Finally, significant interactions were apparent between children's EC and teachers' negative reactions on math achievement scores, beyond the effects of teachers' EC: Teachers' negative reactions were negatively related to math achievement, but only for students with low or medium EC (Figure 5, Panel A).

Children's social competence also moderated 3 of 16 possible tests of *b*-path moderation (see Table 9). For students of all levels of social competence, high teacher-reported STR-quality was negatively related to teacher-reported externalizing problems; however, relations were strongest for students lower in social competence (see Figure 3, Panel B). Children's reports of STR-quality were negatively associated with teachers' reports of externalizing problems only for students low in social competence (Figure 4, Panel B). Last, for students low in social competence only, child-reported STR-quality was negatively related to reading achievement scores (Figure 5, Panel B).

**Alpha correction procedure.** This study is comprised of multiple unique regression analyses, including 4 tests of the *a* path of mediation, 16 tests of the *b* path of mediation, tests of moderation for the 20 mediation paths by children's EC, and tests of moderation for the 20 mediation paths by children's social competence. Because analyzing a great number of independent models increases the chance of Type I error, I implemented a false discovery rate (FDR) post-hoc alpha correction procedure (Benjamini & Hochberg, 1995) as a guard against inflated Type I error rate. I applied the procedure separately for tests of mediation versus for moderated mediation because variables included in the tests differed by strategy. The FDR method controls the expected proportion of incorrectly rejected null hypotheses in a list of rejected hypotheses, and it is considered more

powerful than the Bonferroni or Holm familywise-error methods for multiple tests, particularly as the number of tests increases (Lix & Sajobi, 2010; Shaffer, 1995). Upon implementing the FDR method, the  $p$ -values for relations between negative reactions and math achievement and between teacher-reported STR and reading achievement changed from .02 and .04 to .06 and .08, respectively (see Table 6). In addition, the  $p$ -values for several reported significant interactions changed to  $p > .10$  with implementation of the procedure (see Tables 8 and 9).

### **Discussion**

The purpose of this study was to investigate relations between teachers' EC, teachers' reactions to their students' displays of negative emotions, the STR, and students' social and academic adjustment. Despite a growing literature base to support the premise that students' own EC is crucial for classroom behavioral functioning and achievement, empirical tests of the effects of teachers' EC on classroom dynamics are rare. Findings from this study demonstrate that second-grade teachers' EC is related to their interactions with students. I offer novel evidence that teachers' negative reactions mediated relations between teachers' EC and students' math achievement scores. In addition, teachers' reports of the STR mediated relations between teachers' EC and externalizing problems or reading or math achievement. Finally, in moderated mediation tests, relations between student-teacher interactions and adjustment were especially important for students lower in EC or social competence than their better-regulated peers.

#### **Considering the Role of Teachers' Effortful Control in Classroom Dynamics**

Identifying intrinsic characteristics that can explain variability in teachers' effectiveness to influence positive academic functioning is a research undertaking of relevance across disciplines (Hanushek, 2009; Nye, Konstantopoulos, & Hedges, 2004). Recently, investigators have begun considering the importance of teachers' self-

regulatory competence to how they engage with students, which is expected to affect academic success (Konstantopoulos & Chang, 2011). Teachers' emotion-related regulation, in particular, is related to responsive behaviors and to instruction quality (Brown et al., 2010; Sutton & Wheatley, 2003). Raver et al. (in press) have posited that well-regulated teachers are likely to keep classroom operations running smoothly because they are able to attend to behavioral and instructional management issues, regardless of distractions or interruptions. These teachers are likely better able to oversee the complexities of a classroom, including management of content, instruction, and social interactions involving students, than teachers low in EC (Hall & Smith, 2006).

Findings from this study showed that teachers' EC significantly predicted their positive and negative reactions when students displayed negative emotions, as well as their own reports of the STR, accounting for the effects of students' sex and SES and teachers' years of teaching experience. This is in line with few tests of relations between parents' EC and reactions to displays of their children's negative emotions (Cumberland-Li et al., 2003; Valiente, Lemery-Chalfant, & Reiser, 2007). Teachers' EC is likely to affect the extent to which they can respond calmly to students' needs while keeping the level of overall classroom chaos low and learning objectives for the school day on track (Raver et al., in press). This may be particularly evident in situations when students display negative emotions, such as anxiety or frustration. In contrast, teachers with poorer regulation may be overwhelmed by the complexities of the classroom, causing them to react negatively or elevate student-teacher conflict, undermining the quality of the STR (Sutton, 2004).

Teachers' negative reactions mediated relations between teachers' EC and math, but not reading, achievement. This finding supports some evidence from a longitudinal randomized trial that there are larger effects of teachers' influence on math than on

reading achievement (Nye et al., 2004). Teachers' beliefs about the nature of math, in particular, and about what factors influence success in mathematics have been shown to be linked to their teaching practices and students' math efficacy (Carter & Norwood, 1997; Stipek, Givvin, Salmon, & MacGyvers, 2001). In contrast, positive reactions were unrelated to achievement. Motivation theorists have posited that negative socialization behaviors diminish children's sense of discovery and individual responsibility, which is expected to inhibit motivation to learn and excel (Grolnick, 2003; Gurland & Grolnick, 2005). Indeed, in few tests during primary grades, highly controlling parenting practices have been associated with lower achievement in the kindergarten through second-grade years (Chen et al., 1997; Gadeyne et al., 2004). Students may more internalize teachers' negative reactions in situations when they are vulnerable than teachers' efforts to respond supportively; in turn, students may increasingly disassociate with the school environment and with strivings to perform well. This pattern is likely to be exacerbated when a teacher's behaviors are characterized by dysregulation.

The finding that teachers' reactions did not mediate links between teachers' EC and students' externalizing problems fails to replicate mediation tests of the influence of parents' EC (Cumberland-Li et al., 2003; Valiente, Lemery-Chalfant, & Reiser, 2007). An important distinction between this study and previous work conducted with parents is that in the context of parenting, parents are typically responding to only a single child's (or perhaps simultaneously to only a few children's) negative emotional displays. Conversely, teachers likely respond to a distressed student's negative emotions while simultaneously overseeing classroom-level behavioral management and instruction. In this way, the socializational patterns of positive or negative reactions are perhaps more dependent on the environmental context for teachers than for parents, so the pattern and frequency of relations with problem behaviors differ by socializer and contextual

constraints. A next step to propel this research is to integrate context, by considering the composition of students in the classroom. Classroom compositions comprised of high average levels of problem behaviors have been associated with increased risk of conflict in individual student-teacher interactions (Buyse, Verhueren, Doumen, Van Damme, & Maes, 2008). The compositional constellation of students' competencies is likely to influence how, whether, and when teachers choose to employ particular response strategies. Related to this idea is the possibility that a select few students are the target of teachers' particularly negative (or positive) behaviors, resulting in a generally negative classroom climate but with negativity specifically directed at only a handful of pupils. The diversity of classroom compositions must be considered in future work.

Consistent with a growing literature indicative of the positive influence of a STR characterized by closeness and minimal conflict, results predominantly support the hypothesis that the STR is associated with students' adjustment outcomes. Teachers' reports of the relationship were consistently related to externalizing problems across reporters, as well as to reading and math achievement, though relations with reading were weaker than with math. Teacher-reported STR mediated the relation between teachers' EC and students' adjustment. Across primary grades, STR closeness has predicted social adjustment and achievement (Buyse et al., 2009; Hamre & Pianta, 2005; Silver et al., 2010). Students with supportive teachers may be less likely to engage in externalizing behaviors because they desire to comply with behavioral requests, in order to please an authority figure whose company and esteem they value. In contrast, a STR characterized by cycles of conflict may stir feelings of helplessness, frustration, or apathy toward school, resulting in a student's tendency to act out. These students are also likely to receive minimally helpful feedback and instruction compared to peers (Birch & Ladd, 1997). Students who enjoy interacting with their teachers may feel a stronger sense of



belonging in the classroom and subsequently engage themselves in learning activities, improving their eventual academic performance. In fact, academic engagement and motivation have been shown to mediate relations between high-quality student-teacher interactions and achievement across samples and grades (e.g., Hughes & Kwok, 2007; Hughes, Kwok, & Lloyd, 2008; Ponitz et al., 2009; Skinner & Belmont, 1993). An important future extension for this line of research is to examine whether teachers' self-regulation is indirectly linked to academic success via students' emotional investment and behavioral engagement in school.

Guided by Raver et al.'s (in press) theoretical framework regarding process models of teachers' indirect influence on externalizing problems in particular, the direction of effects presented here assumed student-teacher interactions would predict externalizing problems. Importantly, bidirectional relations are also apparent: Problem behaviors have been related to poorer-quality relationships between students and teachers across the early grades (Birch & Ladd, 1998; Ladd et al., 1999; Ladd & Burgess, 1999).

Researchers have begun exploring whether these constructs may be reciprocally related (Sutherland & Oswald, 2005). Among kindergartners, aggressive behavioral tendencies at school entry predicted elevated student-teacher conflict at the middle of the school year, which predicted increased aggressive behavior at the end of the year (Doumen, Verschueren, Buyse, Germeijs, & Luyckx, 2008). Longitudinal tests of present findings can shed light on the direction of effects between student-teacher interactions and students' social adjustment, beyond the influence of teachers' EC.

### **Moderated Mediation Effects: Students' Potential Differential Susceptibility to Teachers' Influence**

Findings from the present study suggest students may be differentially susceptible to in the influences of their elementary school teachers, according to students' own

regulatory and social competence. Children vary in terms of whether and how much they are susceptible to environmental influences as a function of individualized characteristics, such as temperament (Belsky et al., 2007). Moreover, vulnerable children most likely to be adversely affected by negative environments are those most likely to benefit from positive ones (Ellis et al., 2011). Nonetheless, researchers have only begun to consider the potential for children's differential susceptibility to socialization of non-parent caregivers (Pluess & Belsky, 2009, 2010).

Although students' EC or social competence did not moderate links between teachers' EC and student-teacher interactions, students' characteristics moderated mediated relations between the STR and teachers' reports of externalizing problems. Accounting for the effects of teachers' EC, teacher-reported relationship quality was negatively related to teacher-reported externalizing problem behaviors; however, this relation was particularly pronounced when students were low in EC or social competence. At high levels of teacher-reported-STR-quality, students exhibited similar levels of externalizing problems; overall, a similar, but weaker, pattern was evident for children's reports of relationship quality. This is partly in line with Pluess and Belsky's (2010) longitudinal evidence that early child-rearing environments have differential implications for social functioning in elementary school. Findings from the present study offer support for the premise that the students most in need of a positive learning environment – because they are weaker in important social-emotional competencies needed to succeed academically – are those whose social functioning profits most from a high-quality relationship with their teacher.

Students' EC moderated the mediated association between teachers' negative reactions and math achievement, beyond teachers' EC. For students low in EC, the negative effect of teachers' negative reactions was most salient, whereas a predominantly

negative teacher appears to have been less problematic for students high in EC. That EC comprises a set of self-regulatory skills imperative for developmental functioning across domains, including academics, is becoming increasingly well-established (Liew, in press; Shonkoff & Phillips, 2000). The consistency of present findings regarding moderated mediation by children's EC across outcomes suggests that students whose EC developing skills are well in place in the early years of schooling are likely to excel in spite of experience with a relatively unsupportive or ineffective teacher. In contrast, more vulnerable students are especially negatively affected by dysregulated teachers prone to negative student-teacher interactions. Thus, promoting self-regulatory competence prior to and during the first years of school is essential to successful academic functioning, particularly for those students at-risk (Ursache, Blair, & Raver, in press).

Students' social competence moderated the mediated link between children's reports of the STR and reading achievement, accounting for teachers' EC. Intriguingly, simple slopes indicated that children low in social competence performed *worse* in reading as they perceived better relationships with their teachers. This unexpected finding may suggest that part of children's perceptions of the STR taps dimensions of a dependency domain, which has been generally associated with negative social and academic skills in early school years (Pianta & Stuhlman, 2004) and is distinct from closeness and conflict domains. In contrast to a close relationship with a teacher, children with *dependent* STRs typically refrain from behavioral and social engagement in the classroom, constantly clinging to the teacher's side. Among shy children, in particular, a dependent STR is particularly associated with poor academic functioning, including peer exclusion from classroom activities (Arbeau, Copan, & Weeks, 2010). Like shy students, less socially competent students are likely aware of this social exclusion and rely too much on a teacher's relational support, missing out on valuable learning opportunities and resulting

in poor achievement. Assessments of the dependency domain of the STR will be beneficial in future investigations of these and related constructs to explore this idea.

The pattern of findings from teachers' reports of the STR differed substantially from children's reports in mediation tests. Zero-order correlations indicated that teachers' and children's reports of the STR were not strongly associated with one another, though reports from all informants were reliable. These results suggest that classroom actors may perceive the quality of the STR differently and so value and report on different aspects of the relationship. In a recent longitudinal examination across second and third grades, Hughes (2011) concluded that teachers' and students' reports of the STR generally assess different constructs. These are typically associated with different facets of academic adjustment, such as behavioral or emotional engagement versus achievement. In examinations of reporter concordance, primary-grade students appear to perceive the support versus conflict of the STR differently from teachers' perceptions (Hughes, 2011; Murray, Murray, & Waas, 2008; Rey, Smith, Yoon, Somers, & Barnett, 2007). It is expected that whereas teachers' perceptions reflect supportive versus conflictual relationship dimensions, children's perceptions tap social support and feelings of esteem. Future investigations of the influences of teachers' characteristics on the STR will benefit from considering the potential for differential perceptions of the relationship by agent.

### **Study Limitations and Future Directions**

Findings must be considered in the context of study limitations. First, with two exceptions (i.e., administration of the PPVT in fall of kindergarten and WJ-III in spring of second grade), constructs were assessed concurrently in the fall of second grade; therefore, we cannot be certain of the direction of effects. Although cross-sectional data based in theory and in line with previous empirical work are useful for mediation questions, longitudinal data offer the best method for ascertaining directionality. Second,

constructs were primarily assessed with questionnaires, and many were teacher-reported, though parents' reports, children's reports, and additional methodologies were incorporated into the study design to utilize multiple informant sources. Especially in the light of evidence that informants may perceive classroom experiences differently (see Hughes, 2011), future work could build on these findings by utilizing varied methodologies, including, for example, behavioral assessments of teachers' or students' EC; observations of STR and classroom quality; and diverse self-report methods, such as teachers' daily diary reports of responsive behaviors in the classroom. Third, post-hoc alpha correction tests indicated that some moderated mediation results involving children's reports of the STR or predicting achievement may not be reliable; those findings and implications must be interpreted particularly cautiously. Fourth, the sample was comprised of predominantly Caucasian, middle-class families, and the majority of teachers were relatively experienced women educators with advanced degrees. Some prior work has suggested that teachers with less teaching experience or in disadvantaged communities – and these are often the same cases (Lynch, 2000) – provide lower-quality classrooms (Bryant, Burchinal, Lau, & Sparling, 1994; Croninger et al., 2007). Others have shown that relations between student-teacher interactions and academic competence are similar among ethnically diverse groups (Hughes & Kwok, 2007; Valiente et al., 2008) and that having high-quality middle school teachers has been associated with positive academic functioning, such as motivation (Ryan, Stiller, & Lynch, 1994; Wentzel, 1998). Replications among racially, ethnically, and culturally diverse samples and with women and men teachers across grades are needed to substantiate the generalizability of findings from this study.

Despite limitations, facets of the study support its contribution to developmental, educational, and psychological literatures. Significant regression results were attained

beyond the influence of several relevant controls, including accounting for the clustered structure of the data. This study is among few to adopt Raver et al.'s (in press) framework regarding whether and how teachers' self-regulation may relate to classroom dynamics. In addition, this study is among few to consider and test relations between teachers' EC (i.e., a component of self-regulation) and student-teacher interactions, and it is one of the first to examine whether student-teacher interactions mediate links between teachers' EC and students' adjustment. Finally, this investigation included novel empirical tests of the differential susceptibility hypothesis with teachers as socializers, using a complex, moderated mediation analysis technique; to date, tests of these moderated mediation tests have primarily been limited to simulation studies (D. P. MacKinnon, personal communication, September 7, 2011; MacKinnon, 2008). Similar to validating developmental theories empirically, validating simulated statistical models with actual data is imperative to give credence to underlying operational assumptions (Kleijnen, 1995).

This investigation represents an important first step in examining whether and how teachers' EC, a temperamental self-regulatory feature of socioemotional functioning, influences how teachers interact with students and students' subsequent academic adjustment. Future studies can strengthen the contribution of these findings by replicating tests longitudinally across diverse groups and integrating other intrinsic factors likely to influence teachers' effectiveness, such as methods of coping with normative life- or work-related stressors (Wilhelm, Dewhurst-Savellis, & Parker, 2000), in socializing and instructing students.

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### Footnote

<sup>1</sup>I also conducted analyses accounting for clustering by kindergarten classroom and without accounting for clustering. Model fit estimates for models predicting reading ([clustered by K classroom]:  $\chi^2(58, N = 291) = 72.26, p = .10$ ; CFI = .99; RMSEA = .03; SRMR = .04; [not accounting for clustering]:  $\chi^2(58, N = 291) = 74.16, p = .07$ ; CFI = .99; RMSEA = .03; SRMR = .04) and models predicting math ([clustered by K classroom]:  $\chi^2(30, N = 291) = 35.90, p = .21$ ; CFI = 1.00; RMSEA = .03; SRMR = .04; [not accounting for clustering]:  $\chi^2(30, N = 291) = 35.82, p = .21$ ; CFI = 1.00; RMSEA = .03; SRMR = .04) and the significance levels of the parameter estimates were similar to those presented in Figures 1 and 2.

<sup>2</sup>The pattern of findings inclusive of hypothesized paths only (i.e., without bidirectional relations included) was similar to those presented in Figures 1 and 2 for the model predicting reading ( $\chi^2[63, N = 291] = 85.53, p = .03$ ; CFI = .99; RMSEA = .04; SRMR = .07) and the model predicting math ( $\chi^2[34, N = 291] = 49.41, p = .04$ ; CFI = .99; RMSEA = .04; SRMR = .05).

Table 1

*Descriptive Statistics and Zero-order Correlations for Study 1 Variables*

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	
1 Pos react (K)																			
2 Pos react (G1)	<b>.69**</b>																		
3 Pos react (G2)	<b>.71**</b>	<b>.76**</b>																	
4 EC: PR (K)	.04	.03	.07																
5 EC: PR (G1)	.16*	.17*	.12	<b>.78**</b>															
6 EC: PR (G2)	.12	.07	.11	.75**	<b>.77**</b>														
7 EC: TR (K)	.03	.04	-.05	.48**	.41**	.38**													
8 EC: TR (G1)	.00	.08	-.03	.35**	.42**	.32**	<b>.64**</b>												
9 EC: TR (G2)	-.09	-.03	-.13*	.32**	.41**	.38**	.56**	<b>.57**</b>											
10 WJ: LW (K)	-.01	-.06	-.06	.26**	.30**	.24**	.23**	.26**	.27**										
11 WJ: LW (G1)	-.08	-.07	-.07	.25**	.31**	.31**	.23**	.31**	.30**	<b>.74**</b>									
12 WJ: LW (G2)	-.02	-.05	-.05	.20**	.25**	.30**	.22**	.28**	.27**	.65**	<b>.87**</b>								
13 WJ: PC (K)	.02	-.04	.01	.21**	.28**	.30**	.28**	.26**	.29**	.75**	.61**	.56**							
14 WJ: PC (G1)	-.01	-.06	-.04	.27**	.36**	.28**	.29**	.38**	.35**	.70**	.84**	.79**	<b>.60**</b>						
15 WJ: PC (G2)	.05	-.06	-.06	.23**	.34**	.40**	.24**	.22**	.34**	.57**	.65**	.71**	.54**	<b>.69**</b>					
16 WJ: AP (K)	-.07	-.10	-.17*	.20**	.22**	.20**	.33**	.28**	.38**	.55**	.51**	.51**	.51**	.52**	.57**				
17 WJ: AP (G1)	-.09	-.17*	-.20**	.23**	.27**	.26**	.34**	.33**	.39**	.54**	.52**	.50**	.48**	.55**	.59**	.71**			
18 WJ: AP (G2)	-.09	-.12*	-.18*	.24**	.32**	.32**	.27**	.29**	.37**	.56**	.58**	.57**	.50**	.60**	.65**	.65**	<b>.76**</b>		
<i>M</i>	3.82	3.64	3.60	4.88	4.93	5.00	4.81	4.82	4.89	414.30	457.45	483.62	440.43	476.90	493.73	451.85	472.03	490.39	
<i>SD</i>	1.09	1.23	1.19	.72	.69	.68	1.06	1.06	1.06	24.96	25.29	21.44	21.59	15.58	13.82	16.94	16.84	16.45	

*Note.* Parents' positive reactions is a difference score (i.e., positive minus negative reactions). Coefficients in bold type represent stabilities. AP = Applied problems math achievement score; EC = Effortful control; G1 = Grade 1; G2 = Grade 2; K = Kindergarten; LW = Letter-Word reading achievement score; PC = Passage comprehension reading achievement score; Pos react = Parents' positive reactions; PR = Parent-reported; TR = Teacher-reported; WJ = Woodcock Johnson III Tests of Achievement. +  $p < .10$ ; \*  $p < .05$ ; \*\*  $p < .01$ .

Table 2

*Confidence Limits for Study 1 Mediated Effects of Interest*

	Lower confidence limit	Upper confidence limit
Positive reactions (K) → Effortful control (G1) → Reading achievement (G2)	-.31836	.13507
<b>Positive reactions (K) → Effortful control (G1) → Math achievement (G2)</b>	<b>.03190</b>	<b>1.36907</b>

*Note.* Confidence limits obtained from PRODCLIN. Bolded effects are significant at the .05 level because the 95% confidence limits do not contain zero. G1 = Grade 1; G2 = Grade 2; K = Kindergarten.

Table 3

*Descriptive Statistics and Zero-order Correlations for Study 2 Variables*

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1 Child's sex															
2 Child's SES	-.05														
3 Child's verbal ability	-.01	.19**													
4 Teacher's years of experience	-.02	-.11 <sup>+</sup>	.14*												
5 Teacher's EC: TR	.02	.16**	.07	.26**											
<i>Putative mediators</i>															
6 Positive reactions: TR	.02	.17**	-.01	-.02	.28**										
7 Negative reactions: TR	-.04	-.14*	.00	-.21**	-.35**	-.14*									
8 STR: TR	-.04	.15*	.08	.18**	.22**	.13*	-.22*								
9 STR: CR	-.01	-.08	-.03	.00	.00	.16**	.04	.13*							
<i>Putative moderators</i>															
10 Child's EC	-.02	.10	.15*	.14*	.16**	.01	.02	.54**	.08						
11 Child's SC	-.01	.13*	.17**	.17**	.15*	.09	-.13*	.59**	.11 <sup>+</sup>	.60**					
<i>Adjustment outcomes</i>															
12 EXT: TR	.03	-.13*	-.01	-.07	-.14*	-.06	.12*	-.65**	-.17**	-.45**	-.53**				
13 EXT: PR	.06	-.03	.01	-.04	-.17**	-.01	.02	-.26**	-.07	-.40**	-.47**	.41**			
14 Reading achievement	.00	.24**	.34**	.03	.10*	-.03	-.06	.17**	-.07	.42**	.22**	-.14*	-.13*		
15 Math achievement	.03	.26**	.37**	.06	.06	-.02	-.11 <sup>+</sup>	.15*	-.06	.38**	.16**	-.13*	-.06	.65**	
<i>M</i>	.58	-.02	106.56	11.84	5.24	5.42	1.88	4.36	2.57	.03	.02	1.12	1.19	488.68	490.39
<i>SD</i>	.50	.77	11.83	7.07	.65	.67	.45	.58	.33	.83	.85	.21	.21	16.35	16.45

*Note.* Child's sex was coded 0 = *girl*, 1 = *boy*. CR = Child-reported; EC = Effortful control; EXT = Externalizing problem behaviors; PR = Parent-reported; SC = Social competence; SES = Socioeconomic status; STR = Student-teacher relationship; TR = Teacher-reported. <sup>+</sup>*p* < .10; \**p* < .05; \*\**p* < .01.

Table 4

*Prediction of Teachers' Reactions or the Student-teacher Relationship from Teachers' Effortful Control*

	Predicting teachers' positive reactions			Predicting teachers' negative reactions			Predicting student-teacher relationship: TR			Predicting student-teacher relationship: CR		
	B	SE B	ICC	B	SE B	ICC	B	SE B	ICC	B	SE B	ICC
Child's sex	.000	.089		-.018	.053		-.005	.072		-.060	.047	
Child's SES	.104 <sup>+</sup>	.059		-.071 <sup>+</sup>	.038		.065	.050		-.034	.033	
Teacher's years of experience	-.010	.007		-.006	.005		.013 <sup>*</sup>	.006		.003	.004	
Teacher's EC	.328 <sup>**</sup>	.076	.000	-.146 <sup>**</sup>	.048	.438	.053 <sup>*</sup>	.061	.108	-.017	.040	.124

*Note.* Child's sex was coded 0 = *girl*, 1 = *boy*. EC = Effortful control; ICC = Intraclass correlation; SES = Socioeconomic status. <sup>+</sup> $p < .10$ ; <sup>\*</sup> $p < .05$ , <sup>\*\*</sup> $p < .01$ .

Table 5

*Prediction of Externalizing Problems from Teachers' Effortful Control and Student-teacher Interactions*

	Predicting externalizing problem behaviors: TR			Predicting externalizing problem behaviors: PR		
	B	SE B	ICC	B	SE B	ICC
Child's sex	.003	.028		.018	.031	
Child's SES	-.013	.020		.003	.020	
Teacher's years of experience	.000	.002		.002	.002	
Teacher's EC	-.054*	.026		-.077*	.027	
Positive reactions	.016	.023	.075	.012	.024	.000
Child's sex	.004	.028		.017	.031	
Child's SES	-.013	.020		.002	.021	
Teacher's years of experience	.001	.002		.002	.002	
Teacher's EC	-.055*	.025		-.077**	.027	
Negative reactions	.021	.035	.070	-.017	.036	.002
Child's sex	-.001	.022		.021	.029	
Child's SES	.000	.015		.009	.020	
Teacher's years of experience	.004*	.002		.002	.002	
Teacher's EC	-.026	.019		-.054*	.024	
Student-teacher relationship: TR	-.241**	.021	.115	-.093**	.028	.014
Child's sex	-.010	.028		.017	.031	
Child's SES	-.022	.020		-.003	.020	
Teacher's years of experience	.002	.002		.002	.002	
Teacher's EC	-.067**	.024		-.069**	.025	
Student-teacher relationship: CR	-.136**	.043	.068	-.055	.046	.000

*Note.* Child's sex was coded 0 = *girl*, 1 = *boy*. EC = Effortful control; ICC = Intraclass correlation; SES = Socioeconomic status. †  $p < .10$ ; \*  $p < .05$ , \*\*  $p < .01$ .

Table 6

*Prediction of Achievement from Teachers' Effortful Control and Student-teacher**Interactions*

	Predicting reading achievement			Predicting math achievement		
	B	SE B	ICC	B	SE B	ICC
Child's sex	-1.802*	2.177		1.760	2.088	
Child's SES	2.874 <sup>†</sup>	1.503		3.049*	1.498	
Child's verbal ability	.547**	.099		.528**	.094	
Teacher's years of experience	-.001	.166		.157	.171	
Teacher's EC	2.185	1.946		.722	1.904	
Positive reactions	-2.317	1.741	.000	-.028	1.672	.089
Child's sex	1.562	2.189		1.508	2.060	
Child's SES	2.371	1.514		2.472 <sup>†</sup>	1.485	
Child's verbal ability	.564**	.099		.542**	.093	
Teacher's years of experience	-.006	.168		.101	.170	
Teacher's EC	.948	1.926		-.280	1.853	
Negative reactions	-2.378	2.546	.000	-5.922* <sup>†</sup>	2.562	.093
Child's sex	1.950	2.156		2.015	2.042	
Child's SES	2.755 <sup>†</sup>	1.479		3.308*	1.457	
Child's verbal ability	.494**	.096		.471**	.091	
Teacher's years of experience	-.049	.164		.057	.169	
Teacher's EC	1.527	1.798		.583	1.773	
Student-teacher relationship: TR	4.288* <sup>†</sup>	2.026	.000	5.032*	1.978	.118
Child's sex	1.751	2.207		1.992	2.103	
Child's SES	3.138*	1.507		3.639*	1.498	
Child's verbal ability	.506**	.098		.485**	.093	
Teacher's years of experience	.005	.166		.136	.170	
Teacher's EC	2.091	1.804		1.425	1.777	
Student-teacher relationship: CR	-.879	3.341	.000	-1.495	3.244	.093

*Note.* Child's sex was coded 0 = *girl*, 1 = *boy*. CR = Child-reported; EC = Effortful control; ICC = Intraclass correlation; SES = Socioeconomic status; TR = Teacher-reported. <sup>†</sup> $p < .10$ ; \* $p < .05$ , \*\* $p < .01$ . <sup>†</sup> $p < .10$  when adjusted for the Benjamini-Hochberg false discovery rate alpha correction procedure.



Table 7

*Confidence Limits for Significant Study 2 Mediated Effects*

	Lower confidence limit	Upper confidence limit
Teacher's Effortful Control → Negative Reactions → Math Achievement	.08856	1.96182
Teacher's Effortful Control → Student-teacher Relationship (TR) → Externalizing Problem Behaviors (TR)	-.06747	-.00769
Teacher's Effortful Control → Student-teacher Relationship (TR) → Externalizing Problem Behaviors (PR)	-.03057	-.00226
Teacher's Effortful Control → Student-teacher Relationship (TR) → Reading Achievement	.00559	1.63603
Teacher's Effortful Control → Student-teacher Relationship (TR) → Math Achievement	.06774	1.79685

*Note.* Confidence limits obtained from PRODCLIN. Effects are significant at the .05 level because the 95% confidence limits do not contain zero. PR = Parent-reported; TR = Teacher-reported.

Table 8

*Results for Significant Moderated Mediation Tests by Children's Effortful Control*

	B	SE B	ICC
Predicting externalizing problems: TR			
Child's sex	.003	.021	
Child's SES	-.005	.015	
Teacher's years of experience	.003 <sup>+</sup>	.002	
Teacher's EC	-.025	.018	
STR: TR	-.159**	.027	
Child's EC	-.034*	.015	
Teacher's EC X Child's EC	.015	.020	
STR: TR X Child's EC	.103**	.026	.079
Child's sex	-.001	.025	
Child's SES	-.017	.018	
Teacher's years of experience	.002	.002	
Teacher's EC	-.039 <sup>+</sup>	.022	
STR: CR	-.072 <sup>+</sup>	.041	
Child's EC	-.100**	.016	
Teacher's EC X Child's EC	.045*	.023	
STR: CR X Child's EC	.114* <sup>†</sup>	.046	.076
Predicting math achievement			
Child's sex	1.557	1.889	
Child's SES	2.387 <sup>+</sup>	1.364	
Child's verbal ability	.467**	.087	
Teacher's years of experience	.008	.157	
Teacher's EC	-1.490	1.714	
Negative reactions	-7.124**	2.367	
Child's EC	6.435**	1.160	
Teacher's EC X Child's EC	-.149	1.869	
Negative reactions X Child's EC	4.749* <sup>†</sup>	2.346	.098

*Note.* Child's sex was coded 0 = *girl*, 1 = *boy*. CR = Child-reported; ICC = Intraclass correlation; SC = Social competence; SES = Socioeconomic status; STR = Student-teacher relationship; TR = Teacher-reported. <sup>+</sup> $p < .10$ ; \* $p < .05$ , \*\* $p < .01$ . <sup>†</sup>Not significant when adjusted for the Benjamini-Hochberg false discovery rate alpha correction procedure.

Table 9

*Results for Significant Moderated Mediation Tests by Children's Social Competence*

	B	SE B	ICC
Predicting externalizing problems: TR			
Child's sex	-.009	.021	
Child's SES	-.001	.015	
Teacher's years of experience	.002	.002	
Teacher's EC	-.018	.018	
STR: TR	-.154**	.026	
Child's SC	-.034*	.016	
Teacher's EC X Child's SC	-.003	.018	
STR: TR X Child's SC	.092**	.023	.083
Child's sex	-.006	.025	
Child's SES	-.007	.017	
Teacher's years of experience	.002	.002	
Teacher's EC	-.046*	.021	
STR: CR	-.071 <sup>†</sup>	.039	
Child's SC	-.102**	.016	
Teacher's EC X Child's SC	.030	.020	
STR: CR X Child's SC	.096* <sup>†</sup>	.040	.062
Predicting reading achievement			
Child's sex	1.525	2.158	
Child's SES	2.682 <sup>†</sup>	1.484	
Child's verbal ability	.441**	.098	
Teacher's years of experience	-.056	.164	
Teacher's EC	1.858	1.776	
STR: CR	.005	3.406	
Child's SC	3.186*	1.394	
Teacher's EC X Child's SC	-.200	1.751	
STR: CR X Child's SC	8.736* <sup>†</sup>	3.530	.000

*Note.* Child's sex was coded 0 = *girl*, 1 = *boy*. CR = Child-reported; EC = Effortful control; ICC = Intraclass correlation; SC = Social competence; SES = Socioeconomic status; STR = Student-teacher relationship; TR = Teacher-reported. <sup>†</sup> $p < .10$ ; \* $p < .05$ , \*\* $p < .01$ . <sup>†</sup>Not significant when adjusted for the Benjamini-Hochberg false discovery rate alpha correction procedure.

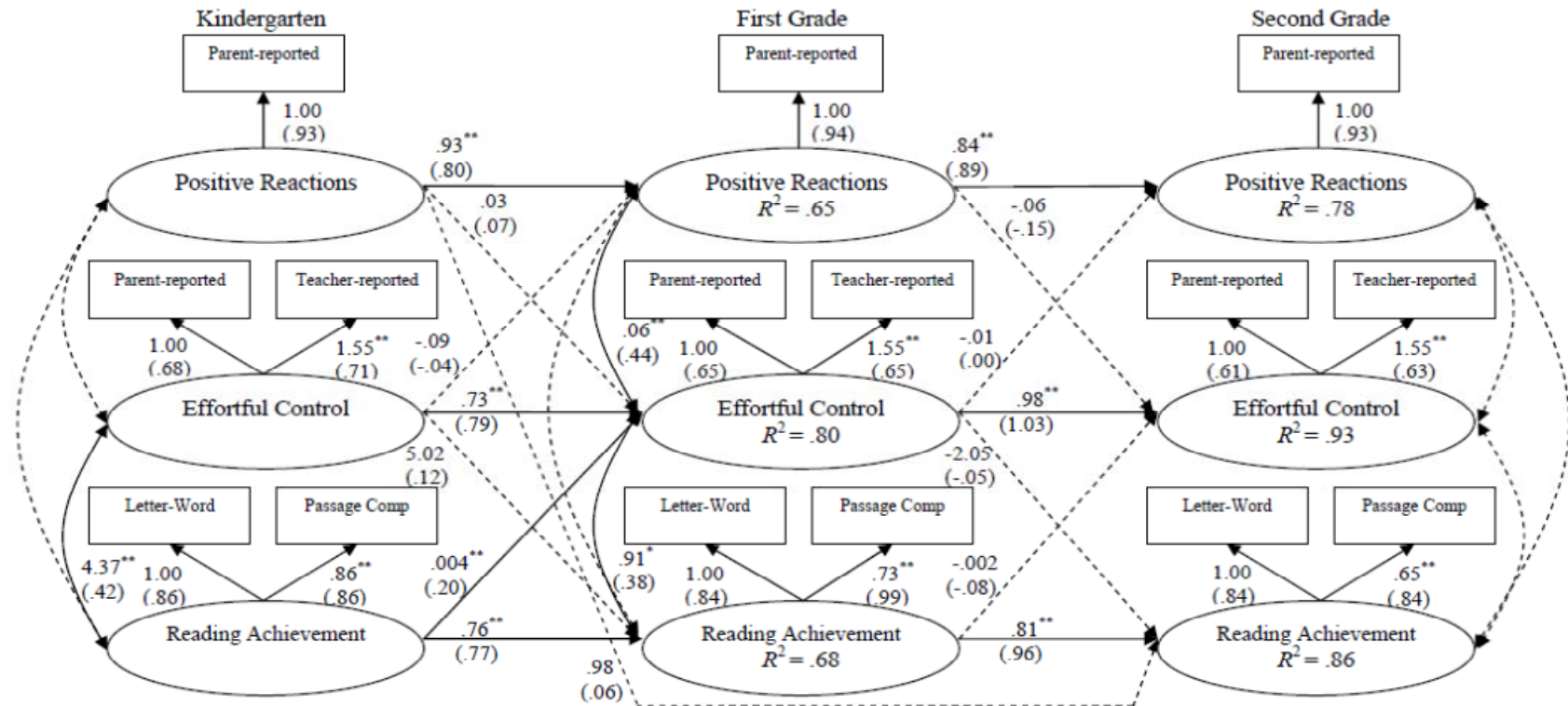


Figure 1. Longitudinal relations between parents' positive reactions and children's effortful control and reading achievement. This model fit the data well,  $\chi^2(58, N = 291) = 73.49, p = .08$ ; CFI = .99; RMSEA = .03; SRMR = .04. Solid lines represent significant relations, whereas dotted lines represent non-significant relations. Unstandardized estimates are above the standardized estimates, which are in parentheses. Covariances between within-source error terms across time are not shown to ease model interpretation. \*  $p < .05$ ; \*\*  $p < .01$ .

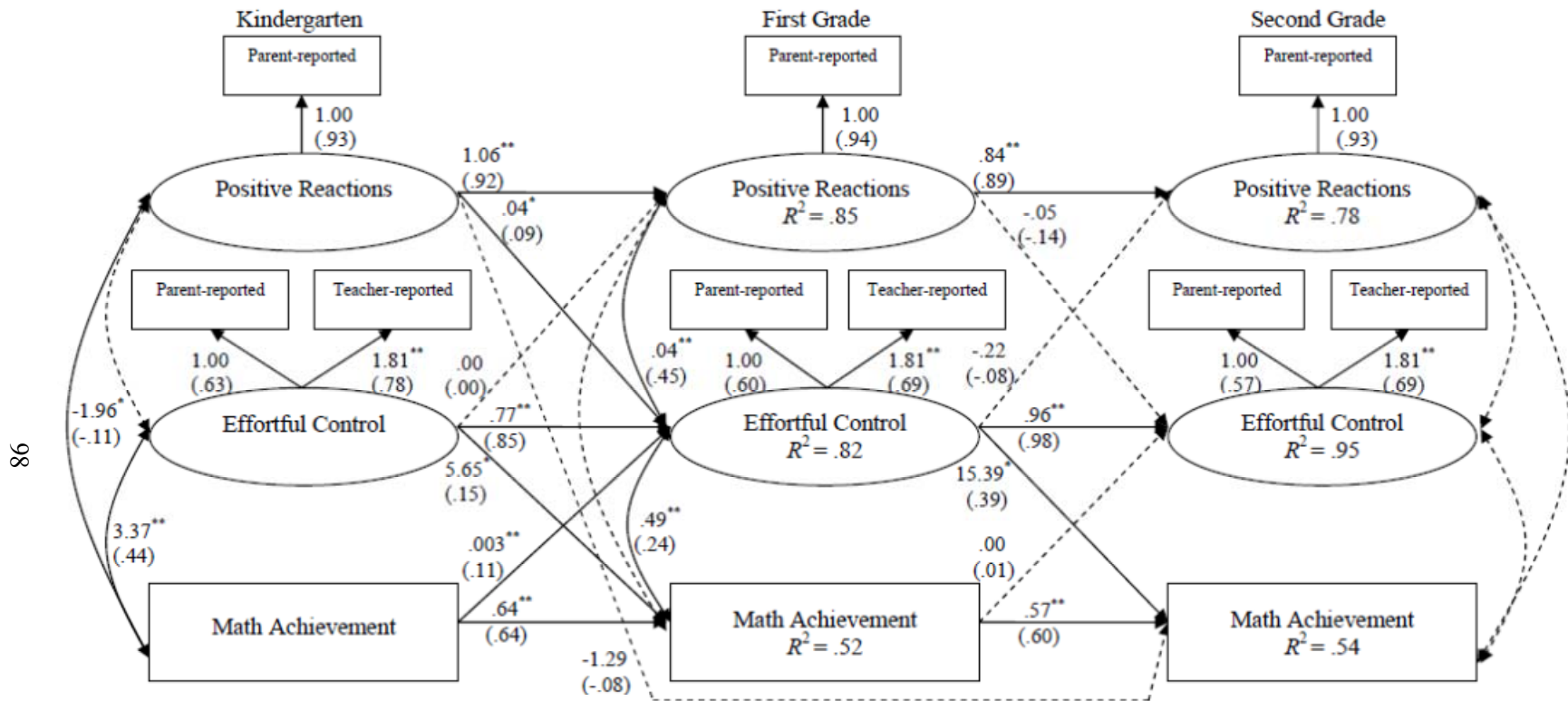


Figure 2. Longitudinal relations between parents' positive reactions and children's effortful control and math achievement. This model fit the data well,  $\chi^2(30, N = 291) = 41.91, p = .07$ ; CFI = .99; RMSEA = .04; SRMR = .04. Solid lines represent significant relations, whereas dotted lines represent non-significant relations. Unstandardized estimates are above the standardized estimates, which are in parentheses. Covariances between within-source error terms across time are not shown to ease model interpretation. \*  $p < .05$ ; \*\*  $p < .01$ .

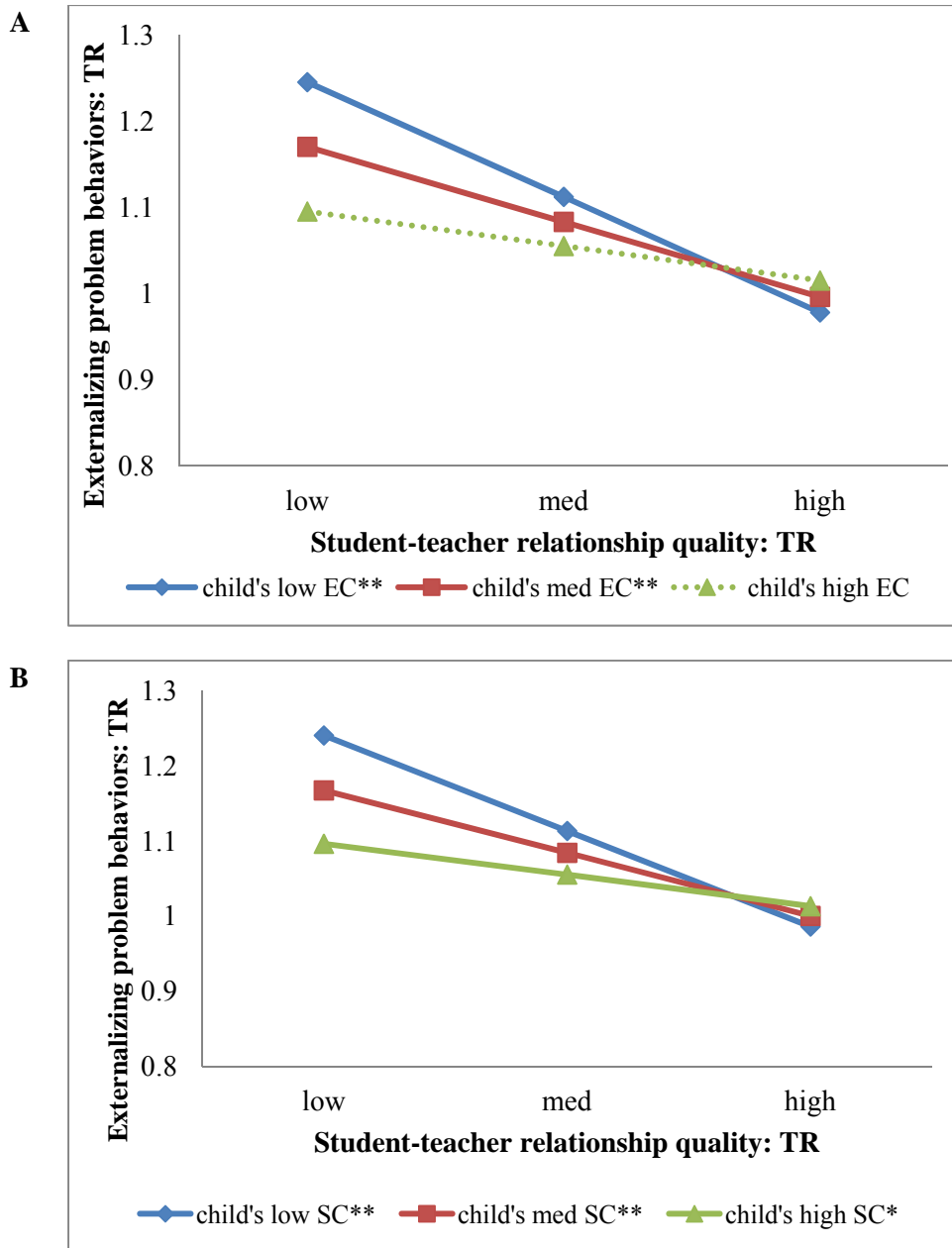


Figure 3. The interactions of teacher-reported student-teacher relationship by children's competencies on teacher-reported externalizing problems. EC = Effortful control; SC = Social competence; TR = Teacher-reported. Slopes for the interaction of teacher-reported student-teacher relationship by children's effortful control on externalizing (panel A): -.24, -.16, and -.07. Slopes for the interaction of teacher-reported student-teacher relationship by children's social competence on externalizing (panel B): -.23, -.15, and -.08. <sup>+</sup> $p < .10$ ; \* $p < .05$ ; \*\* $p < .01$ .

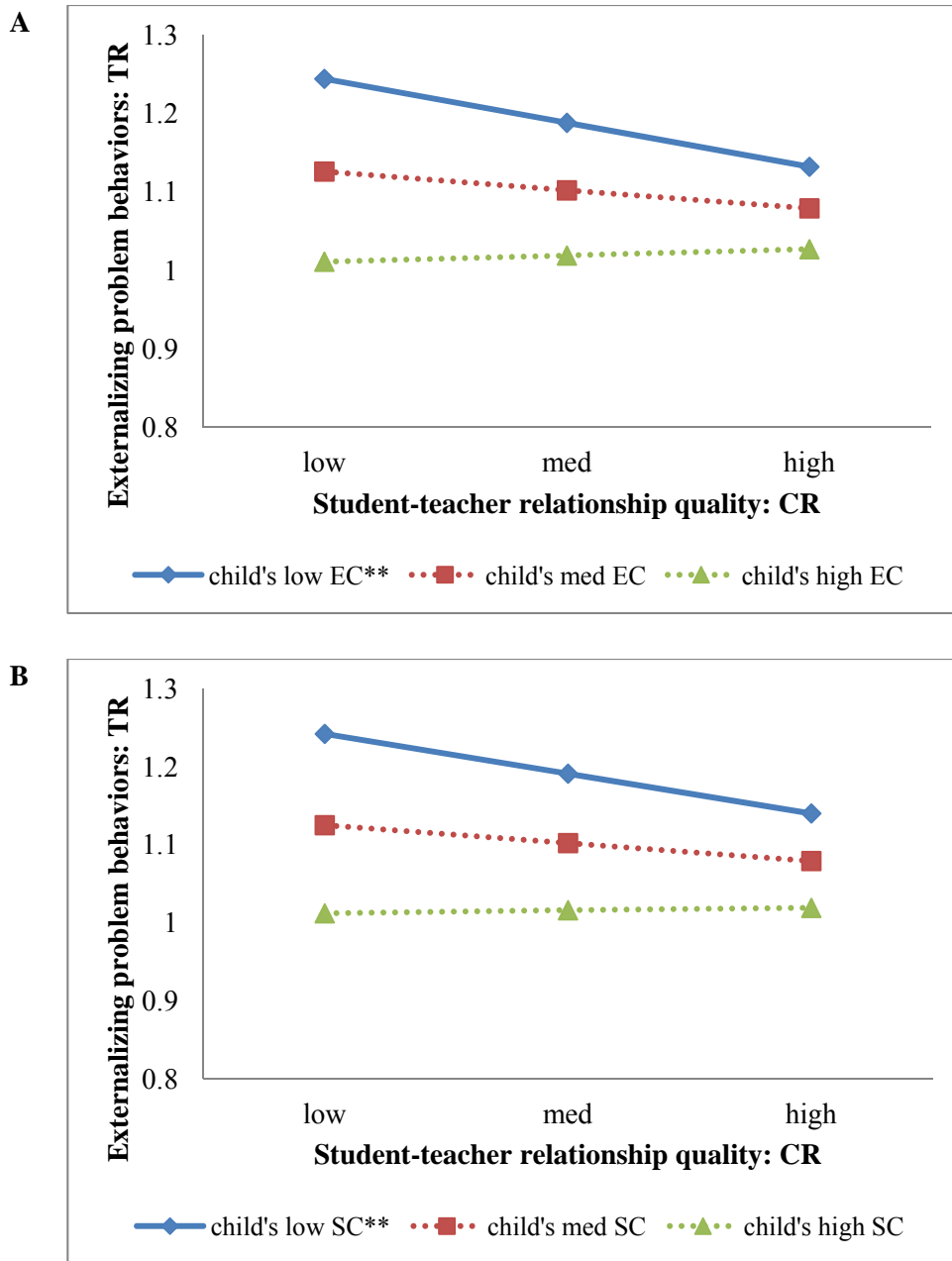


Figure 4. The interactions of child-reported student-teacher relationship by children's competencies on teacher-reported externalizing problems. EC = Effortful control; SC = Social competence; TR = Teacher-reported. Slopes for the interaction of child-reported student-teacher relationship by children's effortful control on externalizing (panel A): -.17, -.07, and .02. Slopes for the interaction of child-reported student-teacher relationship by children's social competence on externalizing (panel B): -.15, -.07, and .01. <sup>+</sup> $p < .10$ ; <sup>\*\*</sup> $p < .01$ .

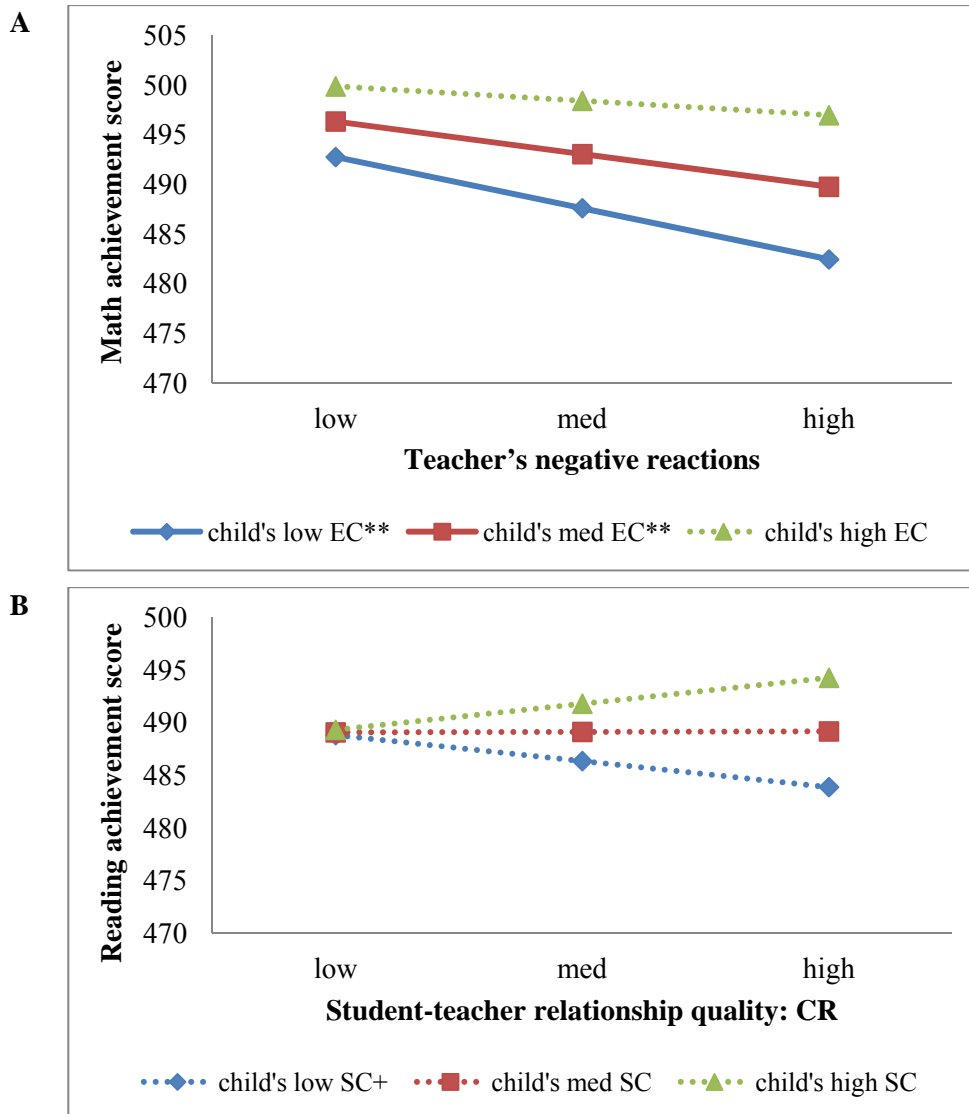


Figure 5. The interactions of student-teacher interactions by children's competencies on achievement. CR = Child-reported; EC = Effortful control; SC = Social competence.

Slopes for the interaction of teachers' negative reactions to children's displays of negative emotions by children's effortful control on math achievement (panel A): -11.11, -7.09, and -3.13. Slopes for the interaction of child-reported student-teacher relationship by children's social competence on reading achievement (panel B): -7.47, .15, and 7.48.

<sup>+</sup> $p = .059$ ; <sup>\*\*</sup> $p < .01$ .



APPENDIX A

STUDY 1 REPORTED MEASURES

### Items from Coping with Children's Negative Emotions Scale (Parent-reported)

Source: Fabes et al., 1990

Instructions: For the following items, please indicate on a scale from "very unlikely" to "very likely" the likelihood that you would respond in the ways listed for each item. Please read each item carefully and respond as honestly and sincerely as you can.

1 = Very unlikely

4 = Medium

7 = Very likely

1. If my child were to fall off his/her bike and break it, and then get upset and cry, I would:
  - a. Tell my child that he/she is over-reacting
  - b. Tell my child it's okay to cry
  - c. Tell my child to stop crying or he/she won't be allowed to ride his/her bike anytime soon
2. If my child were to lose some prized possession and react with tears, I would:
  - a. Help my child think of places he/she hasn't looked yet
  - b. Tell him/her it's okay to cry when you feel unhappy
3. If my child were afraid of injections and became quite shaky and teary while waiting his/her turn to get a shot, I would:
  - a. Tell him/her to shape up or he/she won't be allowed to do something he/she likes to do (e.g., watch TV)
  - b. Tell my child not to make a big deal of the shot
  - c. Comfort him/her before and after the shot
4. If my child were going over to spend the afternoon at a friend's house and became nervous and upset because I can't stay there with him/her, I would:
  - a. Help my child think of things that he/she could do so that being at the friend's house without me wasn't scary (e.g., take a favorite book or toy with him/her)
  - b. Tell my child to quit over-reacting and being a baby
  - c. Tell the child that if he/she doesn't stop that he/she won't be allowed to go out anymore
  - d. Encourage my child to talk about his/her nervous feelings
5. If my child were participating in some group activity at school (with his/her friends) and proceeded to make a mistake, and then looked embarrassed and on the verge of tears, I would:
  - a. Comfort my child and try and make him/her feel better
  - b. Tell my child that he/she is over-reacting
  - c. Tell my child to straighten up or we'll go home right away
  - d. Tell my child that I'll help him/her practice so that he/she can do better next time
6. If my child were about to appear in a recital or concert and became visibly nervous about people watching him/her, I would:
  - a. Help my child think of things that he/she could do to get ready for his/her turn (e.g., do some warm-ups and not look at the audience)
  - b. Suggest that my child think about something relaxing so that his/her nervousness will go away
  - c. Tell my child that he/she is being a baby about it
  - d. Tell my child that if he/she doesn't calm down, we'll have to leave and go home right away
  - e. Encourage my child to talk about his/her nervous feelings
7. If my child were to receive an undesirable birthday gift from a friend and looked obviously disappointed, even annoyed, after opening it in the presence of the friend, I would:
  - a. Encourage my child to express his/her disappointed feelings
  - b. Try to get my child to feel better by doing something fun
8. If my child were panicked and couldn't go to sleep after watching a scary TV show, I would:
  - a. Tell my child that he/she is over-reacting
  - b. Help my child think of something to do so that he/she can get to sleep (e.g., take a toy to bed, leave the lights on)
  - c. Tell him/her to go to bed or he/she won't be allowed to watch any more TV

- d. Do something fun with my child to help him/her forget about what scared him/her
- 9. If my child were at a park and appeared on the verge of tears because the other children were mean to him/her and won't let him/her play with them, I would:
  - a. Tell my child that if he/she starts crying then we'll have to go home right away
  - b. Tell my child it's okay to cry when he/she feels bad
  - c. Comfort my child and try to get him/her to think about something happy
  - d. Help my child think of something else to do
- 10. If my child were playing with other children and one of them called him/her names, and my child then began to tremble and become tearful, I would:
  - a. Tell my child not to make a big deal out of it
  - b. Tell my child to behave or we'll have to go home right away
  - c. Help my child think of constructive things to do when other children tease him/her (e.g., find other things to do)
  - d. Comfort him/her and play a game to take his/her mind off the upsetting event
  - e. Encourage him/her to talk about how it hurts to be teased
- 11. If my child were shy and scared around strangers and consistently became teary and wanted to stay in his/her bedroom whenever family or friends come to visit, I would:
  - a. Help my child think of things to do that would make meeting my friends less scary (e.g., take a favorite toy with him/her when meeting my friends)
  - b. Try to make my child happy by talking about the fun things we can do with our friends
  - c. Tell my child he/she is being a baby

Emotion-focused reactions: 3c, 5a, 6b, 7b, 8d, 9c, 10d, 11b

Expressive-encouragement reactions: 1b, 2b, 4d, 6e, 7a, 9b, 10e

Minimization reactions: 1a, 3b, 4b, 5b, 6c, 8a, 10a, 11c

Problem-focused reactions: 2a, 4a, 5d, 6a, 8b, 9d, 10c, 11a

Punitive reactions: 1c, 3a, 4c, 5c, 6d, 8c, 9a, 10b

### Items from Children's Behavior Questionnaire (Parent-reported and Teacher-reported)

Source: Rothbart et al., 2001

Instructions: On the following pages, you will find a description of children in certain situations. We would like you to indicate how this child would most likely react in these situations. There is no "correct" way to react: Children vary greatly in their behavior; it is exactly these differences that we want to capture. Please read each description and decide if it is true or false with respect to this child over the PAST SIX MONTHS.

- 1 = Extremely false
- 2 = Mostly false
- 3 = Somewhat false
- 4 = Not false or true
- 5 = Somewhat true
- 6 = Mostly true
- 7 = Extremely true

Over the past six months, your son or daughter [this child]:

[Attention-focusing scale:]

1. When picking up toys or other jobs, usually keeps at the task until it's done
2. When practicing an activity, has a hard time keeping her/his mind on it (reverse-coded)
3. Will move from one task to another without completing any of them (reverse-coded)
4. When drawing or coloring in a book, shows strong concentration
5. When building or putting something together, becomes very involved in what she/he is doing, and works for long periods
6. Has difficulty leaving a project she/he has begun
7. Is easily distracted when listening to a story (reverse-coded)
8. Sometimes becomes absorbed in a picture book and looks at it for a long time
9. Has a hard time following instructions (reverse-coded)
10. Has trouble sitting still when she/he is told to (reverse-coded)
11. When watching TV, is easily distracted by other noises or movements (reverse-coded)<sup>a</sup>
12. Is distracted from her/his projects when you enter the room (reverse-coded)
13. Often shifts rapidly from one activity to another (reverse-coded)
14. Will ignore others when playing with an interesting toy

[Inhibitory control scale:]

1. Can lower his/her voice when asked to do so
2. Is good at games like "Simon Says," "Mother, May I?" and "Red Light, Green Light"
3. Prepares for trips, outings, and activities by planning things she/he will need
4. Can wait before entering into new activities if she/he is asked to
5. Has difficulty waiting in line for something (reverse-coded)
6. Is able to resist laughing or smiling when it isn't appropriate
7. Has a hard time concentrating on an activity when there are distracting noises (reverse-coded)
8. Is good at following instructions
9. Has trouble concentrating when listening to a story (reverse-coded)
10. Approaches places she/he has been told are dangerous slowly and cautiously
11. Is not very careful and cautious in crossing streets (reverse-coded)<sup>b</sup>
12. Can easily stop an activity when she/he is told "no"
13. Is usually able to resist temptation when told she/he is not supposed to do something

<sup>a</sup>Teacher version: "When watching a movie or presentation, is easily distracted by other noises or movements"

<sup>b</sup>Teacher version: "Is not very careful and cautious in potentially dangerous situations"

APPENDIX B

STUDY 2 REPORTED MEASURES

### Items from Adult Temperament Questionnaire (Teacher-reported)

Source: Derryberry & Rothbart, 1988

Instructions: Here are a series of statements that individuals use to describe themselves. Please read each statement carefully and give your best estimate of how well it describes you.

1 = Extremely untrue of you

4 = Medium

7 = Extremely true of you

[Activation control scale:]

1. I am often late for appointments (reverse-coded)
2. I often make plans that I do not follow through with (reverse-coded)
3. I can keep performing a task even when I would rather not do it
4. I can make myself work on a difficult task even when I don't feel like trying
5. If I think of something that needs to be done, I usually get right to work on it
6. I usually finish doing things before they are actually due (paying bills, finishing homework, etc.)
7. When I am afraid of how a situation might turn out, I usually avoid dealing with it (reverse-coded)

[Attentional control scale:]

1. It's often hard for me to alternate between two different tasks (reverse-coded)
2. When I am trying to focus my attention, I am easily distracted (reverse-coded)
3. When interrupted or distracted, I usually can easily shift my attention back to whatever I was doing before
4. It is very hard for me to focus my attention when I am distressed (reverse-coded)
5. When I am happy and excited about an upcoming event, I have a hard time focusing my attention on tasks that require concentration (reverse-coded)

[Inhibitory control scale:]

1. Even when I feel energized, I can usually sit still without trouble if it's necessary
2. It is easy for me to hold back my laughter in a situation when laughter wouldn't be appropriate
3. I can easily resist talking out of turn, even when I'm excited and want to express an idea
4. I usually have trouble resisting my cravings for food, drink, etc. (reverse-coded)
5. When I'm excited something, it's usually hard for me to resist jumping right into it before I've considered the possible consequences (reverse-coded)
6. When I see an attractive item in a store, it's usually very hard for me to resist buying it

### Items from Coping with Children's Negative Emotions Scale (Teacher-reported)

Source: Fabes et al., 1990

Instructions: For the following items, please indicate on a scale from "very unlikely" to "very likely" the likelihood that you would respond in the ways listed for each item. Please read each item carefully and respond as honestly and sincerely as you can.

1 = Very unlikely

4 = Medium

7 = Very likely

1. If a child became angry because he/she couldn't go to a fun event (e.g., field trip) with our class, I would:
  - a. Keep the child in the classroom to cool off
  - b. Help the child think about ways that he/she can still be with friends (e.g., invite some friends over after school)
  - c. Tell the child not to make a big deal out of missing the event
  - d. Encourage the child to express his/her feelings of anger and frustration
  - e. Soothe the child and find something fun for him/her to do to make him/her feel better about missing the event
2. If a child fell on our school grounds, and then got upset and cried, I would:
  - a. Comfort the child and try to get him/her to forget about the accident
  - b. Tell the child that he/she is over-reacting
  - c. Tell the child it's okay to cry
  - d. Tell the child to stop crying or he/she won't be allowed to do something he/she wants to do (e.g., go to recess, go to Specials)
3. If a child lost a prized possession in our classroom and reacted with tears, I would:
  - a. Tell the child that he/she is over-reacting
  - b. Help the child think of places he/she hasn't looked yet
  - c. Distract the child by talking about happy things
  - d. Tell him/her it's okay to cry when you feel unhappy
  - e. Tell him/her that's what happens when you're not careful
4. If a child were participating in some group activity at school and proceeded to make a mistake and then looked embarrassed, I would:
  - a. Comfort the child and try to make him/her feel better
  - b. Tell the child that he/she is over-reacting
  - c. Tell the child to straighten up or he/she will have to stop participating right away
  - d. Encourage the child to talk about his/her feelings of embarrassment
  - e. Tell the child that I'll help him/her practice so that he/she can do it better next time
5. If a child were about to appear in a recital or concert at school and became visibly nervous about people watching him/her, I would:
  - a. Help the child think of things that he/she could do to get ready for his/her turn (e.g., to do some warm-ups and not to look at the audience)
  - b. Suggest that the child think about something relaxing so that his/her nervousness will go away
  - c. Tell the child that he/she is being a baby about it
  - d. Tell the child that if he/she doesn't calm down, he/she will lose the privilege of participating
  - e. Encourage the child to talk about his/her nervous feelings
6. If a child were crying because he/she was teased by other children in the lunchroom, I would:
  - a. Tell the child that if he/she starts crying, he/she will have to go back to the classroom right away
  - b. Tell the child it's okay to cry when he/she feels bad
  - c. Comfort the child and try to get him/her to think about something happy
  - d. Help the child think of something else to do
  - e. Tell the child that he/she will feel better soon
7. If a child were very nervous about an important test, I would:
  - a. Tell him/her not to make a big deal out of the test
  - b. Tell him/her not to be nervous, otherwise he/she will have to take the responsibility if he/she fails the test
  - c. Teach the child some ways to relax

- d. Comfort the child and play a game to make him/her feel less nervous
  - e. Encourage him/her to talk about his/her nervous feelings
8. If a child were playing with children from another class on the playground, and classmates call him/her names and the child began to tremble and become tearful, I would:
- a. Tell the child not to make a big deal out of it
  - b. Tell the child to behave or he/she will have to come back in the classroom right away
  - c. Help the child think of constructive things to do when other children tease him/her (e.g., play with something else)
  - d. Comfort him/her and suggest a game to take his/her mind off the upsetting event
  - e. Encourage him/her to talk about how it hurts to be teased
9. If a child were shy and scared around strangers and consistently became teary and wanted to leave the classroom whenever guest speakers came to visit, I would:
- a. Help the child think of things to do that would make meeting the speakers less scary
  - b. Tell the child that it is okay to feel nervous
  - c. Try to make the child happy by talking about the fun things we can do with and what we can learn from the speakers
  - d. Tell the child that he/she is being a baby

Emotion-focused reactions: 1e, 2a, 3c, 4a, 5b, 6c, 7d, 8d, 9c

Expressive-encouragement reactions: 1d, 2c, 3d, 4d, 5e, 6b, 7e, 8e, 9b

Minimization reactions: 1c, 2b, 3a, 4b, 5c, 6e, 7a, 8a, 9e

Problem-focused reactions: 1b, 3b, 4e, 5a, 6d, 7c, 8c, 9a

Punitive reactions: 1a, 2d, 3e, 4c, 5d, 6a, 7b, 8b, 9d



### Items from Children's Behavior Questionnaire (Parent-reported and Teacher-reported)

Source: Rothbart et al., 2001

Instructions: On the following pages, you will find a description of children in certain situations. We would like you to indicate how this child would most likely react in these situations. There is no "correct" way to react: Children vary greatly in their behavior; it is exactly these differences that we want to capture. Please read each description and decide if it is true or false with respect to this child over the PAST SIX MONTHS.

- 1 = Extremely false
- 2 = Mostly false
- 3 = Somewhat false
- 4 = Not false or true
- 5 = Somewhat true
- 6 = Mostly true
- 7 = Extremely true

Over the past six months, your son or daughter [this child]:

[Attention-focusing scale:]

1. When picking up toys or other jobs, usually keeps at the task until it's done
2. When practicing an activity, has a hard time keeping her/his mind on it (reverse-coded)
3. Will move from one task to another without completing any of them (reverse-coded)
4. When drawing or coloring in a book, shows strong concentration
5. When building or putting something together, becomes very involved in what she/he is doing, and works for long periods
6. Has difficulty leaving a project she/he has begun
7. Is easily distracted when listening to a story (reverse-coded)
8. Sometimes becomes absorbed in a picture book and looks at it for a long time
9. Has a hard time following instructions (reverse-coded)
10. Has trouble sitting still when she/he is told to (reverse-coded)
11. When watching TV, is easily distracted by other noises or movements (reverse-coded)<sup>a</sup>
12. Is distracted from her/his projects when you enter the room (reverse-coded)
13. Often shifts rapidly from one activity to another (reverse-coded)
14. Will ignore others when playing with an interesting toy

[Inhibitory control scale:]

1. Can lower his/her voice when asked to do so
2. Is good at games like "Simon Says," "Mother, May I?" and "Red Light, Green Light"
3. Prepares for trips, outings, and activities by planning things she/he will need
4. Can wait before entering into new activities if she/he is asked to
5. Has difficulty waiting in line for something (reverse-coded)
6. Is able to resist laughing or smiling when it isn't appropriate
7. Has a hard time concentrating on an activity when there are distracting noises (reverse-coded)
8. Is good at following instructions
9. Has trouble concentrating when listening to a story (reverse-coded)
10. Approaches places she/he has been told are dangerous slowly and cautiously
11. Is not very careful and cautious in crossing streets (reverse-coded)<sup>b</sup>
12. Can easily stop an activity when she/he is told "no"
13. Is usually able to resist temptation when told she/he is not supposed to do something

<sup>a</sup>Teacher version: "When watching a movie or presentation, is easily distracted by other noises or movements"

<sup>b</sup>Teacher version: "Is not very careful and cautious in potentially dangerous situations"

**Items from Perceived Competence Scale for Children (Parent-reported and Teacher-reported)**

Source: Harter, 1982, adapted by Eisenberg and colleagues, 1997; 2000

Instructions: Please indicate what you feel to be this child's actual tendencies in response to each question. Please indicate the degree to which the statement is false or true.

- 1 = Really false
- 2 = Sort of false
- 3 = Sort of true
- 4 = Really true

[Popularity subscale:]

- 1. This child finds it hard to make friends (reverse-coded)
- 2. This child is popular with others her/his age
- 3. This child has a lot of friends

[Socially appropriate behavior subscale:]

- 1. This child usually acts appropriately
- 2. This child often gets in trouble because of the things she/he does (reverse-coded)
- 3. This child is usually well-behaved
- 4. Compared to other children this child's age, this child has very good social skills

**Items from Student-Teacher Relationship Scale (Teacher-reported and Child-reported)**

Source: Hamre & Pianta, 2001

Instructions: Please reflect on and indicate the degree to which each of the following statements applies to your relationship with this child.

- 1 = Definitely does not apply
- 2 = Not really
- 3 = Neutral, not sure
- 4 = Applies sometimes
- 5 = Definitely applies

[Closeness subscale:]

- 1. I share an affectionate, warm relationship with this child
- 2. If upset, this child will seek comfort from me
- 3. This child is uncomfortable with physical affection from me (reverse-coded)
- 4. This child values his/her relationship with me
- 5. When I praise this child, she/he beams with pride
- 6. This child spontaneously shares information about herself/himself
- 7. It is easy to be in tune with what this child is feeling
- 8. This child openly shares his/her feelings and experiences with me

[Conflict subscale:]

- 1. This child and I always seem to be struggling with each other
- 2. This child easily becomes angry at me
- 3. This child remains angry or is resistant after being disciplined
- 4. Dealing with this child drains my energy
- 5. When this child wakes up in a bad mood, I know we're in for a long and difficult day
- 6. This child's feelings toward me can be unpredictable or can change suddenly
- 7. This child is sneaky or manipulative with me

Adapted Items (Child-reported)

Does your teacher...

- 1. Help you if someone is teasing you?
- 2. Tell you you're good at doing things?
- 3. Make you feel better if you're having a bad day?
- 4. Make you feel happy?
- 5. Cheer you up if you feel sad?
- 6. Ask other kids to share things like stickers, toys, and games with you?
- 7. Help you if you hurt yourself on the playground?
- 8. Make you feel better if something is bothering you?
- 9. Help you if kids are being mean to you?
- 10. Tell you you're a good worker?
- 11. Ask other kids to let you play with them?
- 12. Tell you she's proud of you?
- 13. Listen to what you say if you got into trouble?
- 14. Care about how you do in school?
- 15. Know you very well?
- 16. Like to be with you?
- 17. Like other kids in your class better than you?
- 18. Seem to have enough time for you?

**Items from Health Behavior Questionnaire (Parent-reported and Teacher-reported)**

Source: Armstrong, Goldstein, & The MacArthur Working Group on Outcome Assessment, 2003

Instructions: Please consider the descriptions contained in each of the following items below and rate the extent to which each of these descriptions applies to this child. For example, select Often or very true if the child displays the behaviors described in the statement most of the time, select Sometimes or somewhat true if the child occasionally displays the behavior, and select Never or not true if the child seldom displays the behavior.

- 1 = Never or not true
- 2 = Sometimes or somewhat true
- 3 = Often or very true

[Aggression scale:]

1. When mad at a peer, keeps that peer from being in the play group
2. Tries to get others to dislike a peer
3. Tells others not to play with or be a peer's friend
4. Tells a peer that he/she won't play with that peer or be that peer's friend unless that peer does what he/she asks
5. Verbally threatens to keep a peer out of the play group if the peer doesn't do what he/she wants
6. Tells a peer that they won't be invited to his/her birthday party unless that peer does what he/she wants

[Conduct problems scale:]

1. Steals; takes things that don't belong to him/her
2. Lies or cheats
3. Vandalizes
4. Sets fires<sup>a</sup>
5. Cruel to animals
6. Physically attacks people
7. Threatens people
8. Destroys his/her own things
9. Destroys things belonging to his/her family or other children
10. Disobedient at school
11. Uses a weapon when fighting

[Defiance scale:]

1. Has temper tantrums or hot temper
2. Argues a lot with adults
3. Argues a lot with peers
4. Defiant, talks back to adults
5. Blames others for his/her own mistakes
6. Is easily annoyed by others
7. Angry and resentful
8. Gets back at people
9. Swears or uses obscene language

[Hostility scale:]

1. Taunts and teases other children
2. Does things that annoy others
3. Kicks, bites, or hits other children
4. Gets in many fights

<sup>a</sup>Item not included in Teacher version