

Self Regulation and Children's Relationships with Teachers and Peers in the Classroom:
Developmental Pathways and Trajectories

A Dissertation

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Doctor of Philosophy

By

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DEDICATION

This work is dedicated to my husband, Etan Mintz. Your support, encouragement, wisdom, friendship, and love throughout this process made it all possible. I also dedicate this work to our daughter, Ilana and son, Shlomo, the lights and joys of our lives.

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Running Head: EFFORTFUL CONTROL AND RELATIONSHIPS: LINK

Effortful Control and Children's Relationships with Teachers and Peers: Rationale and
Conceptual Link Across Three Dissertation Studies

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The Three Manuscript Dissertation: Overview

This dissertation presents a line of research exploring the associations between children's effortful control abilities and relationships with teachers and peers in the classroom. The proposal is written according to guidelines in the Curry School of Education's Dissertation Manual: Guidelines for Doctoral Dissertations for the manuscript-style dissertation option.

The Curry School Guidelines require the student to take a lead role on two research papers, contribute to a third research paper, and submit an additional document that articulates the conceptual link among the manuscripts. I am the lead author on all three of the studies described here. The first study is published in *Early Education and Development*, the second study is under review at the *Journal of School Psychology*, and the third study will be submitted to a peer-reviewed journal upon completion.

All three manuscript-style studies are conceptually linked while representing a unique contribution to the field. The remainder of this dissertation covers the rationale for the current line of research and the theoretical framework shared by the three studies. Additionally, each of the three manuscripts is presented in its entirety.

Rationale for Work

Children's effortful control abilities and relationships with teachers and peers in the classroom are powerful predictors of social and academic success or difficulties throughout the school years (Eisenberg et al., 2000; Hamre & Pianta, 2001; Ladd, 1990; Lerner, Lerner, & Zabski, 1999). Children's self-regulatory and relational skills lay the foundation for engaging productively in the classroom and are linked with social competence, popularity, test scores, and grades throughout the elementary school years and beyond (Birch & Ladd, 1997; Eisenberg et al., 2003; Hamre & Pianta, 2001; Ladd & Burgess, 2001). The development of children's effortful control and relationship skills occurs in the context of their early experiences, both with parents as well as with teachers and peers in the classroom (Booth-LaForce & Oxford, 2008; Lengua, Honorado, & Bush, 2007; Liew, Chen, & Hughes, 2010). Children both influence and are influenced by their environments, and develop through these transactional and bi-directional interactions (Sameroff & Fiese, 2000). Research is needed to more fully understand how early experiences contribute to the development of children's effortful control skills and relationships in the classroom, as well as the ways in which these constructs are related to one another during the early school years. Identifying the mechanisms through which children's effortful control skills and relationships develop can help inform prevention and intervention to mitigate children's risk for poor social, emotional, and academic outcomes. The goal of this dissertation is to investigate the associations between children's effortful control skills and relationships as well as the early parenting and classroom experiences that contribute to the development of these skills.

This research is guided by the transactional model of development. This theory posits that children's environment influences them, while children simultaneously exert influence on their

environment. It is this interplay between children's characteristics and their environments that promotes learning and development (Sameroff & Fiese, 2000). Given the complexities and bi-directional nature of children's development, it is crucial to consider the transactions between the child and their context in understanding children's outcomes. For example, while children's effortful control abilities have a highly genetic and temperamental basis, recent research suggests that they are malleable based on children's environments, relationships, and experiences (Blair & Diamond, 2008). The current studies draw upon this theory in conceptualizing how children's self-regulatory skills and relationships with teachers and peers in the classroom mutually influence each other across development.

I. Processes Implicated in the Development of Effortful Control and Relationships

The goal of the present research is to examine the early experiences that contribute both to the development of children's effortful control skills and to their relationships in the classroom. While research conducted to date has elucidated several of the early processes that contribute to the development of children's self-regulation and relationship skills, further research is needed to fully examine the processes involved in the development of these skills. Maternal sensitivity is one early process that has been implicated in the development of children's self-regulatory skills (Eisenberg et al., 1993; Valiente, et al., 2003) and their social and relational skills (Jerome, Hamre, & Pianta, 2009; Kochanska et al., 2000). In terms of maternal influences on the development of self-regulation, Silverman and Ragusa (1990) found that children of more intrusive mothers performed more poorly on a task assessing inhibitory control than children of more sensitive mothers who supported their children's independence. Maternal sensitivity has also been shown to be directly linked to children's social and relational development. Children of more sensitive mothers have been shown to have fewer behavior

problems and better social skills in first grade (NICHD ECCRN, 2003). More specifically, Jerome, Hamre, and Pianta (2009) found that lower maternal sensitivity at 54 months was associated with greater conflict with teachers from kindergarten through sixth grade. Maternal sensitivity therefore plays a critical role in the development of children's self-regulatory skills and relationships. Because of the evidence suggesting that maternal sensitivity is important for the development of both self-regulatory and relationship skills, I examined in paper one how maternal sensitivity is associated with both children's effortful control and relationship skills.

II. Stability of Effortful Control Skills

Self-regulation is an umbrella term that includes the cognitive, social, emotional, and behavioral control skills that enable children to be successful in school. Effortful control can be thought of as one of the cognitive components of self-regulation, and is defined as the ability to focus attention and inhibit impulsive behaviors (Rothbart, 1989). Effortful control is considered a temperamentally based component of self-regulation, and refers to voluntary control over approach or inhibition, and behavioral tendencies regarding attention (Eisenberg, Valiente, & Eggum, 2010; Rothbart & Bates, 2006). The two primary components of effortful control are inhibitory control and attention focusing. Inhibitory control refers to children's volitional ability to inhibit a desired response, for example, being able to stop an enjoyable activity when told no. Attention focusing refers to children's focus and concentration while engaging in tasks. Effortful control has been implicated as a critical component in the development of children's relationships.

The moderate stability of effortful control skills has been demonstrated in multiple studies. Kochanska, Murray, and Harlan (2000) found that children's effortful control skills at 22 and 33 months were moderately correlated, indicating significant continuity prior to school entry.

Carlson, Mandell, and Williams' (2004) study examined the stability of inhibitory control and attention focusing separately in a sample of pre-school age children. They found that both children's inhibitory control and attention focusing skills were moderately correlated between 24 and 39 months, indicating the stability of effortful control in early childhood. There are few studies suggesting that there is moderate stability of skills during the elementary school period as well. For example, Kremen and Block (1998) reported consistency between children's ego control (a construct similar to inhibitory control) as rated by children's parents and teachers from ages 4 to 11. In their longitudinal study of children's emotionality and regulation between ages 4 and 12, Murphy (2003) found significant stability in both constructs over time. Interestingly, the authors found that attention focusing increased in consistency over time. For girls, impulsivity levels decreased as they aged, and behavioral regulation increased over time for both boys and girls. The present studies built upon these findings to demonstrate the moderate stability of effortful control (inhibitory control and attention) during elementary school as well as the processes involved in the development of children's self-regulation skills in preschool.

III. Stability of Teacher-Child and Peer-Child Relationships

Teacher-child relationships have been identified as a crucial contributor to children's adaptation to school and success during the school years (Birch & Ladd, 1997; Howes, Matheson, & Hamilton 1994). Similar to parent-child relationships, teacher-child relationships are crucial for children's social and emotional development, and are therefore influential in children's positive or negative adaptation in school (Pianta, 1999).

Similar to effortful control, research indicates that children's relationships with teachers are moderately stable across development (Howes, Hamilton, & Phillipsen, 1998; Howes & Hamilton, 1992; Li-Grining, 2007; Pianta & Stuhlman, 2004). Children with conflictual

relationships with teachers are at significant risk for social, academic, and behavioral problems into later childhood and adolescence (Eisenberg et al., 2005; Eisenberg et al., 2009; Henricson & Rydell, 2004). Howes, Hamilton, and Philipsen (1998) found that children who had more secure relationships with their teachers in toddlerhood viewed their teachers more positively at age nine. Based on attachment theory, the authors propose that children may develop an internal working model for teachers in general during their early school years that they apply as their teachers change each year. Several studies have examined the stability of conflict and closeness specifically using the Student Teacher Relationship Scale (STRS; Pianta, 2001). Pianta and Stuhlman (2004) found moderate stability for conflict and slightly less consistency for closeness. Interestingly, the authors found a general trend indicating that both conflict and closeness with teachers appeared to decrease over time. Longitudinal analyses have yielded similar results about the stability of both conflict and closeness. Jerome, Hamre and Pianta (2009) found that conflict was more stable than closeness, but that both were moderately stable from kindergarten through sixth grade. Multiple studies using the STRS have yielded similar results, indicating that both conflict and closeness are moderately stable across development, with conflict being more stable across the school years (Blacher, Baker, & Eisenhower, 2009; Jerome, Hamre, & Pianta, 2009; NICHD ECCRN, 2004). Thus, previous research suggests that both early effortful control skills and children's relationships are moderately stable and are linked to outcomes in later childhood and adolescence.

IV. Associations Between Effortful Control and Children's Relationships

In the school setting, children's effortful control abilities are important in the development of close and supportive relationships with teachers and peers (Gresham, 1998). There is a robust literature linking effortful control to teacher-child and peer-child relationships

in the classroom. Spinrad and colleagues (2006) found that children's attention focusing and impulsivity in early childhood was significantly associated with both social competence and adult-rated popularity two years later. Silva et al. (2011) examined children's effortful control abilities and relationship quality with teachers in an ethnically and socio-economically diverse sample. They found that effortful control was positively associated with teacher-child closeness, and negatively correlated with conflict. Thus, previous research suggests that the ability to control attention and behavior may help cultivate the social skills needed to foster close and positive relationships with teachers (Eisenberg et al, 1993; Valiente et al., 2003).

Rudasill and Rimm-Kaufman (2009) conducted an investigation of the contributions of children's effortful control at 54 months to teacher-child relationships in first grade with 819 children using data from the NICHD Study of Early Child Care. The authors discovered that children's effortful control significantly contributed to teacher-child conflict and closeness, such that children with lower effortful control skills displayed greater conflict with teachers, and higher effortful control skills were associated with more closeness. In a study examining these associations with older elementary age children, Rudasill, Reio, Stipanovic, and Taylor (2010) found once again that children with difficult temperaments (which included activity, anger/frustration, approach, and inhibitory control) at age four displayed greater conflict with teachers in fourth, fifth, and sixth grade. In terms of peer-child relationships, children with well-developed abilities to regulate their attention, behavior, and emotions are more well-liked by their peers (Wilson, 2003). These findings have been found with both preschool-aged and elementary-school aged children. For example, Olson and Lifgren (1988) found an association between poorly regulated and more highly impulsive pre-school aged children and negative popularity ratings by peers. Spinrad et al. (2006) found that children's effortful control abilities

predicted children's popularity with peers in elementary school. Thus, there is evidence that children's early effortful control skills are important for relationships later in the school years. While much of the previous literature provides evidence for a link between children's effortful control skills and relationships with teachers and peers, further research is needed to understand the precise ways in which these constructs are associated. The third study addresses this question by examining how conflictual relationships in the classroom impact the development of children's self-regulation and inhibitory control skills.

IV. A Three Study Approach

The goal of this dissertation proposal is to contribute to the field's understanding of the association between children's emerging effortful control skills and their relationships in the classroom, and the early processes that contribute to their development. These studies complement each other by using large datasets to examine specific aspects of the development of effortful control and children's relationships. Findings from these studies provide valuable information that can inform early prevention and intervention initiatives designed to mitigate the risks of negative outcomes for children.

The studies presented in this dissertation will add to this literature by examining maternal and classroom processes that may contribute to the development of children's effortful control skills and relationships during the school years. This dissertation examines 1) how maternal sensitivity contributes to children's developing effortful control and relational skills, 2) the trajectories and bi-directional associations between effortful control and relationships across the school years, and 3) the development of inhibitory control and self-regulation in preschool and how conflict and gender may contribute to change in the development of children's self-regulatory skills.

The first study, *The Role of Effortful Control in Mediating the Association between Maternal Sensitivity and Children's Social and Relational Competence and Problems in First Grade* examined the association between maternal sensitivity and children's social and relational competence and problems in first grade, as well as the extent to which this association is mediated by children's effortful control abilities. The aim of this study was to better understand the mechanisms that contribute to the development of children's relationships with teachers and peers in the early years of schooling. Results from this study demonstrated that children of more sensitive mothers had greater social and relational competence and fewer problems. This association was partially mediated by children's effortful control skills (specifically inhibitory control), such that children of more sensitive mothers displayed better developed inhibitory control skills, which was in turn related to better social competence. This study lays the groundwork for the subsequent studies by demonstrating that there is an association between children's effortful control skills and their relationships in the classroom.

Given that children's effortful control skills were associated with better social and relational outcomes, I was interested in better understanding the developing associations between these constructs. Paper two, *Longitudinal Associations between Effortful Control and Children's Relationships with Teachers across Elementary School*, therefore investigated the reciprocal associations between children's effortful control abilities and conflict and closeness with teachers across the elementary school grades (from 54 months through fifth grade). Results of this study indicated that children's effortful control (inhibitory control and attention) skills were moderately stable across development, as were children's relationships with teachers, though conflict was more stable than closeness. Additionally, the associations between children's effortful control skills and conflict with teachers appeared to be reciprocal, indicating that across

the school years, children's effortful control difficulties and relational difficulties exacerbate each other. In terms of effortful control and closeness, there was no relationship between children's attentional abilities and closeness with teachers. There was a bidirectional association between inhibitory control and closeness, but it was not as strong as for conflict. This study helped to elucidate the reciprocal associations between children's effortful control skills and relationships with teachers across the school years.

In the third study, *The Role of Conflict in the Development of Inhibitory Control in Preschool Children: The Moderating Role of Fall Inhibitory Control Skills and Gender*, I built upon the findings of the two earlier studies to develop a clearer picture of the processes involved in the early development of children's inhibitory control and broader self-regulatory skills. This study examined whether children's conflictual relationships with teachers and peers was significantly associated with the development of their inhibitory control or self-regulation skills. Additionally, I examined whether children's early inhibitory control and self-regulation skills (in the fall of pre-kindergarten) moderated the association, such that children with early self-regulatory difficulties were particularly susceptible to the detrimental effects of conflictual relationships. We also examined the moderating role of gender to examine whether boys or girls were particularly vulnerable to the negative effects of teacher or peer conflict. We found that children's conflictual relationships with teachers were significantly negatively associated with the development of children's self-regulation skills. Additionally, there was a significant gender interaction, such that girls with conflictual relationships with teachers showed fewer gains in their inhibitory control skills from the fall to spring of prekindergarten.

Current applied research indicates that interventions designed both to work to improve children's self-regulation skills as well as those to improve teacher-child relationships have yielded promising results regarding the ability of targeted interventions to improve children's self-regulation and the promotion of supportive teacher-child relationships. (Barnett, et al., 2008; Driscoll & Pianta, 2010). My goal is for the three studies in this dissertation to continue guiding prevention and intervention work with children and teachers to support children with self-regulatory and relationship difficulties in the classroom. The remainder of this dissertation provides the completed manuscripts for the three studies.

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The Role of Effortful Control in Mediating the Association between Maternal Sensitivity and
Children's Social and Relational Competence and Problems in First Grade

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Abstract

This study examined the extent to which maternal sensitivity in infancy and toddlerhood is associated with children's social and relational competence and problems in the early years of schooling as well as the extent to which this association is mediated by children's effortful control abilities. Data from 1,364 children (705 boys, 659 girls), their mothers, and teachers from the longitudinal National Institute of Child Health and Human Development Study of Early Child Care and Youth Development were used. Maternal sensitivity was assessed by coding semistructured videos of mother-child interactions; effortful control was assessed by maternal report; and children's social competence, problems, and relationships with teachers and peers were assessed by school observations and teacher report. Structural equation models examined the extent to which there was an association between maternal sensitivity and children's social and relational competence and problems as well as the extent to which this association was mediated by children's effortful control skills. Maternal sensitivity had a direct association with children's social and relational competence and problems in 1st grade. Children's inhibitory control partially mediated the association between maternal sensitivity and the quality of children's skills. The results are discussed in terms of the importance of interventions geared toward improving maternal sensitivity and children's effortful control skills to help children develop better social and relational skills to foster close and supportive relationships with teachers and peers.

The Role of Effortful Control in Mediating the Association between Maternal Sensitivity and Children's Social and Relational Competence and Problems in First Grade

Children's abilities to form close and supportive relationships with teachers and peers are predictive of later social and academic success in school (Hamre & Pianta, 2001; Ladd, 1990; Lerner, Lerner, & Zabski, 1999; Birch & Ladd, 1997). Ladd (1990) found that kindergarten children who had more friends and maintained those friendships throughout the year had better school adjustment and school performance at the end of the school year. Positive teacher-child relationships provide children with school social support that help children stay identified with and feel positively towards school (La Paro, Pianta, & Stuhlman, 2004; Pianta, 1999; Pianta & Stuhlman, 2004). Despite the importance of social relationships for children's development, a survey of kindergarten teachers in United States found that 50% teachers believed that the majority of the children in their current classroom lacked competencies in building peer relationships (Rimm-Kaufman, Pianta, & Cox, 2000).

Given the importance of developing social and relational skills for children's school success, it is critical to identify the processes that help children develop these competencies. Children's earliest social relationships are with their parents and these relationships are critical to the development of children's emerging social abilities. Early parent-child relationships are associated with later adjustment as children transition to school (Clark & Ladd, 2000). Supportive parenting is associated with popularity among peers (Ladd & LeSieur, 1995), while non-supportive parenting predicts peer rejection and aggression (Carson & Parke, 1996).

In examining the association between early maternal sensitivity and children's social and relational competencies, it is important to identify the developmental mechanisms through which early maternal sensitivity may be associated with later relationships. One likely mediator is

effortful control, or children's abilities to volitionally control behavior and inhibit undesired responses (Rothbart, 1989). Kochanska, Murray, and Harlan (2000) found that children who received more sensitive and responsive mothering had greater effortful control skills. Research has also shown that children who can regulate their behavior have better social skills than their dysregulated peers (Gresham, 1998), and that effortful control is linked to social competence (Lemery, Essex, & Snider, 2002). The current paper examines whether children's effortful control skills mediates the association between maternal sensitivity and children's later social and relational competence and problems.

Social Competence and Relationships in the Classroom

An individual's ability to develop social skills is critical for later school success. The ability to form close, supportive, and non-conflictual relationships with others is a primary task of social competence during the early school years (Birch & Ladd, 1997; NICHD ECCRN, 2003). Children spend the majority of their days interacting with their teachers and peers during this developmental period (Howes, Hamilton, & Phillipsen, 1998). It logically follows to examine children's emerging social skills by measuring their relational competence and problems in interactions with teachers and peers. In a longitudinal study of children from kindergarten through eighth grade, Hamre and Pianta (2001) found that children who form high quality relationships with their teachers in kindergarten displayed better social and academic skills in middle school than their counterparts with poorer teacher relationships. Children's peer relationships are also associated with social success in the classroom. Ladd, Kochenderfer, and Coleman (1996) found that friendships and peer acceptance during the early school years predicted children's school adjustment. Further, effortful control also plays a role in a child's relational and social competence (Eisenberg, Valiente, & Eggum, 2010).

The inability to develop appropriate relational skills is considered a risk factor for problematic school functioning both in current and later school years (Asher & Coie, 1990). Children with conflictual relationships with teachers are at risk for later social and behavioral problems in school (Ladd & Burgess, 1999). In a longitudinal study of the behavioral characteristics that place children at risk for maladaptive social functioning, Ladd and Burgess (1999) found that children were most vulnerable if they displayed aggressive behavior, low peer acceptance, and conflictual teacher-child relationships. Children who are unable to form positive and close relationships with peers are more likely to perform poorly in school, feel lonely, and are more likely to experience psychological or behavioral problems (Ladd & Troop-Gordon, 2003). Not only does the development of relational competencies enable children to succeed in school, but the absence of these skills is associated with children's difficulty with social relationships throughout middle childhood.

Multiple researchers have observed the concordance between children's relationships with their teachers and peers (e.g. Howes, Hamilton, & Matheson, 1994; Howes, Hamilton, & Philipson, 1998; Rimm-Kaufman et al., 2002). For example, Howes et al., (1998) found that children's perceptions of their relationships with teachers at age nine was associated with teachers' ratings of children's relationships with peers. Additionally, research indicates that during the preschool years, children's relationships with their teachers are related to their social competence with peers (Howes et al., 1994). Such findings indicate, in early childhood, children's relationships tend to be similar across individuals within a classroom setting.

Child and Maternal Influences on Social Skills

Research reveals a link between higher levels of maternal sensitivity and the development of subsequent social competence and close relationships. Maternal sensitivity is defined by

Ainsworth and colleagues (1978) as the mother's availability and responsiveness to the child's needs and ability to support the child's growing need for autonomy by following the child's signals consistently and appropriately.

Maternal sensitivity, as observed during play tasks of semi-structured video interactions, is consistently linked to children's social competence in the NICHD study (NICHD ECCRN, 2002a; 2003). For example, children with mothers who are more sensitive and engage in responsive interactions have fewer behavioral problems and increased social skills in first grade (NICHD ECCRN, 2003). Other studies also provide support for the relationships between maternal sensitivity and development of social skills. McElwain and Volling (2004) found that greater maternal sensitivity in infancy was associated with more positive interactions with a friend (selected by the study child) during an observed play session when the children were four. Further, in a study examining the associations between mother-child and teacher-child relationships on child outcomes in the early years of schooling, Jerome, Hamre, and Pianta (2009) found that lower maternal sensitivity at 54 months predicted greater conflict with teachers in kindergarten to sixth grade. Pianta, Nimetz, and Bennett (1997) found that the overall quality of mother-child interactions predicted children's social adjustment in kindergarten. Thus, maternal sensitivity has been linked to both social competence (e.g. McElwain & Volling, 2004) as well as social and behavioral problems (e.g. Bradley & Corwyn, 2007).

It is important to understand the developmental mechanisms through which maternal sensitivity is linked to the development of social relationships. Effortful control is one possible mechanism, as it is associated both with maternal sensitivity and with social development. Effortful control, one component of children's self-regulatory abilities (Caspi & Shiner, 2006),

is defined as a level of volitional control that emerges during children's early development (Rothbart, 1989). Rothbart and Bates (2006; p. 129) describe effortful control as "the efficiency of executive attention, including the ability to inhibit a dominant response and/or to activate a subdominant response, to plan, and to detect errors." Effortful control skills include the ability to voluntarily shift one's attention as well as the capacity to initiate and inhibit behaviors (Caspi & Shiner; Kieras, Tobin, Graziano, & Rothbart, 2005). Inhibitory control and attentional focusing were both assessed by maternal report in the current study. Examples of inhibitory control in the classroom include raising hands before speaking, taking turns while playing with peers, and waiting in line. Attentional focusing assesses children's abilities to follow a teacher's directions, remain engaged in tasks through completion, and filter out distractions in the classroom setting.

While effortful control is believed to have a largely constitutional basis, research has demonstrated that it is influenced by environmental experience (Rothbart & Bates, 2006). Recent evidence points specifically to sensitive parenting as a crucial factor in children's development of effortful control skills (Kochanska et al, 2000; Lengua, Honorado, & Bush, 2007; Olson, Bates, Sandy, & Schilling, 2002). Kochanska et al. (2000) found that greater maternal responsiveness at 22 months predicts children's effortful control at both 22 and 33 months. In their longitudinal study of early precursors to children's impulsive and inattentive behavior, Olson and colleagues (2002) demonstrate that lower levels of maternal restrictiveness when children were six months were significantly related to children's inhibitory control at eight years.

There are multiple pathways through which sensitive parenting may promote the development of effortful control. Kopp (1982) describes that in early infancy, caregivers provide children with external regulation, but as the child develops and the parent provides increasing autonomy, children's regulation becomes internal. Research supports that children of more

intrusive mothers perform more poorly on a delay task than children of mothers who supported independence (Silverman & Ragusa, 1990). It is possible that overly involved mothers fail to provide their children the opportunity to learn to internally regulate. Mothers may also serve as models for their children as to how to manage emotions and behavior, such that more anxious and disapproving mothers model dysregulation and more supportive and warm mothers model how to effectively regulate their emotions (Halberstadt, Crisp, & Eaton, 1999). From an attachment perspective, it is also possible that warm and supportive mothering fosters a positive mother-child attachment, which in turn enables children to develop better regulatory skills (Calkins, 2004; Thompson, 2006).

Effortful Control and Children's Social Competence and Relationships

Research indicates that children who are able to regulate have better social skills than their dysregulated peers (Gresham, 1998), and that effortful control is linked to social competence (Lemery, Essex, & Snider, 2002). Children who score lower on measures of effortful control demonstrate more behavior problems than their peers (Eisenberg et al., 2001; Kochanska & Knaack, 2003). Better developed effortful control skills in children are linked to children's prosocial behavior (Rothbart, Ahadi, & Hershey, 1994) and social competence (Calkins, Gill, Johnson, & Smith, 1999). In a study of the transition to school for children with and without intellectual disabilities, McIntyre, Blacher, and Baker (2006) found that inhibitory control (as measured by latency in touching a desired toy) at 36 months was significantly related to teacher-reported problem behavior at 60 months. In terms of broader self-regulation, Eisenhower, Blacher, and Baker (2007) found that children's self-regulatory abilities were significantly correlated with positive child-teacher relationships. Further, observed child self-

regulation and mother report of child behavior problems at age three accounted for 9.8% of the variance in student-teacher relationships at age six.

In the school setting, children's effortful control abilities are important in the development of close and supportive relationships with teachers and peers (Gresham, 1998). The transition to school presents new behavioral, academic, and social demands on the child. As such, the ability to inhibit one's behavior and shift attention are particularly important skills in predicting school adjustment.

Overview of the Present Study

The current study makes several unique contributions to the literature. Numerous studies elucidate the role of early parenting in children's social development (See Booth-LaForce & Oxford, 2008; Lucas-Thompson & Clarke-Stewart, 2007; NICHD ECCRN 2003; 2004). However, most of this work broadly examines social competence rather than specifically focusing on the relational aspects of social competence and problems. Additionally, few studies have investigated potential mediational pathways that may help to explain the association between parenting and children's social outcomes. The current study extends the literature by examining the potential mediational pathway of child effortful control. Additionally, this study extends the literature by focusing specifically on social skills needed to effectively navigate relationships in the school setting.

There is some evidence that self-regulatory skills may mediate the associations between parenting and social competence in older children (Eisenberg, et al., 2001; Eisenberg et al., 2003), but only a few studies have examined this effect with younger children. For example, Spinrad and colleagues (2007) found that toddlers' effortful control mediated the association between maternal support and lower levels of externalizing problems and separation distress and

higher social competence. Kochanska and Knaack (2003) found an association between less developed effortful control abilities in toddlerhood and children's externalizing problems at 6 years of age. The current study will extend this inquiry by examining whether this mediational association holds true for children's relationships as they begin elementary school. A further strength of the current study is our examination of two components of effortful control (inhibitory control and attentional focusing) to investigate whether these processes have different influences on children's social and relational competence and problems.

The present study utilizes data from the multi-site, longitudinal NICHD Study of Early Child Care and Youth Development to examine the association between maternal sensitivity in early childhood and children's social and relational functioning in first grade. It also explores the extent to which this association is mediated by children's effortful control; that is, whether sensitive mothers provide their children with tools to learn to control their impulses which in turn contribute to their social skills and relationships during the early school years.

The study's research questions and hypotheses are as follows: (1) To what extent is exposure to maternal sensitivity in early childhood associated with children's social and relational skill development in first grade? It is hypothesized that higher ratings of maternal sensitivity will be associated with better developed social and relational competence and fewer problems in first grade. And (2) To what extent is the association between maternal sensitivity and social and relational competence and problems in the early school years mediated by children's effortful control, such that maternal sensitivity is associated with competencies in children that are related to their development of positive relationships with teachers and peers in first grade? It is hypothesized that children who received more sensitive mothering will have

better developed effortful control skills which will be associated with better social and relational competencies and fewer social and relational conflicts and problems in first grade.

Method

The data used for this study came from the longitudinal National Institute of Child Health and Human Development Study of Early Child Care and Youth Development. The study began in 1989 and aimed to investigate the relationships between various child care experiences and child developmental outcomes (NICHD ECCRN, 1993). Data was collected from families, child care settings, and children through multiple methods including observations, interviews, questionnaires, and individual child assessments.

Participants

Participants were recruited in 1991 from hospitals in or near 10 selected cities (Little Rock, AR; Irvine, CA; Lawrence and Topeka, KS; Boston, MA; Philadelphia, PA; Pittsburgh, PA; Charlottesville, VA; Morganton and Hickory, NC; Seattle, WA; and Madison, WI). Conditional random-sampling was conducted to ensure the diversity of participants across sites (please refer to NICHD ECCRN, 2001 for other sample details including exclusion criteria and sampling procedures). After the initial one month interview, data was collected during four phases: Phase I (birth to age 3), Phase II (age 3 through first grade), Phase III (second grade through sixth grade), and Phase IV (seventh grade through tenth grade). For the analyses in this study, data from Phases I and II were used. Of the 1,364 study participants, slightly over half of the children were boys ($n = 705$), 80.4% were European American ($n = 1,097$), and 19.6% were African American ($n = 176$), Asian American ($n = 22$), or other/mixed ethnicity ($n = 69$). In terms of maternal education, 10.2% of mothers completed fewer than 12 years of schooling ($n = 139$), 21.1% had obtained a high school degree ($n = 287$), 54.2 % had a 2- or 4- year college

diploma ($n = 739$), and 14.5% had completed at least some graduate work ($n = 198$). When the study children were one month of age, 85% of children were living with both their mother and father.

Overview of Data Collection

Mother-child observations occurred in the home when the study child was 6, 15, 24, and 36 months old. Demographic data was collected when the study child was one month of age, including child gender, maternal education, and the family's income-to-needs ratio. Classroom observations took place during first grade. At each data collection time point, mothers participated in interviews and completed questionnaires regarding major life events, family income, and changes in family composition. Teachers completed questionnaires assessing the nature of the child's relationship with themselves and with other children in the classroom.

Measures

Covariates. The covariates used in the current study were child's gender, maternal education, and the family's income-to-needs ratio. The income-to-needs ratio was calculated by dividing the total family income by the poverty threshold for the appropriate family size. For the current study, we averaged the income-to-needs ratio from the time the child was 1 month until 36 months to obtain a more stable estimate of the family's income level over several years.

Maternal sensitivity. Mother-child interactions were conducted when the child was 6, 15, 24, and 36 months old and trained observers coded the videotapes to assess maternal sensitivity. The 6 and 15 month interactions took place in the child's home, while the 24 and 36 months sessions took place in a laboratory. The videotaped interaction at the 6-month visit only involved a free-play session. For the 15, 24, and 36 month visits the mother and child participated in developmentally appropriate play and problem solving tasks.

A more specific description of the maternal behavior ratings follows. The ratings of maternal behavior looked at (a) sensitivity to non-distress and the extent to which mother-child interaction is characterized by prompt and appropriate responses to the child's social gestures, expressions, and signals, and is generally child-centered; (b) intrusiveness, the degree to which the mother imposes her agenda on the child as opposed to interacting in a way that provides a sense of control to the child; (c) positive regard for the child, the quality and quantity of expressions to the child that connote the mother's positive feelings toward the child; and (d) respect for autonomy, or the extent to which the mother supported the child's independence and followed their lead during the observation period. Overall, this measure assessed how warm, sensitive, attending, supportive, and responsive the mother was to the child's cues.

Composite maternal sensitivity scores were created from the 6, 15, and 24 month data from the sums of three 4-point global ratings (mother's sensitivity/responsiveness to non-distress, intrusiveness (reverse scored), and positive regard for the child). At 36 months, the maternal sensitivity composite was the sum of three 7-point ratings (maternal supportive presence, hostility (reverse scored), and respect for child's autonomy). These sensitivity indicators were standardized and averaged across multiple time points to provide an estimate of average level of maternal sensitivity across the 6-36 month time period. Cronbach's alpha exceeded .7 at every age. Videotapes of the interactions were sent to a location not involved in data collection. Inter-rater reliability was attained by assigning 19-20% of tapes to be watched and coded by two observers and inter-rater reliability exceeded .83 at each age for the maternal sensitivity composite scores.

Effortful control. Mother's completed the Child Behavior Questionnaire (CBQ) as a measure of the child's self-regulatory abilities at 54 months. The CBQ was originally designed

as a measure of child temperament. However, more recent research (e.g. Kochanska et al., 2000) has conceptualized these same skills as falling under the domain of self-regulation.

The original questionnaire has 196 items that assess 15 dimensions of temperament. For the NICHD study, only 80 items and eight of the subscales were used. The eight subscales fall under three broad domains of temperament: surgency, negative affectivity, and effortful control. For the current study, we were primarily interested in examining the effortful control domain of self-regulation, as those are the skills most pertinent to children's social development and behavior in the classroom. The NICHD study only administered the Attentional Focusing and Inhibitory Control scales of the CBQ to mothers (the subscales of effortful control not administered were Low Intensity Pleasure and Perceptual Sensitivity). The current study examined whether the two effortful control scales mediated the association between maternal sensitivity and children's relationships with teachers and peers.

The questionnaire consisted of items that describe children's reactions to different situations. Items are rated on a 7-point likert scale ranging from 1 (extremely untrue) to 7 (extremely true) to capture the child's reactions over the previous 6 months. Cronbach's alpha ranged from .60 to .85 for the eight subscales. The CBQ has been used in many studies and is linked to parents report of children's social behavior (Rothbart, Ahadi, & Hershey, 1994).

Student-teacher relationship scale. Teachers completed the Student-Teacher Relationship Scale (STRS; Pianta, 2001) during the spring of first grade to assess the teacher-child relationship. In this study, the STRS was administered during the spring of first grade. Using this 30 item questionnaire, teachers reported their perceptions of a particular students' relationship with them. Teachers rated how well each statement described their relationship with the study child on a 5-point Likert scale that ranged from 1 (*definitely does not apply*) to 5

(definitely applies). The two aspects of the teacher-child relationship that were used for the current study were conflict and closeness. The conflict subscale measures the degree to which the relationship is characterized by antagonistic, disharmonious, or negative interactions. The closeness subscale assesses the extent to which the relationship is characterized by warmth, open communication, and positive interactions. Higher scores on the STRS indicate more positive relationships for the closeness subscale, and lower scores indicate more conflictual relationships.

In terms of the reliability of the STRS, Cronbach's alpha were .86 and .93 for conflict and closeness, respectively. The STRS has been used extensively to measure teacher-child relationships in child care and elementary school (e.g. Birch & Ladd, 1997; Hamre & Pianta, 2001; Jerome, Hamre, & Pianta, 2009). The STRS has been linked to children's and teacher's behaviors in the classroom and associated with observational measures of the quality of teacher-child relationships (e.g. Birch & Ladd, 1997; Howes & Ritchie, 1999).

Classroom observation system. In the winter to early spring of first grade, classroom observations took place using the Classroom Observation System for first grade (COS-1; NICHD ECCRN, 2002b). All observations took place during the first half of the school day and began with the start of school in the morning. The observation period was approximately three hours. Composite scores were developed for children's positive and negative interactions toward the teacher and peers.

Children's positive/neutral interactions with the teacher were a sum of four scores: (1) child complies with teacher's request (coded when the study child complied with any direct request made by a teacher), (2) child requests (coded when the study child sought help, assistance, or clarification from the teacher), (3) child volunteers (coded when the study child raised his/her hand to answer a question or participate in an activity), and (4) child has social interaction with

teacher (coded when the study child engaged in spontaneous positive or neutral talk with the teacher, not including relaying academic knowledge). Children's negative interactions with the teacher were the sum of three scores: (1) child does not comply with teacher's request (coded when the study child passively or actively refused to comply with a teacher's direct request), (2) child is negative (coded when the study child demonstrated a variety of negative behavior toward the teacher, including physical or verbal aggression, angry gestures, or making faces), and (3) child is disruptive (coded when the study child demonstrated disruptive and annoying behaviors including bothering other children, calling out, or acting like the "class clown.")

Two composites from the Classroom Observation System (COS-1) were used for assessing children's relationships with peers. The first composite measured children's positive relationships with peers and was the sum of three scores: (1) child's cooperative activity with peers (coded when the study child was engaged in an activity in which he/she interacted with peers), (2) child's shared positive affect with peers (coded when the study child giggled, laughed, or smiled with a peer), and (3) child's social interaction with peers (coded when the study child engaged in positive or neutral talk with a peer). Children's negative interactions with peers were a composite of two scores: (1) child's physical aggression with peers (coded when the study child was physically aggressive, for example hitting, tripping, pushing, or pinching), and (2) child's other negative behavior with peers (coded when the study child carried out a negative act towards a peer, including name calling, scolding, taunting, or teasing).

For the COS – 1 observation, two 44-minute cycles were completed. In each cycle, observers made time-sampled recordings for three 10-minute periods of 30-second observe and 30-second record intervals. Thus, there were 30 different minutes in which discrete behaviors

were sampled across each of the two observation cycles for a total of 60 different minutes (i.e., 60 intervals) in which these codes were sampled (NICHD ECCRN, 2003).

Before entering the classrooms, observers were required to pass a videotaped reliability test of six 44 minute cycles. To pass the reliability training, observers had to match at least 60% with a master coder on time-sampled codes and 80% match within one scale point for the global rating scales. The average agreement for the observers for the gold-standard videotape for the time-sampled codes was .70. For the global teacher and classroom ratings, the average reliability for observers was estimated at .63. Live inter-rater reliability was assessed by paired visits to classrooms. Correlations between the observers exceeded .60 for 37 of the 44 time-sampled codes, with lower estimates when the behavior was infrequently observed. Correlations between observers for the global teacher and classroom ratings exceeded .70 for 8 of the 11 ratings.

Unstructured peer observation. The Unstructured Peer observation examined the study child's interactions with peers during recess, the least structured time of the school day. The procedure included 20 minute observation cycles during which observers followed a schedule of 30 second observe time and 30 second record time. For the present study, two composite scales were used: (1) Negative or aggressive play with peers, and (2) Shared positive affect with peers. Pearson correlations for the behavioral scales for the unstructured peer observation were moderately to highly correlated.

Social skills rating system. In addition to the observational measure of children's friendships, teachers completed the Social Skills Rating System (SSRS; Gresham & Elliot, 1990) when the child was in first grade. Each item is rated on a 3-point scale from 0 (*never*) to 3 (*very often*). A scale assessing peer competence was created for the NICHD Study of Early Child Care by summing 9 items from the SSRS and was not part of Gresham and Elliot's scoring system.

The Peer Competence scale was the only scale used for the present study and assessed how the target child behaves with peers (e.g., co-operates with peers without prompting; responds appropriately when hit or pushed by other children; makes friends easily), with higher scores indicating more positive, skilled interactions with other children. Reliability for the first grade Peer Competence scale was .85. The validity of the SSRS has been documented in Gresham and Eliot (1990). The Elementary Level form is highly correlated with other teacher report measures, including the Social Behavior Assessment (SBA), the Child Behavior Checklist (CBCL), and the Harter Teacher Rating Scale (TRS).

Teacher report form. Teachers also completed the Teacher Report Form (TRF) (Achenbach, 1991), a well-validated measure of children's problem behaviors and social competence. Children's behaviors are rated on 3-point scales from 0 (*not true of the child*) to 2 (*very true of the child*), and a computer program was used to determine whether children fall within a clinically significant range. For this study, only the Social Problems scale was used. Extensive reliability and validity information is available for the TRF. Internal consistency of the TRF ranges from .72 to .95 and inter-rater reliability is .60. Validity studies have demonstrated that children who receive scores in the clinical range are referred more frequently to clinical services and that elevated scores predict more severity and duration of difficulties.

Friends or foes. Teachers completed a survey of the study child's popularity called Friends or Foes that was created for the NICHD study. The questionnaire examined the study child's ability to make friends and interact with peers. For the present study, only the teacher's rating of the child's peer status was used. Children's peer status was calculated by summing 4 items (are there children who like to play with the study child, are there children who do not like to play with the study child (reversed), the study child is well liked by children of the same sex,

and the study child is well liked by children of the opposite sex). Internal reliability for ratings of the child's peer status was moderate, with Cronbach's alpha ranging from .81 to .88 over the data collection points.

Attrition and Missing Data

Participants in the current study were followed for six years of data collection. Of the original 1,364 children who entered the study, 966 were observed in their first grade classroom. Mplus 5.1 (Muthén & Muthén, 2007) is a program designed to address latent variable modeling and has properties to estimate the fit of the latent factor structures while accounting for missing data. For the current study, missing data was handled using the default full information maximum likelihood (FIML) algorithm. FIML estimation is considered the most efficient and unbiased method for handling missing data and decreases Type-I error rates compared to both listwise and pairwise deletion (Enders & Bandalos, 2001).

Analytic Plan

Descriptive statistics, including means and standard deviations were executed for all covariates, predictors, mediators, and outcome measures. The covariates entered into the model were child's gender, maternal education, and the family's income-to-needs ratio. Researchers used structural equation modeling (SEM) to examine both the direct effects of maternal sensitivity on children's social and relational functioning in first grade, as well as the extent to which effortful control mediated the association between maternal sensitivity and later relationships. The two domains of effortful control, attentional focusing and behavioral inhibition, were entered separately into the model so that we could examine if one aspect of effortful control contributed more significantly to children's later relationships. The errors were correlated between inhibitory control and attentional focusing given that the variables were

highly correlated ($r = .53$). Correlating the errors of the attentional focusing and inhibitory control improved model fit, and the models presented below include these terms.

We used SEM to combine indices of children's relationships into two latent variables for children's social and relational competence and problems. We collapsed the variables across teachers and peers for two reasons: First, from a theoretical perspective, research suggests that during the early school years when children are developing social and relational skills, it is prudent to assess their skill development more broadly, rather than specifically (e.g., by whom the child is interacting with). Additionally, research indicates that young children tend to have similar types of relationships (e.g., close versus conflictual) across different contexts and people in early childhood (Howes, Hamilton, & Phillipsen, 1998). In tandem with our theoretical model, preliminary analyses supported combining teacher and student relationships. In preliminary modeling building analyses, positive/neutral teacher interactions demonstrated a nonsignificant influence ($b = -.01$; $p = .68$) on the latent construct of social and relational competence. The likelihood ratio test indicated that dropping the variable did not influence the model fit, and thus this variable was removed from the model to present a more parsimonious model. Therefore, we chose to examine children's social and relational competence and problems across persons in the classroom.

Bootstrapping is a resampling technique used to test for the indirect effects of mediation (MacKinnon et al., 2004). Resampling methods create their own sampling distribution, rather than using established distributions of test statistics. These distributions are used to test hypotheses and generate confidence intervals to determine whether indirect mediation occurred (Williams & MacKinnon, 2008). In bootstrapping, a large number of smaller samples are

repeatedly selected from the larger dataset to create a sampling distribution. In the current study, 1,000 bootstrap samples were selected to test for the indirect effects.

Results

Descriptive statistics for all variables included in the analyses are presented in Table 1 and correlations among all independent, mediating, and dependent variables are depicted in Table 2. To answer the primary research questions, SEM was used to assess the extent to which 1) maternal sensitivity is associated with children's social and relational competence and problems, respectively (direct effect), 2) maternal sensitivity is associated with children's effortful control; and 3) the extent to which children's effortful control is related to their social and relational skills in first grade (indirect effects). Questions two and three address mediation examining the degree to which the association between maternal sensitivity and children's later social skills and relationships are partially mediated by the child's effortful control abilities. SEM provides statistics addressing overall fit of the hypothesized model compared to the observed data. Because chi square values are sensitive to sample size and are often found to be statistically significant when the sample size is large, other model fit statistics are frequently used to ascertain the goodness-of-fit of the model. The root mean square error of approximation (RMSEA) is reported here as an estimate of the fit of the model tested. Steiger (1990) suggests that a close model fit has a RSMSEA less than or equal to .05, RMSEA between .05 and .08 is considered an adequate fit, .08 to .10 is a mediocre fit, and greater than .10 is not an acceptable fit of the model to the data. Other researchers (e.g., Hu & Bentler, 1999) recommend that an RMSEA of .06 be used as the cut-off for a good model fit. The overall model indicated good model fit (RMSEA = .046, 90% confidence interval: .03 to .05), indicating an improvement of the model fit to the data. Additionally, the comparative fit index (CFI) for this data was .91.

Kenny and McCoach (2003) recommend interpreting a CFI between .90 and .95 as an acceptable fit to the data, and above .95 as a good fit, indicating that the current model is an adequate fit.

Direct Effects

Females were more likely to display higher social and relational competence than males ($\beta = .12$; $p < .01$). On average, females scored .12 points higher on the latent construct of social and relational competence compared to males. Children whose mothers had more education ($\beta = .14$; $p < .01$) were more likely to be rated higher in social and relational competence. That is, for every one year increase in mother's education level, children display a .14 increase in social and relational competence. Moreover, even after accounting for the covariates, there was a positive effect of maternal sensitivity on social and relational competence (see Figure 1). Alternatively, males were more likely to have higher scores on social and relational problems ($\beta = -.12$; $p < .05$). On average, males scored .12 points higher compared to females compared to social and relational problems. Children whose mothers who displayed lower sensitivity were more likely to display increased social and relational problems (see Figure 1).

Indirect Effects

In addition to the effects of maternal sensitivity on children's social and relational skills, we tested whether this association was partially mediated by children's effortful control skills. Specifically, we tested two components of effortful control, attentional focusing and inhibitory control. We tested these as separate mediators in order to examine the unique contribution of each aspect of the effortful control construct. Results from the SEM model indicated that maternal sensitivity was significantly associated with both attentional focusing ($\beta = .37$; $p < .001$) and inhibitory control ($\beta = .23$; $p < .001$), demonstrating the first necessary step in determining mediation (Baron & Kenny, 1986). Interestingly, attentional focusing was not

significantly associated with either children's social and relational skills or problems in first grade signifying no further need to examine mediation. However, inhibitory control was significantly associated with both children's social and relational competence ($\beta = .13$; $p < .01$) and problems ($\beta = -.25$; $p < .01$) in first grade. Results indicated a significant indirect effect of inhibitory control ($\beta = .03$, $p > .01$) on the relationship between maternal sensitivity and social and relationship competence. Further, child inhibitory control partially mediated the relationship between maternal sensitivity and social and relational problems ($\beta = -.06$, $p < .01$). Given that the mediating effect of inhibitory control was small for both outcomes, it is necessary to report bootstrap confidence intervals as they are more reliable estimates of the effect (Cheung, 2007; MacKinnon et al., 2004). The 95% unstandardized confidence interval for the indirect effects provided further evidence of a significant indirect effect of inhibitory control for social and relationship competence (0.04 to 0.16) and social and relational problems (-0.02 to -0.004). Results indicate that the influence of maternal sensitivity on children's social and relational competence and problems is partially explained by the child's inhibitory control.

Discussion

The results of this study suggest that maternal sensitivity, as observed from infancy through toddlerhood, is significantly associated with children's social and relational competence and problems in first grade. Maternal sensitivity was positively associated with children's social and relational competence and negatively associated with relational problems. These findings are in line with previous longitudinal research suggesting that maternal sensitivity from infancy, toddlerhood, and the preschool years is one of the strongest predictors of children's social development in the early years of school (Pianta & McCoy, 1997; Ramey, Ramey, & Phillips, 1996). The NICHD ECCRN (2003) found that the children of sensitive mothers were rated by

their first grade teachers as having fewer externalizing problems and greater social skills. While prior research has demonstrated the association between maternal sensitivity and children's later social functioning, this study contributed to the literature by also examining children's relationships within the school setting. Children's relationships with teachers and peers have been linked to both later academic and social-emotional outcomes (Baker, Grant, & Morlock, 2008; Birch & Ladd, 1997; Hamre & Pianta, 2001). Findings from the current study add to this literature by demonstrating that less sensitive parenting is one of the factors that may be associated with the development of social and relational problems during the early school years, and conversely, that greater maternal sensitivity is associated with social and relational skill development.

This study also examined the extent to which associations between early maternal sensitivity and children's relationships in first grade may be explained in part by the development of greater effortful control skills, particularly in the domain of children's inhibitory control. Results demonstrated that inhibitory control partially mediated the association between maternal sensitivity and children's relationships in first grade. This supports the hypothesis that children with more sensitive mothers in early childhood develop regulatory capacities that help them better adjust to the social environment of school. Interestingly, maternal sensitivity was significantly related to both dimensions of effortful control (attentional focusing and inhibitory control), but only inhibitory control was significantly associated with children's later social competence and relationships. This finding suggests that maternal sensitivity may contribute to the development of children's effortful control skills more broadly. However, consistent with the transactional model of development (Sameroff, 2009), it is also possible that children's behavior influences their parents' reactions. For example, it may be that children with better developed

effortful control skills may elicit more sensitive responses from their mothers since it may be easier to be sensitive to such children.

Our results suggest that inhibitory control may be more important to children's relationships in the classroom than attention focusing. As the demands of school increase, children are required to increasingly inhibit their impulsive responses. They are required to raise their hands before speaking, take their turns, and wait in line. In addition to the importance of complying with these requests for academic success, mastery of these skills is required for social success as well. Impulsive children who have difficulty controlling their behavior in the classroom are likely to have difficulty forming close and supportive relationships with their teachers and peers (Ladd, 1999; Spinrad et al., 2006). Attentional focusing assesses children's ability to attend to teacher's directions and remain engaged in classroom tasks. While this is an important skill for children's academic success, it is likely less related to children's relationships in the classroom. Furthermore, Nathanson, Rimm-Kaufman, and Brook (2009) found that behavioral inhibition was significantly associated with children's kindergarten adjustment, while attentional focusing was not. Thus, it appears that the behavioral rather than attentional components of effortful control are more important for children's social and relational success.

Previous research has demonstrated that regulating one's actions is important in the development of social relationships. More impulsive children (i.e. children who have difficulty consciously inhibiting their behavior) have significantly poorer relationships with peers in kindergarten (Gomes & Livesey, 2008) as well as more behavior problems (McClelland, Morrison, & Holmes, 2000). In their study of self-regulation and parenting styles, Nathanson et al., (2009) found that children with poor inhibitory control had more difficulty adjusting to kindergarten than children with better inhibitory control, but that attentional focusing was not

associated with kindergarten adjustment. Thus, inhibitory control may be the component of effortful control that is most crucial for the development of children's social relationships, particularly in the classroom. Given that, in the current study, inhibitory control was found to partially mediate both social/relational competence and problems suggests that children's ability to inhibit their impulsive behaviors is important both for the prevention of social problems as well as for the promotion of social and relational competence in the classroom.

While inhibitory control demonstrates an indirect effect on children's relationships with teachers and peers in first grade, the mediation was only partial. It is likely that in addition to inhibitory control, there are other developmental processes that the association between maternal sensitivity and children's relational capacities. One possible mediator between maternal sensitivity and children's relationships is their language development. Research indicates that maternal sensitivity contributes to children's cognitive and linguistic development (Landry, Smith, Swank, & Miller-Loncar, 2000). Language development is a critical component of children's social development, as children with stronger language abilities are able to communicate their needs more effectively and have greater social competence (Longoria, Page, Hubbs-Tait, & Kennison, 2009). Because parenting (including maternal sensitivity) contributes to children's linguistic skills, and children's language abilities are linked to social competence during early schooling, testing whether language skills impacts the association would be an interesting area for future research.

Study Limitations

While this study adds to the literature, it does have some limitations. The sample was large and geographically diverse; however, several limits placed on inclusion in the study may limit its generalizability. Families without fluency in English, families living in very dangerous

areas, families of children with disabilities, mothers under age 18, and families with a substance abuse problem were excluded from the study. These exclusion criteria limit the application of the study to families who fit the criteria represented in the study. There was also limited ethnic and racial diversity within the sample, as 80% of participants were Caucasian. While 85% of study children were living with both parents at one month of age, the current study was not able to examine paternal sensitivity.

Observations for the study were conducted on a single day. This may have limited the robustness and reliability of children's observed behaviors in the classroom. Reliability could be increased by having observations on multiple days and at different times throughout the day (Downer, Booren, Lima, Luckner, & Pianta, 2010). It is therefore possible that the association between maternal sensitivity and relational outcomes were underestimated because the single day observational assessment is not as robust as assessment over a longer period. Additionally it should be noted that Cronbach's alpha for the maternal sensitivity observations were .7, which demonstrates moderate support for internal consistency.

Effortful control was only assessed by maternal report. In future studies, it will be beneficial to assess children's effortful control using direct observation, particularly in the classroom, as that is the most proximal assessment to the outcomes measured. It will be important to assess children's effortful control abilities in the classroom using multiple observation times so that the most valid and reliable estimate is obtained. Further, the Cronbach's alpha for the subscales of the CBQ were moderate (ranging from .6 to .85), indicating that items that were grouped together were only moderately associated with one another. However, it should be noted that Rothbart, Ahadi, Hershey, and Fisher (2001) reported a similar estimates for internal consistency of the CBQ subscales.

Finally, the nature of this study was non-experimental in design. While maternal sensitivity was significantly associated with children's later relationships, a causal pathway cannot be concluded. The directionality between maternal sensitivity and effortful control could not be determined from the findings, and the associations could be merely correlated or have bidirectional associations.

Despite these limitations, the findings from the current study provide support for the importance of sensitive parenting in early childhood for children's development of social and relational competence in first grade. In addition, this study shows support for inhibitory control as a partial mediator between these processes. The results indicate that sensitive parenting has important ramifications for children as they enter school.

Directions for Future Research and Practical Implications

Although this study demonstrated that the association between maternal sensitivity and children's later social and relational competence and problems is partially mediated by the child's inhibitory control abilities, further research is needed to examine these pathways more specifically. Future studies should examine whether maternal sensitivity is more important for children from various backgrounds. The differential susceptibility hypothesis postulates that children who are more sensitive to stimulation and have more difficult temperaments are more sensitive to their rearing experiences than other children (Belsky, Bakermans-Kranenburg, & van IJzendoorn, 2007). Thus, maternal sensitivity may be most important for buffering children who are more biologically predisposed to having difficult temperaments.

Another area for future research is the extent to which children who received less sensitive parenting can improve their social and relational competencies by having a sensitive teacher during their school years. Some researchers suggest that having a supportive and positive

relationship with an adult, not necessarily a parent, can help children facing multiple risks (Gambone, Klem, & Connell, 2002). It is important to identify the processes that may help children with less sensitive parents to develop relationships with caring adults. This may in turn help such children improve academically, socially, and emotionally.

The current study can help guide intervention research as well. This study points to the association between sensitive parenting in infancy and toddlerhood and later social and relational competence and problems. It therefore appears that the importance of sensitivity extends beyond early childhood, and has ramifications for children's relationships as they enter school. Interventions aimed at improving the sensitivity and responsiveness of parents of young children (e.g., Kalinauskiene et al., 2009; Stolk, et. al, 2008) will likely improve children's relationships beyond early childhood and into the school years.

As this study also demonstrated that inhibitory control is a significant partial mediator between parenting and classroom processes, targeting inhibitory control may be another way to improve children's social and relational skills. Children with better abilities to regulate and control their impulsive behavior have less conflict and negative interactions with teachers and peers. Improving children's effortful control, particularly in the domain of inhibitory control therefore appears to be an important area for intervention to improve children's relationships.

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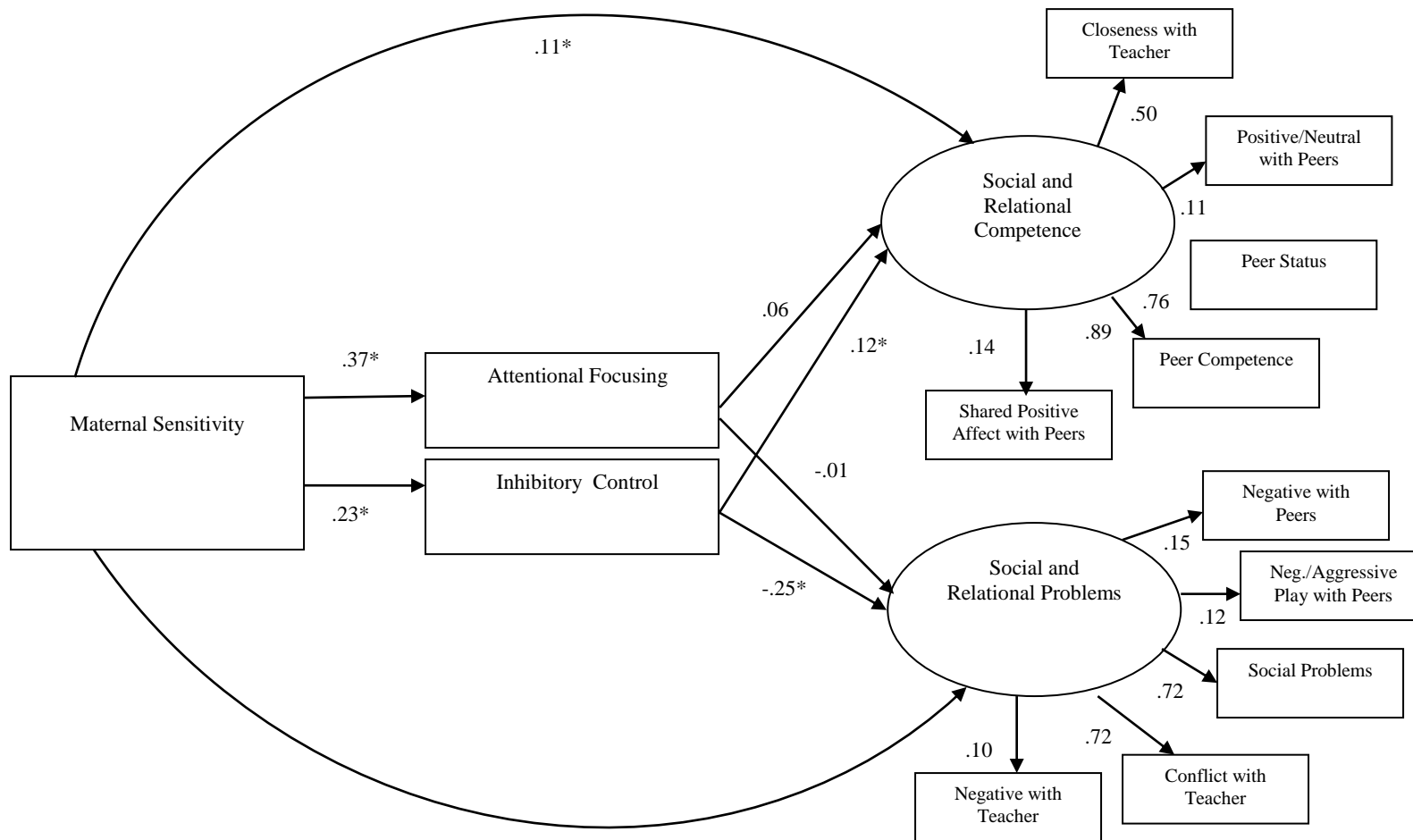
Table 1: Descriptive Statistics for Independent, Mediator, and Dependent Variables

<i>Variable</i>	<i>M</i>	<i>SD</i>	<i>N</i>	<i>Range</i>
Covariates				
Maternal Education (years)	14.23	2.51	1363	7-21
Income-to-needs ratio	3.27	2.79	1365	0-18.76
Independent Variable				
Maternal Sensitivity	-.02	.77	1306	-3.07-1.57
Mediator Variables – CBQ				
Effortful Control				
Attentional Focusing	4.71	.85	1023	1.25-6.88
Inhibitory Control	4.66	.78	1061	2.00-6.70
Outcome Variables				
Social and Relational				
Competence				
Closeness with Teacher (STRS)	33.96	5.04	1006	12-40
Pos/neutral with Peers (COS)	11.90	9.33	966	0-50
Positive Play with Peers (UPO)	2.88	3.83	966	0-20
Peer Status (Friends or Foes)	16.14	3.16	1000	4-20
Peer Competency (SSRS)	15.30	3.62	1001	4-20
Social and Relational				
Problems				
Conflict with teacher (STRS)	10.92	5.17	1007	7-35
Negative with Teacher (COS)	.033	.42	966	0-12
Negative with Peers (COS)	.29	.85	966	0-50
Negative Play with Peers (UPO)	.0034	2.86	962	-1.15-26.98
Social Problems (TRF)	53.94	5.57	1008	50-83

Table 2. Correlations Among Predictor, Mediator, and Outcome Measures

<i>Variable</i>	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1. Gender	.04	.03	.09**	.13**	.16**	.17**	.00	.01	.08*	.06	.15**	-.17**	-.06	-.03	-.12**	-.09**
2. Maternal Ed		.56**	.50**	.28**	.19**	.12**	-.04	.02	.00	.16**	.19**	-.15**	-.06*	-.09**	-.08*	-.15**
3. Inc-to-needs			.43**	.24**	.22**	.09**	-.04	-.01	-.02	.11**	.12**	-.13**	-.05	-.10**	-.08*	-.12**
4. Mat. Sens.				.32**	.23**	.09**	-.06	.04	.00	.15**	.20**	-.18**	-.08*	-.13**	-.10**	-.19**
5. Attentional Focusing					.53**	.09**	-.06	.04	-.01	.12**	.19**	-.20**	-.09**	-.10**	-.10**	-.12**
6. Inhibitory Control						.08*	-.03	.04	.03	.16**	.19**	-.27**	-.08*	-.09**	-.07*	-.19**
7. Closeness with Teacher							.04	.08*	.09**	.42**	.46**	-.28**	-.03	-.01	.04	-.22**
8. Pos/Neutral with Teacher								-.06	.17**	.00	-.01	.03	-.02	.04	.08*	.03
9. Pos/Neutral with Peers									.15**	.11**	.10**	-.05	-.02	.18**	.03	-.08*
10. Positive Play with Peers										.12**	.12**	-.08*	-.04	-.01	-.07*	-.12**
11. Peer Status											.66**	-.47**	-.06	-.10**	-.04	-.56**
12. Peer Competency												-.56**	-.09**	-.10**	-.09**	-.58**
13. Conflict with Teacher													.03	.14**	.10**	.52**
14. Negative with Teacher														.06	.06	.03
15. Negative with Peers															.18**	.08**
16. Negative Play with Peers																.07*
17. Social Problems																

Figure 1. Results from an SEM model examining the associations between maternal sensitivity, child inhibitory control and attentional focusing, and child social and relational competence and problems in first grade.



Note. The above model was adjusted for the child's gender, maternal education, and income-to-needs ratio. Standardized coefficients are displayed and significant pathways are indicated with an *; ($p > .05$).

Longitudinal Associations between Effortful Control and Children's Relationships with Teachers
across Elementary School

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Abstract

This study examined the longitudinal associations between children's effortful control skills (comprised of inhibitory control and attention focusing) and relationships (both conflict and closeness) with teachers from pre-kindergarten through fifth grade. Data from 1,364 children (705 boys, 659 girls) and their teachers from the longitudinal National Institute of Child Health and Human Development Study of Early Child Care and Youth Development were used. Children's effortful control skills were measured with a direct assessment using a computerized task and relationships with teachers were assessed by teacher report. Regression analyses examined the longitudinal associations between effortful control and relationships across the elementary school years. Bi-directional associations were found for inhibitory control difficulties and attention problems and conflict, such that increased effortful control difficulties were associated with increased conflict and vice versa across the elementary school years. For closeness, there was some evidence that increased inhibitory control difficulties were associated with declines in teacher-child closeness, but no associations between attention and closeness with teachers. The results are discussed in terms of the importance of interventions geared towards improving both children's effortful control skills and help promote close and supportive and prevent conflictual relationships with teachers.

Longitudinal Associations between Effortful Control and Children’s Relationships with Teachers across Elementary School

Both effortful control skills and children’s relationships are foundational to children’s success or failure socially and academically in school (Eisenberg et al., 2000; Hamre & Pianta, 2001; Ladd, 1990; Lerner, Lerner, & Zabski, 1999). Evidence suggests that difficulties in these developmental domains often begin in early childhood and are moderately stable across development (Hamre & Pianta, 2001; Howes, Hamilton, & Phillipsen, 1998; Howes & Hamilton, 1992; Kochanska, Murray, & Harlan, 2000; Rudasill, Reio, Stipanovic, & Taylor, 2010). Although literature also suggests strong associations between children’s effortful control abilities and relationships with teachers during the school years (Griggs et al., 2009; Rudasill et al., 2006; Rudasill & Rimm-Kaufman, 2009), the causal ordering and potential processes contributing to their association is less clear. Given the importance of children’s effortful control skills and teacher-student relationships for children’s school success, it is crucial to examine the processes that contribute the development of these skills over the school years. By understanding the ways in which these constructs are associated and which process may be “driving” the other, intervention efforts can be developed to help children at-risk for poor social and academic outcomes.

Previous investigations have demonstrated that the individual trajectories of effortful control and teacher-child relationships are moderately stable during the elementary school years (Howes, Hamilton, & Phillipsen, 1998; Howes & Hamilton, 1992; Li-Grining, 2007; Pianta & Stuhlman, 2004). Research investigating the directionality of the association between effortful control and teacher-child relationships offer differing hypotheses to explain the association between the two constructs. One hypothesis proposes that effortful control difficulties can

interfere with the development of close and supportive teacher-child relationships (Eisenberg, Valiente, & Eggum, 2010). Students with poorly developed effortful control skills are more likely to be disruptive in the classroom and are at increased risk for forming negative relationships with teachers and receive less positive feedback in the classroom (Wentzel, 1997; Birch & Ladd, 1997; Raver, 2002), while well-developed effortful control skills have been linked to positive student-teacher relationships (Midgley, Feldlaufer, & Eccles, 1989). Students with poorly developed regulatory abilities appear to be more disliked by teachers and less engaged in the classroom (Wentzel, 1998).

An alternative theory proposes that it is through relationships with central adults (e.g. parents and teachers) that children develop self-regulation skills (Howes & Hamilton, 1992). Close and supportive teacher-student relationships are hypothesized to serve as external supports that assist in the development of children's regulatory skills, while conflictual and negative relationships are thought to serve as external stressors which impair children's developing regulation skills (Howes & Hamilton, 1992; Pianta, 1999). There is research suggesting that the importance of relationships in the development of self-regulation occurs very early on, with evidence suggesting that infant-caregiver relationships influence the self-regulation skills of preschool and elementary school-aged children (Hofer, 1994). It is crucial to understand both the early individual trajectories of these constructs (e.g. how stable they are across development) as well as the associations between them as they are developing, in order to inform prevention and intervention programs designed to help children at-risk for social and academic difficulties in school. Given the limited intervention resources, it is particularly important to identify whether interventions should be geared towards teacher-child relationships, the development of effortful control skills, or both domains. Through theoretically informed longitudinal research that

examines how children's self-regulatory skills develop over time, interventions can be designed to help children with such difficulties succeed in the classroom. The aim of the present study is to contribute to our ability to develop the most proximal and targeted interventions.

A third theory, the transactional model of development, suggests that children's development occurs through a bi-directional process of exerting influence on and being influenced by their environment and interactions with others (Sameroff & Fiese, 2000; Sameroff & MacKenzie, 2003). The transactional model proposes that neither children's effortful control skills nor relationships with teachers develop first and "drive" the development of the other construct, but that the two skills develop simultaneously and exert influence on each other.

The goal of the present study is to investigate the trajectories and associations of effortful control and children's relationships with teachers across the school years in order to more clearly determine the directionality of these associations. While it has been demonstrated that effortful control is associated with later positive relationships, it is also possible that close and non-conflictual relationships with teachers provide children with a context to practice and further develop their effortful control skills. Through understanding the directionality of these associations, interventions can be more targeted to the skills most proximal for improving children's developmental outcomes.

Effortful Control: Components and Stability during the Elementary School Years

Self-regulation is an umbrella term that includes the cognitive, social, emotional, and behavioral control skills that enable children to be successful in school. Effortful control can be thought of as one of the cognitive components of self-regulation, and is defined as the ability to focus attention and inhibit impulsive behaviors (Rothbart, 1989). Effortful control is considered a temperamentally based component of self-regulation, and refers to voluntary control over

approach or inhibition, and behavioral tendencies regarding attention (Eisenberg, Spinrad, & Eggum, 2010; Rothbart & Bates, 2006). The two primary components of effortful control are inhibitory control and attention focusing. Inhibitory control refers to children's volitional ability to inhibit a desired response, for example, being able to stop an enjoyable activity when told no. Attention focusing refers to children's focus and concentration while engaging in tasks. Effortful control has been implicated as a critical component in the development of children's relationships.

The moderate stability of effortful control skills has been demonstrated in multiple studies. Kochanska, Murray, and Harlan (2000) found that children's effortful control skills at 22 and 33 months were moderately correlated, indicating significant continuity prior to school entry. Carlson, Mandell, and Williams (2004) study examined the stability of inhibitory control and attention focusing separately in a sample of pre-school age children. They found that both children's inhibitory control and attention focusing skills were moderately correlated between 24 and 39 months, indicating the stability of effortful control in early childhood. There are few studies suggesting that there is moderate stability of skills during the elementary school period as well. For example, Kremen and Block (1998) reported consistency between children's ego control (a construct similar to inhibitory control) as rated by children's parents and teachers from ages 4 to 11. In their longitudinal study of children's emotionality and regulation between ages 4 and 12, Murphy (2003) found significant stability in both constructs over time. Interestingly, the authors found that attention focusing increased in consistency over time. For girls, impulsivity levels decreased as they aged, and behavioral regulation increased over time for both boys and girls.

Teacher-Child Relationships: Components and Stability during the Elementary School Years

Teacher-child relationships have been identified as a crucial contributor to children's adaptation to school and success during the school years (Birch & Ladd, 1997; Howes, Hamilton, & Matheson, 1994). Similar to parent-child relationships, teacher-child relationships are crucial for children's social and emotional development, and are therefore influential in children's positive or negative adaptation in school (Pianta, 1999).

Similar to effortful control, research indicates that children's relationships with teachers are moderately stable across development (Howes, Hamilton, & Phillipsen, 1998; Howes & Hamilton, 1992; Li-Grining, 2007; Pianta & Stuhlman, 2004). Children with conflictual relationships with teachers are at significant risk for social, academic, and behavioral problems into later childhood and adolescence (Eisenberg et al., 2005; Eisenberg et al., 2009; Henricsson & Rydell, 2004). Howes, Hamilton, and Phillipsen (1998) found that children who had more secure relationships with their teachers in toddlerhood viewed their teachers more positively at age nine. Based on attachment theory, the authors propose that children may develop an internal working model for teachers in general during their early school years that they apply as their teachers change each year. Several studies have examined the stability of conflict and closeness specifically using the Student Teacher Relationship Scale (STRS; Pianta, 2001). Pianta and Stuhlman (2004) found moderate stability for conflict and slightly less consistency for closeness. Interestingly, the authors found a general trend indicating that both conflict and closeness with teachers appeared to decrease over time. Longitudinal analyses have yielded similar results about the stability of both conflict and closeness. Jerome, Hamre and Pianta (2009) found that conflict was more stable than closeness, but that both were moderately stable from kindergarten through

sixth grade. Multiple studies using the STRS have yielded similar results, indicating that both conflict and closeness are moderately stable across development, with conflict being more stable across the school years (Blacher, Baker, & Eisenhower, 2010; Jerome, Hamre, & Pianta, 2009; NICHD ECCRN, 2005). Thus, previous research suggests that both early effortful control skills and children's relationships are moderately stable and are linked to outcomes in later childhood and adolescence.

Teacher-Child Relationships and Effortful Control

There is a robust literature linking effortful control to teacher-child relationships in the classroom. Spinrad and colleagues (2006) found that children's attention focusing and impulsivity in early childhood was significantly associated with both social competence and adult-rated popularity two years later. Silva et al. (2011) examined children's effortful control abilities and relationship quality with teachers in an ethnically and socio-economically diverse sample. They found that effortful control was positively associated with teacher-child closeness, and negatively correlated with conflict. Thus, previous research suggests that the ability to control attention and behavior may help cultivate the social skills needed to foster close and positive relationships with teachers (Eisenberg et al., 1993; Valiente et al., 2003).

Rudasill and Rimm-Kaufman (2009) conducted an investigation of the contributions of children's effortful control at 54 months to teacher-child relationships in first grade with 819 children using data from the NICHD Study of Early Child Care. The authors discovered that children's effortful control significantly contributed to teacher-child conflict and closeness, such that children with lower effortful control skills displayed greater conflict with teachers, and higher effortful control skills were associated with more closeness. In a study examining these associations with older elementary age children, Rudasill, Reio, Stipanovic, and Taylor (2010)

found once again that children with difficult temperaments (which included activity, anger/frustration, approach, and inhibitory control) at age four displayed greater conflict with teachers in fourth, fifth, and sixth grade. Thus, there is some evidence that children's early effortful control skills are important for relationships later in the school years.

Directionality

The transactional model is the theoretical framework that informs this study. Numerous studies have demonstrated the reciprocal associations in developmental processes in general (e.g. Doumen, 2008; Rudasill & Rimm-Kaufman, 2009; Sutherland & Oswald, 2005), but this approach has not been applied to understanding the development of children's effortful control skills and relationships with teachers during the school years. For the current study, a bi-directional association would mean that effortful control skills contribute to the development of children's close and conflictual relationships with teachers, which in turn contributes to the continuing development of effortful control.

Though there is clear evidence that children's effortful control skills and relationships with teachers are linked, there is limited longitudinal research investigating the directionality of this association. As detailed above, much of the prior literature has conceptualized effortful control as contributing to or predicting children's conflict and closeness with teachers. However, the transactional model of development would suggest that the associations between children's effortful control and relationships may be reciprocal. Few studies have investigated such a model. In one such study of child temperament, teacher-child interactions, and teacher-child relationships from first through third grade, Rudasill (2010) found that children's effortful control skills contributed to both teacher's behaviors towards as well as their perceptions of children; and that those teacher behaviors were in turn associated with children's behavior and

development. Spinrad et al. (2006) conducted a study examining the relationship between impulsivity (a construct similar to inhibitory control) and popularity (a component of children's social competence) and found reciprocal associations between the two constructs. This study will expand the limited research investigating the bidirectional associations between effortful control and relationships with teachers.

Overview of the Present Study

This study will make several unique contributions to the extant literature. This investigation will further our understanding of the development of children's effortful control skills and relationships with teachers by testing the reciprocal associations between these constructs. Further, by testing the two constructs of effortful control (inhibitory control and attention focusing) separately, this study will help elucidate how each construct operates independently in the development of children's close and conflictual relationships with teachers. Previous research indicates that children with problem behaviors (e.g. aggressive acts, poor temper control) are associated with conflictual relationships with teachers (Hamre, Pianta, Downer, & Mashburn, 2008). However, not all such children display conflict and there are children with conflictual relationships who do not display problem behaviors. For the present study, we were interested in examining the associations between effortful control and conflict above and beyond the contribution of children's problem behaviors. Thus, this study contributes to the literature by isolating conflict as a unique construct independent of other negative behaviors children can display in the classroom.

The goal of the present study is to examine these bi-directional and reciprocal processes to further our understanding of the mechanisms through which children develop close and non-conflictual relationships throughout the elementary school years. Our overall research question

examines the development of children's effortful control skills and relationships across the elementary school years, as well as the extent to which these constructs are associated with one another. This overall question has several sub-questions and hypotheses: (1) How stable are children's effortful control skills and relationships with teachers over the elementary school years? We hypothesized that both children's effortful control skills and relationships with teachers, particularly conflict, would be moderately stable over time. (2) Do children's effortful control skills lead to closer and/or less conflictual relationships with teachers over the school years, or do children's relationships with teachers provide children with the opportunity to develop better effortful control skills over time? Although we expected to find bi-directional associations, based on Eisenberg, Valiente, and Eggum's (2010) model examining the associations between children's self-regulatory abilities and school readiness, we hypothesized that children's effortful control skills would lead the association to relationships more strongly than children's relationships would lead to the development of increased effortful control. Previous research (e.g. Mintz, Hamre, & Hatfield, 2011) has demonstrated that children's effortful control skills may be more important for the prevention of conflictual relationships, rather than the promotion of close relationships with teachers over time. Research also indicates that behavioral inhibition is more important to the development of relational problems with teachers than attention difficulties (Mintz, Hamre, & Hatfield, 2011; Nathanson, Rimm-Kaufman, & Brook, 2009). Thus, we hypothesized that the associations would be strongest for children's inhibitory control and conflictual relationships with teachers.

Methods

The data used for this study came from the longitudinal National Institute of Child Health and Human Development Study of Early Child Care and Youth Development. The study began

in 1989 and aimed to investigate the relationships between various child care experiences and child developmental outcomes (NICHD ECCRN, 1993). Data was collected from families, child care settings, and children through multiple methods including observations, interviews, questionnaires, and individual child assessments.

Participants

Participants were recruited in 1991 from hospitals in or near 10 selected cities (Little Rock, AR; Irvine, CA; Lawrence and Topeka, KS; Boston, MA; Philadelphia, PA; Pittsburgh, PA; Charlottesville, VA; Morganton and Hickory, NC; Seattle, WA; and Madison, WI). Conditional random-sampling was conducted to ensure the diversity of participants across sites (please refer to NICHD ECCRN, 2001 for other sample details including exclusion criteria and sampling procedures). After the initial one month interview, data was collected during four phases: Phase I (birth to age 3), Phase II (age 3 through first grade), Phase III (second grade through sixth grade), and Phase IV (seventh grade through tenth grade). For the analyses in this study, data from Phases II and III were used. Of the 1,364 study participants, slightly over half of the children were boys ($n = 705$), 80.4% were European American ($n = 1,097$), and 19.6% were African American ($n = 176$), Asian American ($n = 22$), or other/mixed ethnicity ($n = 69$). In terms of maternal education, 10.2% of mothers completed fewer than 12 years of schooling ($n = 139$), 21.1% had obtained a high school degree ($n = 287$), 54.2 % had a 2- or 4- year college diploma ($n = 739$), and 14.5% had completed at least some graduate work ($n = 198$). When the study children were one month of age, 85% of children were living with both their mother and father.

Overview of Data Collection

Demographic data was collected when the study child was one month of age, including child gender, maternal education, and the family's income-to-needs ratio. Children's effortful control skills were assessed directly with the Continuous Performance Test when study children were 54 months, and at first and fourth grades. At each data collection time point, mothers participated in interviews and completed questionnaires regarding major life events, family income, and changes in family composition. Teachers completed questionnaires assessing the nature of the child's relationship with themselves.

Measures

Covariates. The covariates used in the current study were child's gender, maternal education, the family's income-to-needs ratio, and children's externalizing behavior problems in Kindergarten. The income-to-needs ratio was calculated by dividing the total family income by the poverty threshold for the appropriate family size. For the current study, we averaged the income-to-needs ratio from the time the child was 1 month until 36 months to obtain a more stable estimate of the family's income level over several years. Children's externalizing behavior problems at Kindergarten were accounted for in the model in order to obtain a more accurate assessment of children's relational difficulties with teachers, independent of their behavior problems. Teachers completed the Child Behavior Checklist (CBCL), a well-established and standardized measure of children's behavior problems (Achenbach, 1991). Teachers' responses were combined to form broadband scales of internalizing and externalizing behavior problems. For the current study, only the externalizing behavior problems scale was used. Children's externalizing behavior problems were only controlled for at one time point as they are relatively stable over time (Campbell, March, Pierce, Ewing, & Szumowski, 1991; Campbell, Shaw, & Gilliom, 2000).

Effortful control. The Conners' Continuous Performance Test (CPT) was administered to children at 54 months, first, and fourth grade as a measure of children's inhibitory control and attentional focusing. The CPT, modeled on the young children's version described by Mirsky and his colleagues (Mirsky, Anthony, Duncan, Ahearn, & Kellam, 1991; Rosvold, Mirsky, Sarason, Bransome Jr., & Beck, 1956), was used. This computerized task required children to press a button whenever the target stimulus appeared on the screen. At 54 months, ten stimuli were presented in 22 blocks; in first grade ten stimuli were presented in 30 blocks, and in fourth grade, twelve stimuli were presented in 45 blocks. Stimulus duration was 500 milliseconds with an interstimulus interval of 1500 milliseconds at 54 months and, at 1st and 4th grades, 200 milliseconds with an interstimulus interval of 1500 milliseconds. The target stimulus was randomly presented twice in each block and all response data was automatically compiled by the computer. The CPT has adequate test-retest reliability ($r=.65-.74$) and has high content and predictive validity (Halperin, Sharman, Greenblat, & Schwartz, 1991). Following earlier studies that have been conducted with these data, we selected commission errors (i.e. responses to non-targets) as a measure of children's impulsivity and lack of behavioral inhibition (Campbell & von Stauffenberg, 2009) and omission errors as an assessment of children's attentional control (Hamre & Pianta, 2005).

Student-teacher relationship scale. Teachers completed the Student-Teacher Relationship Scale (STRS; Pianta, 2001) during the spring of first grade to assess the teacher-child relationship. In this study, the STRS was administered during the spring of first, third, and fifth grade. Using this 30 item questionnaire, teachers reported their perceptions of a particular students' relationship with them. Teachers rated how well each statement described their relationship with the study child on a 5-point Likert scale that ranged from 1 (*definitely does not*

apply) to 5 (*definitely applies*). The two aspects of the teacher-child relationship that were used for the current study were conflict and closeness. The conflict subscale measures the degree to which the relationship is characterized by antagonistic, disharmonious, or negative interactions. The closeness subscale assesses the extent to which the relationship is characterized by warmth, open communication, and positive interactions. Higher scores on the STRS indicate more positive relationships for the closeness subscale, and lower scores indicate more conflictual relationships. In terms of the reliability of the STRS, Cronbach's alpha were .86 and .93 for conflict and closeness, respectively. The STRS has been used extensively to measure teacher-child relationships in child care and elementary school (e.g. Birch & Ladd, 1997; Hamre & Pianta, 2001; Jerome, Hamre, & Pianta, 2009). The STRS has been linked to children's and teacher's behaviors in the classroom and associated with observational measures of the quality of teacher-child relationships (e.g. Birch & Ladd, 1997; Howes & Ritchie, 1999).

Attrition and Missing Data

Participants in the current study were followed from 54 months through fifth grade. Of the original 1,364 children who entered the study, 930 had teachers who reported on their relationship with the study child in fifth grade. Mplus 5.1 (Muthén & Muthén, 2007) is a program that is designed to account for missing data. For the current study, missing data was handled using the default full information maximum likelihood (FIML) algorithm. FIML estimation is considered the most efficient and unbiased method for handling missing data and decreases Type-I error rates compared to both listwise and pairwise deletion (Enders & Bandalos, 2001).

Experimental

Descriptive statistics, including means and standard deviations were executed for all covariates, independent, and dependent variables. Correlations among effortful control and children's relationships with teachers were examined across the elementary school years. Path analyses were conducted to compare the leading and lagging associations between children's effortful control skills (inhibitory and attentional control) and children's relationships with their teachers (conflict and closeness) over time. Four models were run separately: 1) conflict with omission errors, 2) conflict with commission errors, 3) closeness with omission errors, and 4) closeness with commission errors in order to independently test the associations and examine differences between the constructs. The covariates entered into the model were child's gender, maternal education, the family's income-to-needs ratio, and children's externalizing behavior problems at Kindergarten.

Results

Stability of Effortful Control and Relationships

Descriptive statistics for all variables included in the analyses are presented in Table 1; correlations among all variables appear in Table 2. The first research question sought to examine the extent to which children's effortful control skills and relationships with teachers were stable from age 54 months through fifth grade. To answer this question, we conducted path analyses to test the stability of children's effortful control skills and relationships. Children's inhibitory control skills were moderately stable across the elementary school years. Interestingly, inhibitory control became more stable from first to fourth grade ($\beta = .42$) compared with their skills from 54 months to first grade ($\beta = .26$) suggesting that inhibitory control skills become increasingly set as children mature. Children's attention focusing abilities (as assessed by omission errors on

the CPT) were moderately stable between 54 months and first grade ($\beta = .22$) and first grade to fourth grade ($\beta = .27$) (See Figure 1b). These coefficients represent a small to medium effect size according to Cohen's interpretation guidelines (Cohen, 1992). Children's level of conflict with teachers was quite stable over time ($\beta = .43$ for both kindergarten to second grade and second to fifth grade). Lastly, children's closeness with teachers was also stable across elementary school ($\beta = .27$ for kindergarten to second grade and second to fifth grade); though the magnitude of the association was much smaller than for conflict. Thus, while both conflict and closeness are stable across the elementary school years, conflict is more robust and stable than closeness (See Figures 1c and 1d).

It is important to note that these associations controlled for kindergarten problem behaviors since children's externalizing behavior problems were highly correlated with conflict ($r = .43$ between externalizing behavior problems in kindergarten and conflict with teachers in second grade). These analyses demonstrate that effortful control skills are related to children's conflictual relationships with teachers over and above the contribution of children's behavior problems.

Reciprocal Associations between Effortful Control and Relationships

The second research question examined the reciprocal associations between effortful control and relationships with teachers. More specifically, this question sought to understand whether children's effortful control abilities were more of the "driver" of children's close and conflictual relationships, or whether children's relationships led children to be able to develop better effortful control skills. Several different patterns emerged from the analyses. Firstly, across the four models, there is no evidence of bi-directionality early on. Effortful control at 54 months did not predict children's conflict or closeness in kindergarten. Early effortful control

skills at 54 months did not contribute significantly to children's relationships with teachers in first grade. It is not until later in elementary school that effortful control is significantly linked with children's close and conflictual relationships with teachers. Additionally, the only significant pathway from relationships in kindergarten significantly predicting to effortful control skills in first grade was for conflict predicting to inhibitory control difficulties in first grade.

Overall, it appears that the associations between effortful control and relationships are reciprocal, and there is not strong evidence of one "driving" the associations. As hypothesized, there is also a stronger association for effortful control with conflict than with closeness with teachers. The four models will be interpreted briefly below to understand the differential patterns:

Conflict and inhibitory control. As can be seen in Figure 1a, after the initial time point at which inhibitory control skills at 54 months do not predict conflict at kindergarten, results indicate that the association between conflict and inhibitory control is reciprocal. While previous researchers (e.g. Birch & Ladd, 1997; see Eisenberg, Valiente, & Eggum, 2010 for a conceptual review) have tested a hypothesis in which effortful control skills predict children's relationships with teachers, these results indicate that these associations are bi-directional. Increasing conflict with teachers is associated with decreases in children's inhibitory control which in turn predicts increases in conflict with teachers as children mature.

Conflict and attention focusing. The associations between conflict and attention focusing also appear to be reciprocal as seen in Figure 1b. Children with more conflictual relationships with teachers display more poorly developed attention skills, which is then associated with increases in conflict with teachers across the elementary school years.

Closeness and inhibitory control. As predicted, the associations between closeness and effortful control were less strong than the models for conflict. Overall, this suggests that children's

effortful control abilities are more related to the development of conflictual relationships with teachers than the promotion of close and supportive ones. As depicted in Figure 1c, overall, there is some evidence that increased inhibitory control difficulties lead to declines in teacher-child closeness.

Closeness and attention focusing. As can be seen in Figure 1d, none of the pathways between closeness and attention were significant.

Discussion

This study was among the first to demonstrate the reciprocal associations between children's effortful control abilities and teacher-child relationships throughout the elementary school years. The results of this study confirmed our hypothesis regarding the transactional model of development, providing evidence that effortful control and teacher-child relationships are bi-directional processes that build upon and contribute to the development of each other throughout the early school years.

Consistent with prior research (e.g. Howes, Hamilton, & Phillipsen, 1998; Olson, Bates, Sandy, & Schilling, 2004 ; Pianta & Stuhlman, 2004), the results of this study indicate that both children's effortful control skills and relationships with teachers are moderately stable across the elementary school years. In terms of children's relationships, this moderate stability reflects that children tend to have continuity in their relationships with teachers from year to year. As found in previous studies, conflict showed greater stability over time than did closeness. Jerome, Hamre, and Pianta (2009) point out that this could be due to one of two possibilities. Firstly, it is possible that teachers' perceptions of conflict are more consistent across the school years, possibly because conflict may be more related to children's personality characteristics. Secondly, the greater stability of conflict than closeness could be due to the fact that teachers may be more

likely to communicate with one another about more difficult children with whom they have conflictual relationships, and their conflict ratings may also reflect how other teachers perceived that child. Consistent with prior work, we also found moderate stability of effortful control skills across the elementary school years. For both conflict and closeness with teacher, it appears that children's attention focusing abilities are moderately stable from pre-kindergarten through fifth grade. Interestingly, a different pattern emerged for the development of children's inhibitory control capacities. Inhibitory control is moderately stable from 54 months through first grade, but becomes more stable from first through fourth grade. This finding indicates that there may be a period earlier in development before children's inhibitory control skills become more fixed during which interventions may be able to change the trajectories for children with poorly developed inhibitory control skills.

Our results also demonstrate that across multiple time points during the elementary school years, greater conflict with teachers is associated with more difficulties with both inhibitory control and attention and vice versa. Children who were rated by their teachers as having more conflictual relationships had significantly higher commission and omission errors on an individual computerized test of attention and inhibitory control, compared with children displaying lower levels of conflict. These significant associations were found after controlling for children's externalizing behavior problems, suggesting that conflict with a teacher, above and beyond children's more general difficult behavior, is associated with more difficulty with effortful control. The patterns of these associations indicate a bi-directional association between conflict and effortful control, supporting the transactional model of development. Eisenberg et al., (2006) presented a theoretical model suggesting that children's effortful control skills lead to closer and less conflictual relationships with teachers (which would in turn lead to school

engagement and academic outcomes). The current study indicates that these associations are reciprocal, rather than children's effortful control skills serving as the "driver" of later relationships with teachers.

There was no evidence in support of bi-directionality in the associations between attention focusing and teacher-child closeness. Children who had increasing levels of closeness with teachers did not display reductions in either their attention focusing abilities. Previous research (e.g. Mintz, Hamre, & Hatfield, 2011; Nathanson, Rimm-Kaufman, & Brock, 2009) suggests that attention may be less proximal to the development of close and non-conflictual relationships in the classroom compared to more noticeable impulsive behaviors. In terms of the association between inhibitory and closeness, inhibitory control appears to be the "driver" of the associations (see Figure 1c). This association suggests that during the middle elementary school years, decreases in inhibitory control difficulties are associated with increases in teacher-child closeness, but closeness with a teacher is not associated with increases in inhibitory control. This finding supports Eisenberg et al.'s (2010) model of development, in which effortful control abilities lead to the development of relationships in the classroom.

Limitations

While this study adds significantly to the literature on the development of children's relationships with teachers across the elementary school years, it has several limitations as well. The sample used was large and geographically diverse, however there were several exclusion criteria in the study that may limit its generalizability. Families that were not fluent in English, families living in very dangerous areas, families of children with disabilities, mothers younger than age 18, and families with a substance abuse problem were excluded from the study. The

ethnic and racial diversity of participants was also limited, as 80% of the study participants were Caucasian.

There were advantages and disadvantages to the measure of effortful control that was used. The continuous performance test is an individualized neuropsychological assessment of attention and inhibition. It provides a direct and objective assessment of children's effortful control skills. On the other hand, the measurement was only taken at one time-point at each occasion, which may provide a less robust estimate of a child's abilities. Additionally, this measure may not adequately represent how a child's effortful control skills are manifest in the classroom setting. Ultimately, due to the strong reliability and validity of the measure, we chose the CPT as an accurate estimate of children's attentional focusing and inhibitory control skills.

Due to the descriptive nature of the study, causal statements cannot be made regarding the associations found. While effortful control and children's relationships were significantly associated with one another, a causal pathway cannot be concluded. It is important to note, though, that employing a cross-lagged modeling technique is frequently used to assess causal associations in descriptive longitudinal data, (Kenny, 2005). Reciprocal developmental processes are methodologically difficult to test experimentally, as it is difficult to manipulate these processes independently over time. The current study provides support for the transactional theory arguing that these developmental processes are reciprocal. Despite these limitations, the findings from the present study provide support for the importance of effortful control and children's relationships with peers for development.

Directions for Future Research and Practical Implications

This research can inform prevention and intervention work designed to improve children's effortful control skills and relationships with teachers. The results of this study

suggests that improving children's early skills in both effortful control skills and teacher-child conflict will likely help in slowing the growth of children's difficulties with effortful control skills and negative interactions with teachers over time. This research is particularly relevant for early intervention and prevention work designed to target children before these maladaptive patterns emerge. The results of this study point to the bi-directional nature of these developmental processes, suggesting that it would be beneficial to intervene with both children's effortful control skills as well as improving relationships with teachers. This study found that the associations between effortful control and relationships were stronger for conflict than for closeness, suggesting that it may be most effective to target children with conflictual relationships with teachers, and helping to decrease teacher-child conflict. While teacher-child closeness is also linked to child outcomes (Birch & Ladd, 1997; Pianta et al., 1995), it is conflict with teachers that is particularly detrimental to children's academic, social, and emotional development (Birch & Ladd, 1997; 1998; Hamre & Pianta, 2001; Pianta et al., 1995). Interventions targeted at preventing conflictual relationships with teachers will likely be effective in changing the trajectories of children with effortful control difficulties.

One example of this type of intervention is Banking Time. Banking Time is designed to facilitate positive interactions between the teacher and a particular child who is struggling (due to disruptive behavior problems) in the classroom. An exploratory evaluation of Banking Time (Driscoll & Pianta, 2010) found that teachers who received the intervention showed gains in their perceived relationship quality. Preliminary results from the Banking Time intervention indicate that teachers report gains in teacher-child closeness as well as gains in children's frustration tolerance and competence, and decreases in problem behaviors as a result of the intervention (Williford & Whitaker, 2010).

This study also provides further evidence regarding the potential value of interventions designed to improve children's self-regulatory skills by suggesting that these types of interventions could have a secondary impact on reducing children's conflict with teachers. Barnett et al. (2008) found that Tools of the Mind, a curriculum designed to improve preschool children's self-regulatory skills contributed to improvements in children's social development. The Chicago School Readiness Project (CSRP) is an intervention program for low-income children designed to improve school readiness and academic outcomes through the mechanism of improving children's self-regulatory capacities. In a study assessing the impact of CSRP on children's pre-academic skills, Raver et al. (2011) found that the intervention did improve children's self-regulation skills from fall to spring. CSRP demonstrated impacts on the emotional support teachers provided in the classroom but future work might more explicitly examine the extent to which such interventions impact the nature of children's relationships with teachers.

The present study demonstrates that there are significant bi-directional associations between children's effortful control skills and relationships with teachers across the elementary school years, and that this association is strongest for the prevention of conflictual relationships and points to the importance of early intervention efforts targeted at improving both children's effortful control skills and the development of conflictual relationships with teachers in the early years of schooling. The bi-directional findings indicate that early intervention efforts targeted at either effortful control skills or relationships will likely have significant carryover effects in improving the other domain.

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Table 1. Descriptive Statistics for Variables Used in Analyses

<i>Variable</i>	<i>M</i>	<i>SD</i>	<i>N</i>	<i>Range</i>
Maternal Education	14.23	2.51	1,363	7-21
Income-to-Needs	3.43	2.95	1,355	0-22.47
Externalizing Behavior Problems (K) TRF	49.72	8.86	1,004	39-89
Conflict (K) STRS	10.60	5.34	1,006	7-34
Closeness (K) STRS	34.23	10.60	1,006	15-40
Conflict (2 nd) STRS	10.94	5.41	935	7-35
Closeness (2 nd) STRS	33.67	5.17	936	8-40
Conflict (5 th) STRS	11.44	5.74	930	7-35
Closeness (5 th) STRS	31.85	5.37	927	14-40
Inhibitory Control (54 months) CPT	14.19	21.30	1,002	.01-154
Attention Focusing (54 months) CPT	9.13	7.59	1,002	.01-41.07
Inhibitory Control (1 st) CPT	6.11	10.64	996	.01-94
Attention Focusing (1 st) CPT	2.37	3.92	996	.01-35.63
Inhibitory Control (4 th) CPT	8.38	12.38	928	0-136
Attention Focusing (4 th) CPT	4.19	5.72	928	0-58

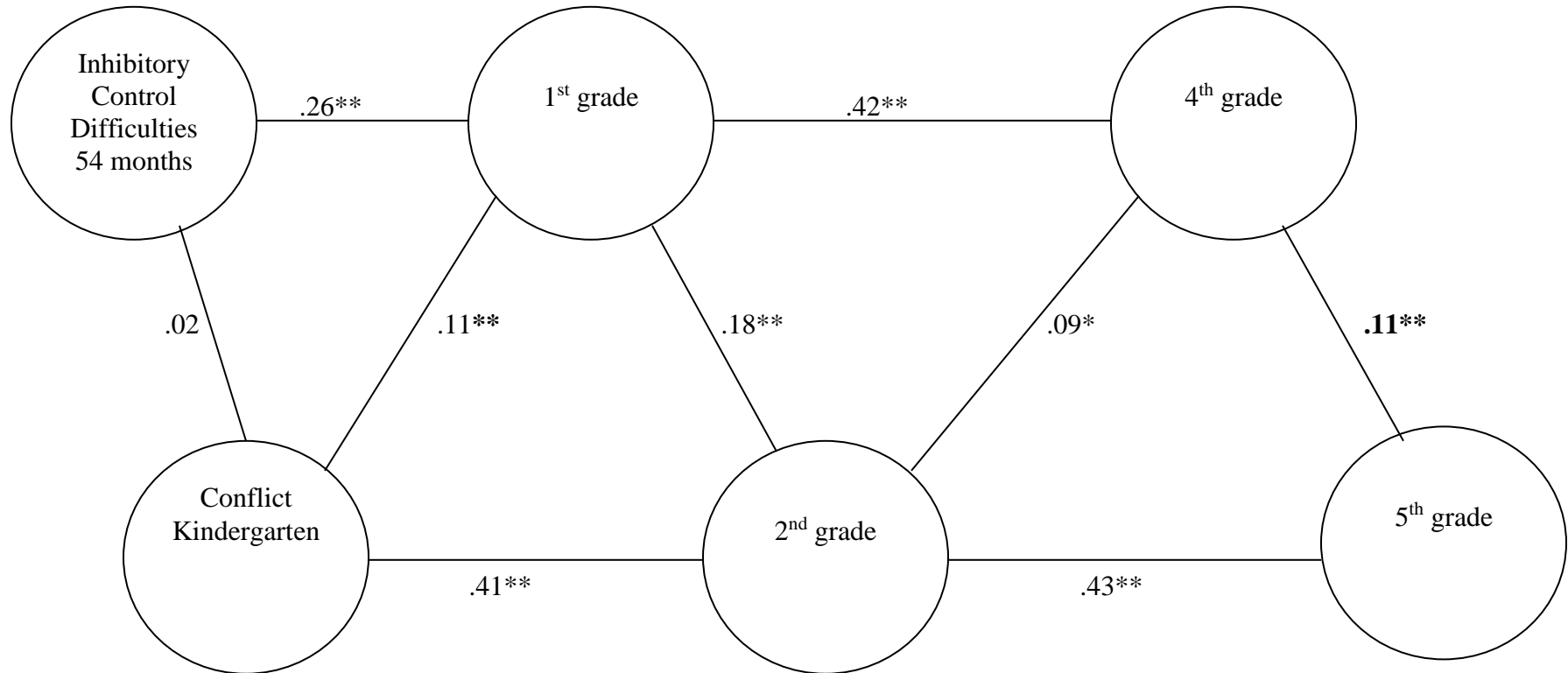
Table 2. Zero-order correlations between covariates, conflict, closeness, attention focusing, and inhibitory control across multiple time point across elementary school

<i>Variable</i>	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>	<i>6</i>	<i>7</i>	<i>8</i>	<i>9</i>	<i>10</i>	<i>11</i>	<i>12</i>	<i>13</i>	<i>14</i>	<i>15</i>	<i>16</i>
1. Gender	–	.04	.04	-.01	-.13**	.14**	-.17**	.24**	-.18**	.17**	-.24**	-.07*	-.19**	-.06	-.19**	-.06
2. Maternal education		–	.56**	-.12**	-.09**	.10**	-.16**	.13**	-.24**	.14**	-.21**	-.18**	-.19**	-.22**	-.18**	-.23**
3. Income-to-needs			–	-.09**	-.06*	.09**	-.18**	.10**	-.24**	.09**	-.15**	-.14**	-.15**	-.17**	-.12**	-.19**
4. Externalizing Problems				–	.75**	-.16**	.43**	-.01	.27**	.03	.23**	.17**	.20**	.11**	.15**	.12**
5. Conflict K					–	-.28**	.42**	-.09**	.27**	.00	.22**	.17**	.16**	.07*	.15**	.12**
6. Closeness K						–	-.14**	.26**	-.07	.17**	-.05	-.05	-.07*	-.05	-.05	-.10**
7. Conflict 2 nd							–	-.37**	.43	-.08*	.18**	.16**	.26**	.16**	.20**	.23**
8. Closeness 2 nd								–	-.16**	.26**	-.07*	-.04	-.11**	-.06	-.11**	-.09**
9. Conflict 5 th									–	-.35**	.17**	.17**	.20**	.14**	.20**	.19**
10. Closeness 5 th										–	-.05	-.08*	-.13**	-.12**	-.10**	-.02
11. Inhib. Control- 54 mos.											–	.24**	.26**	.18**	.22**	.18**
12. Attn. Focusing- 54 mos.												–	.15**	.19**	.13**	.27**
13. Inhibitory Control- 1 st													–	.48**	.43**	.24**
14. Attn. Focusing- 1 st														–	.24**	.30**
15. Inhibitory Control- 4 th															–	.36**
16. Attn. Focusing- 4 th																–

Figure 1. The Overall Path Models for the Associations Between Effortful Control and Relationships with Teachers²

a) Inhibitory Control Difficulties and Conflict with Teachers

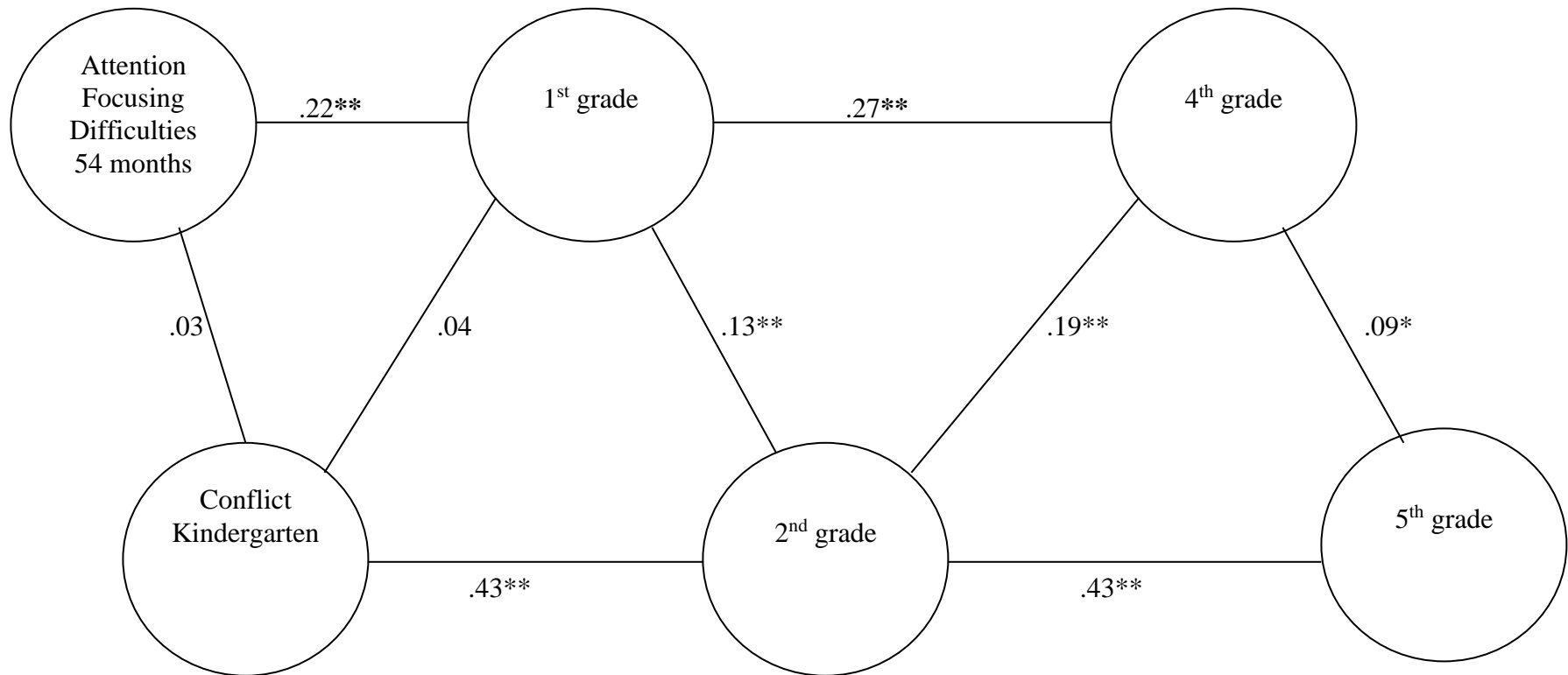
RMSEA = .07; CFI = .89



² All models control for child gender, maternal education, income-to-needs ratio, and children's externalizing behavior problems in Kindergarten

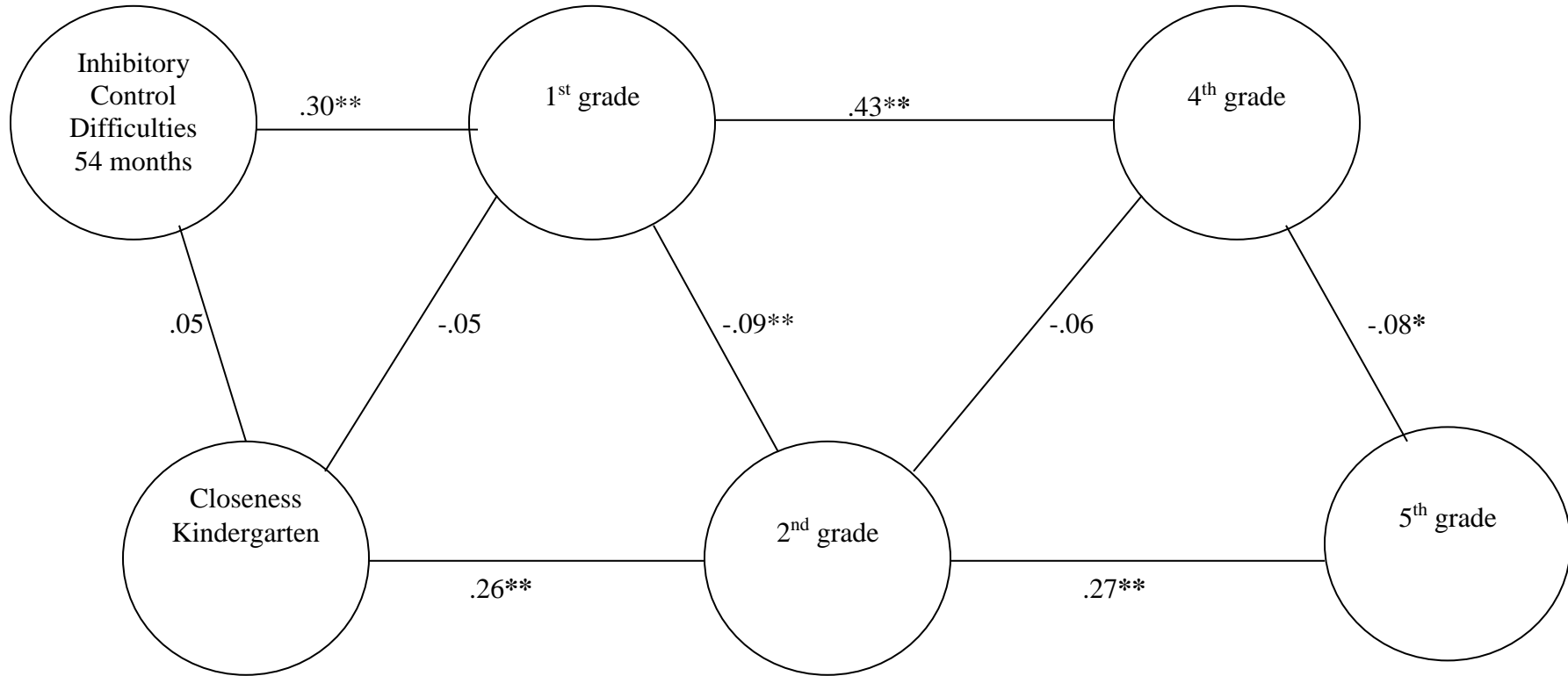
b) Attention Focusing Difficulties and Conflict with Teacher

RMSEA = .08; CFI = .84



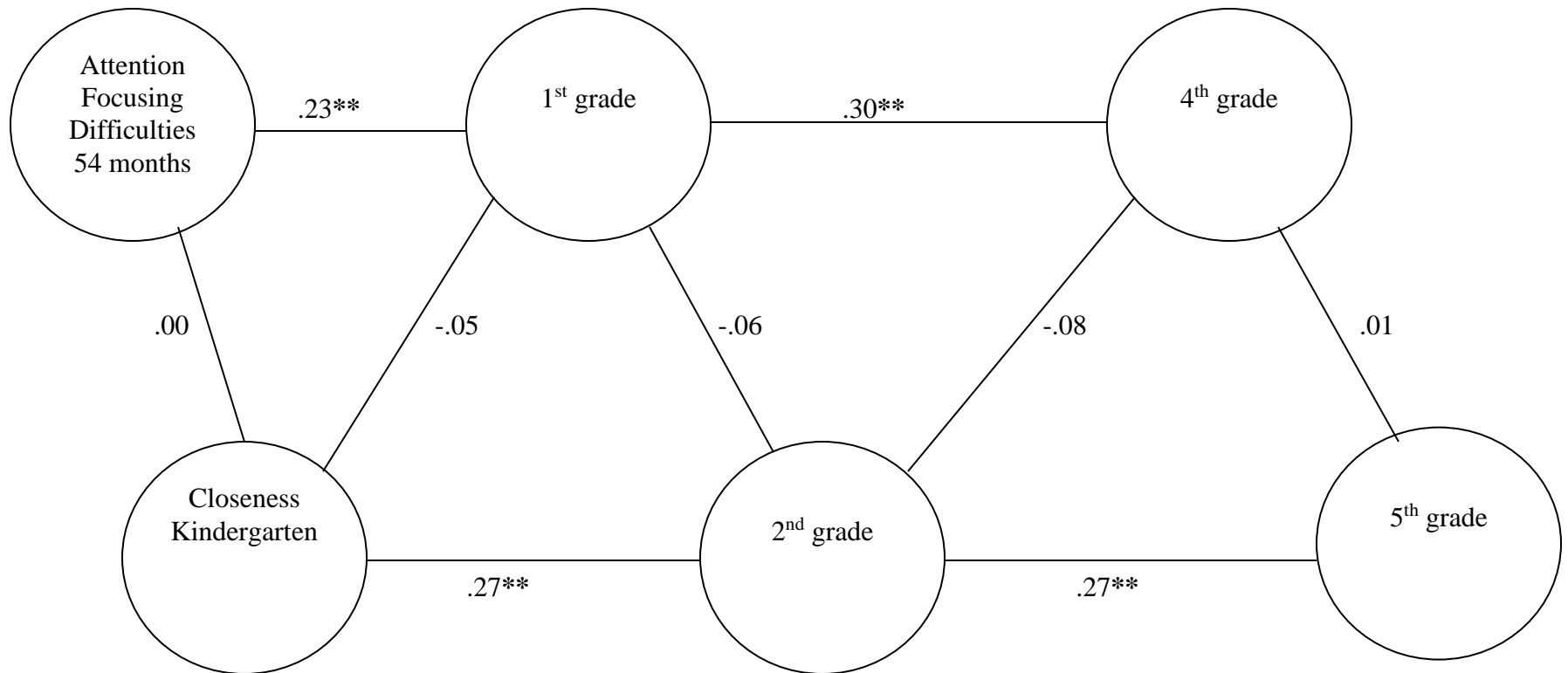
c) Inhibitory Control Difficulties and Closeness with Teacher

RMSEA = .07; CFI = .78



d) Attention Focusing Difficulties and Closeness

RMSEA = .08; CFI = .60



Running head: CONFLICT IN THE DEVELOPMENT OF INHIBITORY CONTROL

The Role of Conflict in the Development of Inhibitory Control in Preschool Children: The
Moderating Role of Fall Inhibitory Control Skills and Gender

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Abstract

This study examined the extent to which children's conflictual relationships with teachers and peers in pre-kindergarten affects the development of their inhibitory control and self-regulatory skills in one academic year. This study also examined whether children's gender moderated the association between conflict and children's inhibitory control and self-regulation skills. Participants were 895 preschool-aged children (452 boys; 443 girls) from a low SES and ethnically diverse sample. Children's inhibitory control skills were measured by direct assessment, self-regulation was assessed by teacher report, and children's conflictual relationships with teachers and peers were measured by classroom observation. Regression analyses examined whether children's conflictual relationships impacted the development of children's regulatory skills, as well as whether gender moderated that association. Children displaying conflict in their relationships with teachers showed fewer gains in their self-regulatory skills from the fall to spring of pre-kindergarten. Gender moderated this association, such that conflict was not associated with changes in inhibitory control for boys, but that girls with high conflict showed the fewest gains in inhibitory control over the year. These findings have implications for understanding the role that teacher-child relationships may play in the early development of children's self-regulatory capacities.

Study 3: The Role of Teacher-Child and Peer-Child Conflict in the Development of Inhibitory Control and Self-Regulation in Preschool Children

Children's ability to regulate their emotions, behavior, and attention in the classroom has been identified as a crucial developmental task of early childhood (Blair, 2002; Rimm-Kaufman et al., 2009). These skills, known broadly as self-regulation, are linked to children's social and academic success as they transition to formal schooling (Gresham, 1998; Lemery et al., 2002; Blair & Razza, 2007). A robust body of literature demonstrates that children who possess the ability to effectively regulate their emotions and behavior have significantly better early school success, including prosocial behavior (Rothbart, Ahadi, & Hershey, 1994) and social competence (Calkins, Gill, Johnson, & Smith, 1999). Recent literature indicates that having strong self-regulatory skills may promote children's enjoyment of school, ability to function in the classroom setting, relationships with teachers and peers, task performance, and motivation (Cameron Ponitz, et al., 2008; Rimm-Kaufman, Curby, Grimm, Nathanson, & Brock, 2009). On the other hand, children with regulation difficulties face challenges in their early school adjustment (Ponitz, McClelland, Matthews, & Morrison, 2009) including more behavior problems compared to children with more developed self-regulation skills (Eisenberg et al., 2001; Kochanska & Knaack, 2003).

Recent findings indicate that teacher-student interactions in early child care settings provide a relational context that supports children's developing regulatory skills. Effective and positive teacher-child interactions facilitate children's development of behavioral regulation skills such as following directions, managing attentional demands, being able to wait their turn, and generally managing the emotional and behavioral demands associated with appropriate classroom behavior (Rimm-Kaufman, Curby, Grimm, Nathanson, & Brock, 2009). An emerging

body of research indicates that warm and supportive interactions with teachers helps to scaffold growth in children's self-regulation skills (Barnett, et al., 2008; Rimm-Kaufman, Curby, Grimm, Nathanson, & Brock, 2009). Less research has examined the role of teacher-child and peer-child conflict as a factor that may inhibit development of children's regulation skills. The current study will fill an important gap in the literature by addressing these questions.

Self-Regulation

Self-regulation is defined as “primarily volitional regulation of attention, emotion, and executive functions for the purposes of goal-directed actions” (Blair & Raver, 2012, p.3; Carlson & Meltzoff, 2008). Included in this definition are skills that are used to control, direct, and plan emotions, affect, cognitions, and behavior (Vohs & Baumeister, 2004; Cameron Ponitz et al., 2008). Recently, children's self-regulatory capacities have been implicated as being equally, if not more, important to children's school readiness than intelligence (Blair, 2002; Normandeau & Guay, 1998; Skinner et al., 1998). Blair (2002) found that children's inability to regulate their emotions has negative implications for the use of higher-order cognitive processes, including working memory, attention, and planning in the classroom setting. The National Academy of Science committee report *“From Neurons to Neighborhoods”* writes that children's growth of regulation is a cornerstone of early development that has implications for all domains of children's functioning (Shonkoff & Phillips, 2000). Data from the National Center for Education Statistics survey of kindergarten teachers' ratings of child characteristics necessary for school entry indicated that teachers believe that children's ability to regulate their emotions and behavior is central to readiness (Lewit & Baker, 1995). A striking 84% of teachers endorse that children need to be able to communicate their thoughts, wants, and needs verbally, and 60% believe that children need to be able to follow directions and not be disruptive in class. Despite

teachers' acknowledgement regarding the importance of regulation, 46% of teachers from a nationally representative survey of kindergarten teachers reported that over half of the children in their class lacked the skills and experiences that would enable them to function productively in kindergarten (Rimm-Kaufman, Pianta, & Cox, 2000).

Taken together, these findings indicate that self-regulation is a crucial early developmental task for children in the transition to school, and that those children who have difficulties paying attention, following directions, managing emotions, and inhibiting negative behaviors are at increased risk for both social and academic failure as they begin formal schooling. At the same time, recent research suggests that many children entering school lack the basic regulatory capacities that will enable them to successfully navigate this transition.

Given the importance of self-regulation for children's social and academic development, it is crucial to identify the processes that help bolster the development of these skills. Children's relationships in the classroom have been identified as a promising avenue for research in the development of self-regulation. Various theories have been proposed regarding the mechanisms by which children develop the ability to manage their behavior and emotions. An important and well-substantiated theory suggests that it is through relationships with central adults (i.e. parents and teachers) that children learn the skills necessary to regulate themselves (Howes & Hamilton, 1992). Close and supportive relationships are hypothesized to serve as external supports as children begin to learn and practice these skills. Conversely, it is proposed that conflictual relationships serve as stressors which interfere with the development of children's regulatory abilities (Howes & Hamilton, 1992; Pianta, 1999). Recent literature suggests that relationships can influence the development of self-regulation early in a child's life, with evidence suggesting that infant-caregiver relationships influence the self-regulation skills of preschool and elementary

school aged children (Hofer, 1994; Mintz, Hamre, and Hatfield, 2011). This study will extend the existing research by examining the extent to which conflictual relationships with both teachers and peers influences the development of children's self-regulatory skills in preschool. Further, this study will examine whether gender moderates the association between self-regulation and conflict, such that conflict is more detrimental for the development of self-regulation skills for boys.

Development of Self-Regulatory and Inhibitory Control Skills in Preschool

As described above, self-regulation is a broad umbrella term that encapsulates a wide range of skills across cognitive, emotional, and behavioral domains. One subset of self-regulatory skills, known as effortful control, has been defined as the ability to suppress a dominant response to perform a subdominant response, to plan, and to detect errors (Rothbart, 1989). Effortful control consists of the ability to maintain and shift attention, as well as the ability to inhibit a dominant response in favor of a non-dominant one (for example, inhibiting one's desire to shout out an answer and raising one's hand instead). This skill, known as inhibitory control, has been linked uniquely to children's social relationships in the classroom (Mintz, Hamre, & Hatfield, 2011; Mintz, Hatfield, & Hamre, under review; Nathanson, Rimm-Kaufman, & Brock, 2009). The current paper will therefore examine the development of children's broad self-regulation abilities as well as the behaviorally observable skill of inhibitory control, which previous research indicates may be uniquely relevant to the development of relationships in the classroom.

Research from social, developmental, cognitive, and neurobiological disciplines suggest that children enter school with distinct emotional and behavioral regulation abilities that impact their relationships with teachers, peers, and engagement with learning (Blair, 2002; Bruce,

Davis, & Gunnar, 2002; Fantuzzo et al., 2007; Raver et al., 2007). Much of the research on temperament and self-regulation suggests that children's proneness to inattention and impulsivity emerges as early as infancy, that children's regulatory profiles are moderately stable, and that children's regulatory capacities increase with age (Blair, 2002; Bruce, Davis, & Gunnar, 2002; Raver et al., 2007). While much research indicates that certain aspects of self-regulation (including inhibitory control) has a large genetic and neurobiological component, recent research suggests that children's experiences and relationships impact the development of children's developing self-regulatory capacities (Noble, Norman, & Farrah, 2005; Raver et al., 2011). Recent research has demonstrated that children's self-regulation skills can be modified through intervention. One such intervention, *Tools of the Mind*, is a curriculum designed to improve the self-regulatory capacities of preschool-aged children. In a randomized controlled trial assessing its effectiveness, Barnett and colleagues (2008) found that those children assigned to receive the intervention improved on their executive functioning skills and had lower scores on a problem behavior scale compared to children in the control group. Similarly, Diamond and colleagues (2007) found that four and five-year-old children receiving the *Tools of the Mind* curriculum demonstrated better inhibitory control skills compared to their peers who did not receive the intervention.

Self-Regulation, Inhibitory Control and Relational Conflict

Given that children's self-regulatory abilities can be improved, it is important to identify the specific mechanisms through which relationships in the classroom or the classroom environment may help in the development of children's inhibitory control skills in preschool. Previous research has demonstrated evidence for direct links between student-teacher relationships and a variety of child outcomes (Birch & Ladd, 1997; Ladd, Birch, & Buhs, 1999;

Hamre & Pianta, 2006). A moderating role of teacher-student relationships has also been suggested (Burchinal, Peisner-Feinberg, Pianta, & Howes, 2002; Hamre & Pianta, 2001; Hughes, Cavell, & Jackson, 1999; Ladd & Burgess, 2001). Close relationships have been found to protect children at risk for academic and social problems due to family characteristics (Burchinal et al., 2002), while relational conflict is linked with conduct problems and aggressive behavior (Ladd & Burgess, 2001). Rudasill, Rimm-Kaufmann, Justice, and Pence (2006) found that bolder (less behaviorally inhibited) children with lower language complexity were more likely to have higher levels of conflict with their teachers. Relationships with significant conflict and dependency have been found to predict children's academic and behavioral problems from kindergarten through eighth grade, particularly for children identified as having increased behavior problems in kindergarten (Hamre & Pianta, 2001). In their study of the moderating role of teacher-student relationships in the association between temperament and social competence in preschoolers, Griggs and colleagues (2009) found that the association between temperament and disruptive peer play was attenuated for children with low-conflict with teachers. Taken together, these findings suggest that relational conflict can serve to impede the development of children's self-regulation and inhibitory control skills in the early years of schooling.

Children with difficulty regulating their behavior, emotions, and impulses may be more difficult to teach as they are more disruptive in the classroom setting, and tend to have more trouble forming and maintaining positive peer relationships (Bierman & Erath, 2006; Blair, 2002). Previous research has indicated bi-directional associations between self-regulation and teacher-student relationships (Berry, 2012). The pathway of children's self-regulatory skills leading to increased teacher-child and peer-child conflict has been established, as children with poor regulatory skills tend to be more behaviorally difficult to manage in the classroom. This

study is testing the hypothesis that children with conflictual relationships with teachers and peers in the classroom evidence fewer gains in their self-regulatory skills from the fall to spring of pre-kindergarten. These authors hypothesize that children with increased conflict with teachers and peers miss crucial opportunities to learn and practice the regulatory skills that are necessary for classroom success. Children with warm, close, and supportive relationships with teachers and peers in the classroom receive ample opportunity for feedback and scaffolding of regulatory skills through positive interactions (redirection of the child's attention, encouragement to persist in difficult tasks; planning or problem solving with a child (Cole, Martin, and Dennis, 2004). On the other hand, children with high levels of relational conflict are afforded fewer such opportunities for positive feedback to build on their regulatory skills, which is hypothesized to lead to fewer gains in skills throughout the preschool year compared to children with low levels of relational conflict.

The existing literature has focused on the role that teacher-child interactions can serve in supporting children's developing regulatory abilities. Teachers are recognized as crucial in providing external structure and feedback to help children learn to internally regulate their behavior and emotions (Calkins & Hill, 2007; Raver, 2002; Vohs & Baumeister, 2004). This study will add to the literature base by examining the role that peer-child conflict may play in impeding the development of children's self-regulatory skills above and beyond the role of teachers. Previous research has elucidated the important role that positive peer interactions can play in children's behavioral, emotional, and academic adjustment (Ladd, 1999; Ladd and Troop Gordon, 2003). However, to our knowledge, this is the first study to test the unique contribution of conflict with peers on the development of children's self-regulatory skills. Based on previous research suggesting the importance of positive peer-child relationships on children's emotional

and behavioral outcomes, we anticipate that peer-child conflict will uniquely contribute to fewer gains in children's self-regulatory and inhibitory control skills from the fall to spring of prekindergarten.

The Moderating Role of Gender

While still an emerging area of research, there is evidence that gender may play a moderating role in teacher-child and peer-child relationships in the classroom. Two gender theories, which lead to differential hypotheses regarding the role of gender on teacher-child and peer-child relationships, will be outlined below.

The first theory, gender socialization theory, posits that girls tend to display more cooperation and physical and emotional closeness in their relationships whereas boys display more dominance and activity-based play in preschool (Maccoby, 1998). Moreover, research on teacher-child relationships indicates that girls tend to have closer and less conflictual relationships with teachers (Baker, 2006; Birch & Ladd, 1997; Hamre & Pianta, 2001). Because it appears that girls are socialized to have more nurturing and cooperative relationships with teachers and peers, this theory would hypothesize that conflict with teachers and peers would be particularly detrimental for the development of self-regulation for girls. Conflict is more discordant with expectations of how girls should behave than for boys, and would therefore be more likely to interfere with the development of girls regulatory abilities.

The second theory, academic risk theory, offers a different prediction regarding the role of gender in the differential development of boys and girls self-regulation skills. Academic risk theory proposes that children who are greater risk for school failure are more susceptible to rearing influences, and that close or conflictual relationships with teachers and peers would be more likely to alter the trajectories for at-risk children (Belsky, 2005; Hamre & Pianta, 2001).

Much research has demonstrated that compared to girls, boys have more social and behavioral difficulties in the classroom (Hamre & Pianta, 2001; McClelland, Morrison, & Holmes, 2000) compared to girls (Keogh, 2003). Boys can thus be considered to be at-risk for school difficulties compared to girls. This hypothesis would therefore predict that boys would be particularly sensitive to the negative effects of conflictual relationships with teachers and peers on the development of their regulatory skills, and would hypothesize that conflict would be particularly detrimental for boys. In addition, girls tend to do better on self-regulation tasks at earlier ages than boys (McCabe, Cunnington, & Brooks-Gunn, 2004).

Interestingly, the few studies that have tested the moderating role of gender in teacher- and peer- child relationships with children's school adjustment more broadly have found support for both hypotheses. In her study of teacher-child relationships and positive school adjustment in elementary school, Baker (2006) found that girls with close teacher-child relationships had moderately better school adjustment outcomes compared to boys with similarly close relationships with their teachers. This finding is supportive of the gender socialization hypothesis, suggesting that close relationships were particularly important for positive outcomes for girls. In support of the academic risk hypothesis, Hamre and Pianta (2001) found that conflictual and negative relationships with teachers was related to poor behavioral and academic outcomes from kindergarten through eighth grade, particularly for boys. This finding confirms the hypothesis that boys are particularly sensitive to the effects of classroom relationships. In their study of the moderating role of gender and ethnicity in the associations between teacher-child relationships and children's elementary school adjustment, Ewing and Taylor (2009) found evidence in support of both theories. They found that teacher-child closeness was particularly important for the development of social competence for girls, supporting the gender socialization

hypothesis. Conversely, the authors found that teacher-child conflict was particularly detrimental for the development of social competence for boys, supporting the academic risk hypothesis.

Overview of the Present Study

The current study makes several unique contributions to the literature. This investigation furthers our understanding of the development of children's inhibitory control and broader self-regulatory skills during prekindergarten, and the early processes that contribute to their development. Most of the previous studies that have examined children's relationships in the classroom have relied on parent or teacher report (Raver, Blackburn, Bancroft, & Torp, 1999; Silva et al., 2011). A strength of this study is its use of direct observation of inhibitory control and relational conflict in order to obtain a more objective assessment of children's skills and classroom processes. This study can inform prevention and intervention work designed to help children displaying conflict in the classroom. While recent studies have begun to investigate the ways in which children's regulatory skills can be modified (e.g. Barnett et al., 2008; Diamond et al., 2007; Raver et al., 2011), further research is needed to elucidate the processes through which children's skills may be modified in the context of the classroom. Further, this study utilizes a sample of children from minority families primarily from low socioeconomic backgrounds. Drawing from this sample will allow the results to generalize to disadvantaged children, an important population who are frequently underrepresented in research.

The study's research questions and hypotheses are as follows: (1) Are children's conflict with teachers and peers associated with changes in children's inhibitory control and self-regulation skills from the fall to spring of pre-kindergarten? It is hypothesized that children's conflictual relationships in the classroom with teachers and peers will be significantly associated with changes in children's inhibitory control and self-regulation skills from fall to spring.

Specifically, conflictual relationships will be related to fewer gains in spring inhibitory control and self-regulation skills compared to children without conflictual relationships; and (2) Are conflictual relationships with teachers and peers particularly detrimental for the development of inhibitory control and self-regulation for boys or girls? Because of the limited number of previous studies combined with the fact that previous research has demonstrated support for both theories (academic risk and gender socialization), this research question is considered exploratory.

Methods

Participants

Data were collected as part of the National Center for Research on Child Development (NCRECE) Professional Development Study. This was an 18 month study designed to improve teacher-child and interactions and to promote language and literacy skills. There were two types of professional development offered: a 14 week course (Phase I), and/or year-long coaching through the MyTeachingPartner (MTP) approach, which utilized individualized, web-based coaching (Phase II). Following the two phases of the study, there was a “post intervention” year of data collection specifically designed to examine child outcomes of the interventions received by teachers. The impact of the intervention was not of interest in the present study and was controlled for in the analyses.

The NCRECE Professional Development Study recruited teachers from large community preschools and Head Start centers in ten sites in eight states across the United States. Teachers were eligible for participation in the study if they were the lead teacher in a publicly funded classroom in which the majority of the students were (a) eligible to begin kindergarten the following school year and (b) did not have an Individualized Education Plan (IEP) at the start of

the school year. Additionally, it was required that classroom instruction was in English for the majority of the day and that high-speed internet was available for teachers.

A total of 405 teachers were recruited to the consultancy phase of the study (of which 49 were lost with no data collected, and an additional 15 were lost after participating in some data collection). In total, there were 200 classrooms (100 from Cohort 1 and 100 from Cohort 2) that participated in the consultancy phase. Teachers who were enrolled during the consultancy phase were then invited to participate in one year of additional follow-up. This post-intervention follow-up consisted of data collection only, and teachers were not exposed to treatment during this phase of the study. Data collection occurred during the school year immediately following the year-long consultancy phase. Teachers had an average of 16 years of education and a mean age of 42.

During the post-intervention year, four children from each classroom were selected for direct assessments and inCLASS observations for a total of 895 children assessed. The children came from socioeconomically disadvantaged families, with an average income of \$23,949 (range \$2,500 to \$87,000) and average maternal education of 13 years (range 8-20). Children ranged in age from 2-5, with a mean age of 4. Most of the children were African American (47%) or Latino/a (34%), with a smaller number of White (18%), Asian (5%), and multi-ethnic (4%).

Procedures

Recruitment. Schools were recruited from ten urban areas across the United States. Permission to participate in the study was first obtained from center directors or principals, and then teachers were invited to participate. Following receipt of informed consent documentation, data collectors conducted classroom observations and teachers completed personal and classroom demographic surveys. All parents or guardians of children were sent home a letter

describing the study, an informed consent form, and a brief demographic survey that was returned to the classroom teacher. On average, 9.98 (SD = 3.83; range = 2-20) per classroom consented to participate in the study. Of those children without an IEP, four children (two boys and two girls when possible) from each classroom were selected for participation. Two of these children were randomly selected for individual observation of their classroom engagement.

Data Collection. Teachers completed a professional and classroom demographic survey in the fall. Data collectors conducted direct child observations in the fall and the spring. Observations of teacher-child interactions at the classroom level and individual observations of children's engagement were collected at a single time point in the winter.

Observation Training. All data collectors attended a two-day intensive training session for each of the two observational measures: one classroom level measure of teacher-child interactions, the Classroom Assessment Scoring System (CLASS), and one child-level measure of children's engagement, the Individualized Classroom Assessment Scoring System (inCLASS; see measures section for a description of the inCLASS). Only the inCLASS was used for the present study. Trainings included a detailed review of all contents/dimensions, combined with watching, coding, and discussing five training clips of classroom footage from a diverse range of programs. At the end of the trainings, data collectors were required to independently code five reliability clips and score within 1 point of the master code on 80% of the dimensions in order to be certified as reliable and conduct observations. If data collectors did not achieve this reliability standard, they received individual consultation and then repeated reliability clips prior to conducting live data collection. Data collectors were also required to complete a "live" coding session in a preschool classroom with a master trainer, using both the CLASS and the inCLASS. Data collector reliability for the inCLASS ranged from 90-94%. Weekly calibration meetings

were held for data collectors to ensure maintenance of reliability in coding in which they were required to independently watch and code reliability clips and discuss (over conference call) how their codes compared with the mastercodes.

Observation Protocol. Observations were scheduled at the teachers' discretion and lasted for approximately four hours from the beginning of the day until mid-day dismissal or after lunch. A data collector fluent in Spanish conducted observations for classrooms in which a large percentage of the children spoke Spanish and/or a large proportion of instruction was in Spanish. Data collectors observed selected children and their classroom in a series of alternating cycles starting at the beginning of the school day: a 25-minute cycle for CLASS (15 minutes to observe; 10 minutes to score) and a 15 minute cycle for inCLASS (10 minutes to observe, 5 minutes to score), shifting across the two target children. The goal was to complete a minimum of three CLASS and three inCLASS cycles per child per visit.

Direct Assessment Training. Prior to the formal training days, data collectors were mailed a kit that included the various child assessment measures, a training manual created by the study team (to address questions that may arise during data collection), a CD with an example child assessment, and props necessary for administering the assessment. Data collectors carefully reviewed the materials and gave practice assessments prior to training. Data collectors then attended a two day training in which they practiced administration of the assessments, had questions answered, and received feedback from trainers. Following the training, data collectors video-recorded their administration of the assessment battery to a preschool child which was evaluated by a trainer.

Measures

Child Demographic Information. Parents completed a survey that provided information about their child's date of birth, race/ethnicity, sex, and family income.

Inhibitory control skills. Children's inhibitory control skills were assessed using the Pencil Tap Test (Diamond & Taylor, 1996; Smith-Donald, Raver, Hayes, & Richardson, 2007) and the Preschool Learning Behaviors Scale (PLBS) (McDermott, Leigh, & Perry, 2002). For the Pencil Tap, children were taught a pencil tapping game that tested the child's ability to resist a dominant response in favor of a subdominant response. Children were asked to tap their pencil once when the assessor tapped twice and vice versa. The percent of correct responses were measured (with higher correct indicating greater inhibitory control. Based on Smith-Donald et al.'s (2007) reliability and validity study of the Preschool Self-Regulation Assessment, the Pencil Tap loaded onto the Compliance/Executive Control factor and displayed good concurrent and construct validity. The children who were selected for assessments were administered the Pencil Tap twice during the post-intervention year, once during the fall, and once in the spring.

Preschool Learning Behaviors Scale

The PLBS is a 29-item questionnaire administered to teachers to assess children's early learning behaviors. While not defined as an assessment of children's regulatory abilities, the domains assessed, including children's flexibility, motivation, attention, and persistence are considered constructs related to self-regulation. In a factor analysis of the PLBS, a three-factor structure emerged: motivation, attention/persistence, and attitude toward learning. Example items include "is reluctant to tackle a new activity (motivation factor), "pays attention to what you say" (attention/persistence factor), and "shows little desire to please the teacher" (attitudes toward learning factor). Cronbach's alpha for the total score is .859 across all ratings, showing strong internal consistency reliability for the measure. In validity studies of the PLBS, the measure has

been demonstrated to be associated with children's social skills, and is linked to children's general intelligence scores (Fantuzzo, Perry, & McDermott, 2004; McDermott, Leigh, & Perry, 2002). In preschool-aged children, there is considerable overlap between children's broad learning skills and the behavioral manifestation of self-regulation skills in the classroom. The questionnaire asked teachers to rate children on domains that are conceptually assessing children's self-regulation skills as manifest in the classroom setting. We did, however, want to ensure that the motivation subscale did not confound our results. Motivation is a relational process, and can be impacted by the teacher-child relationship. We therefore removed the motivation subscale from the analyses and used the attention/persistence and attitudes towards learning subscales for the analyses.

Relational conflict. The Individualized Classroom Assessment Scoring System (inCLASS) is an observational assessment of young children's competence during everyday interactions with teachers, peers, and tasks in preschool and kindergarten classroom environments. The inCLASS targets aspects of young children's adjustment to the classroom with known links to school readiness and successful adaptation to early schooling (Downer et al., 2009). The inCLASS is currently being validated with over 750 children in approximately 250 classrooms across the country. The inCLASS measures 10 dimensions using 7-point scales: (a) positive engagement with the teacher, (b) teacher conflict, (c) teacher communication, (d) peer sociability, (e) peer conflict, (f) peer assertiveness, (g) peer communication, (h) engagement within tasks, (i) self-reliance, and (j) behavior control. Interrater agreement during live observations on these scales ranged from 0.71 to 0.99 during the pilot study (Downer et al., 2009), and from 0.87 to 0.99 during a recent field study. Initial findings lend support to construct validity, and criterion-related validity for the inCLASS (Downer et al., 2009). The current study

uses the dimensions of teacher conflict and peer conflict (these two dimensions are correlated .43).

In the present study, 410 children were assessed at the first time point, and 406 children were assessed at the second time point. However, 102 of the children assessed at the second time point had already been previously assessed, for a total of 714 unique child assessments. The conflict with teacher and conflict with peer variables that were used in the current assessment represent each score for those children who were assessed once, and the mean of the two scores for those children who were assessed twice.

Covariates. The covariates entered into the model were 1) child's gender, 2) child's age, 3) maternal education (as a proxy for family socio-economic status), 4) level of teacher education, 4) whether or not the teacher was in a head start classroom, 5) whether the teacher was in a public school or private center, 6) number of days between fall and spring assessments for pencil tap and PBLs, and 7) whether the teacher was in the intervention or control group during the larger NCRECE professional development study.

Missing Data

Participants in the current study were followed for one full year of data collection. Mplus 5.1 (Muthen & Muthen, 2007) was used to account for missing data, as it is a program designed to address latent variable modeling and has properties to estimate the fit of the latent factor structures while accounting for missing data. For the current study, missing data were handled using the default full information maximum likelihood algorithm. Full information maximum likelihood estimation is considered the most efficient and unbiased method of handling missing data and decreases Type I error rates compared to both listwise and pairwise deletion (Enders & Bandalos, 2001).

Analytic plan.

For the regression analyses, all of the continuous covariate, predictor, and outcome variables were standardized, while the dichotomous variables remained unstandardized. Descriptive statistics, including means and standard deviations, were executed for all covariates, predictors, moderators, and outcome measures. The hierarchically nested structure of the data where children (Level 1) were nested within classrooms (Level 2) was accounted for in the model with the COMPLEX command in Mplus. This command adjusts the standard errors to account for the clustering of children within classrooms. Mplus 5.1 (Muthén & Muthén, 2007) provided the conceptual framework for specifying the multilevel models.

Two separate models were run, one using the pencil tap task, a direct assessment of children's fall (predictor) and spring (outcome) inhibitory control skills, and a second model using the Preschool Learning Behaviors Scale, a teacher-reported assessment of children's self-regulatory capacities as manifest in the classroom environment. These two measures of self-regulation were tested in two separate models for both theoretical and empirical reasons. Theoretically, we thought that the pencil tap task and the PLBS are assessing related, but divergent aspects of children's regulatory abilities. The pencil tap task is an individually administered direct assessment of children's abilities to inhibit a desired response. It provides important, albeit quite specific, information regarding children's inhibitory control skills. The PLBS is a measure that captures teachers' perceptions of children's skills across a broader range of abilities. Together, the two measures provide a robust picture of children's abilities. Given the different abilities that they are assessing, we thought that it was theoretically justified to test the two models separately. This decision was confirmed empirically as well. The pencil tap and PLBS are not correlated strongly enough to be considered one construct ($r = .23$). This

correlation indicates that while there is certainly overlap between the measures, they are assessing different skills and should be examined separately.

We had two variables assessing conflict with teachers; one that examined conflict with teachers, and one that measured conflict with peers. The two measures were correlated .43, indicating a moderate correlation between children's conflict with teachers and peers in the classroom. Based on this moderate correlation, we decided to keep the two conflict variables separate, rather than compositing or creating a latent construct, as it appears that children can display conflict with either teachers or peers, and not necessarily neither or both.

We ran two multiple regression analyses for each model; one model to test the main effect of conflict on children's developing inhibitory control skills from the fall to spring, and the second model to test the interactions between 1) fall inhibitory control and conflict, and 2) gender and conflict. All models were ran with the following covariates in the model: the child's gender, maternal education, teacher education, whether or not the teacher was in a head start classroom, whether the teacher was in a public school or private center, days between assessments, and whether the teacher was in the intervention or control group.

The regression equations for the main effect models are:

$$(1) Y (\text{spring pencil tap}) = b_0 + b_1(\text{covariates}) + b_2(\text{fall IC}) + b_3(\text{conflict with teachers}) + b_4(\text{conflict with peers}) + r.$$

$$(2) Y (\text{spring PLBS}) = b_0 + b_1(\text{covariates}) + b_2(\text{fall IC}) + b_3(\text{conflict with teachers}) + b_4(\text{conflict with peers}) + r.$$

The regression equations for the full models are:

$$(1) Y (\text{spring pencil tap}) = b_0 + b_1(\text{covariates}) + b_2(\text{fall IC}) + b_3(\text{conflict with teachers}) + b_4(\text{conflict with peers}) + b_5 (\text{conflict} * \text{gender}) + r.$$

$$(2) Y (\text{spring PLBS}) = b_0 + b_1(\text{covariates}) + b_2(\text{fall IC}) + b_3(\text{conflict with teachers}) + b_4(\text{conflict with peers}) + b_5(\text{conflict} * \text{gender}) + r.$$

Results

We used regression analyses to test the hypothesis that children with conflict with teachers and peers would impact the development of children's self-regulation skills from the fall to the spring of pre-kindergarten. Further regression analyses were conducted to examine whether gender moderated this difference; that is, whether conflict with teachers and/or peers impacts self-regulation differentially for boys and girls. Descriptive statistics for all variables can be found in Table 1. Correlational analyses were conducted to examine the associations between the covariates, predictor, and outcome variables (Table 2).

Main Effect of Conflict Predicting Spring Inhibitory Control and Self-Regulatory Abilities

We ran regression models to test the impact of conflictual teacher-child and peer-child relationships on the development of children's inhibitory control and broader self-regulation skills. This first set of analyses included 1) the covariates, 2) conflict with teachers, and 3) conflict with peers to test the main effect of each type of conflict on the development of children's inhibitory control and self-regulatory skills. All non-dichotomous variables were standardized for all analyses.

As expected, for both pencil tap and Preschool Learning Behaviors Scale (PLBS), children's skills in the fall significantly predicted spring scores ($b = .48, p < .001$ and $b = .59, p < .001$, respectively). A significant main effect was found for the impact of teacher-conflict on children's self-regulatory skills (as assessed by the Preschool Learning Behaviors Scale) ($b = -.4; p < .001$). This finding suggests that teacher-child conflict, as assessed via direct observation of teacher-child interactions, was negatively associated with gains in children's self-regulatory

skills (as assessed by teacher-report) from the fall to spring of prekindergarten. Additionally, a trend was observed indicating that peer-child conflict negatively impacted the development of children's inhibitory control skills from the fall to spring of pre-kindergarten ($b = .07$; $p = .07$).

Gender x Conflict Interaction

Following the examination of the main effects of the impact of conflict on the development of children's self-regulation and inhibitory control skills, we tested whether these effects differed for boys and girls. Specifically, we were interested in whether teacher-child and/or peer child conflict was particularly detrimental for either boys or girls. This set of analyses included 1) the covariates, 2) conflict with teachers, 3) conflict with peers, and 4) gender x conflict. As in the first set of analyses, all non-dichotomous variables were standardized.

For the pencil tap, there was a trend towards significance for the role of gender in moderating the relationship between teacher-child conflict and children's self-regulation development ($b = .17$, $p = .06$; see Table 3 and Figure 1 for depiction of the interaction). Specifically, girls with low teacher-child conflict had the highest scores on a direct assessment of inhibitory control skills in the spring of pre-kindergarten. Girls with high teacher-child conflict had the lowest spring inhibitory control of the children assessed. Interestingly, as can be seen in Figure 1, teacher-child conflict did not significantly impact the development of inhibitory control skills from the fall to spring or pre-kindergarten for boys.

Discussion

In this study, we examined the development of children's inhibitory control and self-regulation skills over the course of one pre-kindergarten year and the role that teacher-child and

peer-child conflict plays in the development of those skills. Our results demonstrated that on a teacher-reported assessment of children's self-regulatory abilities as manifest in the classroom, teacher-child conflict was significantly associated with fewer gains in children's self-regulation skills from the fall to spring of pre-kindergarten. This finding was not found for children's conflictual relationships with peers. Interestingly, on a direct assessment of children's inhibitory control skills, teacher-child conflict was not significantly associated with the development of children's skills from fall to spring. However, there was a trend approaching significance for the role of peer-child conflict in impacting the development of children's inhibitory control skills.

Second, gender was found to moderate the association between conflict and changes in children's inhibitory control skills, as measured by a direct assessment. However, gender did not moderate the association between conflict and children's self-regulatory skills when assessed by teacher-report. These results indicated that conflict with teachers is particularly detrimental for girls, such that girls with high conflict show the smallest gains in their inhibitory control scores throughout the year (compared to both boys and girls with low conflict), and girls with low conflict show the greatest gains in their inhibitory control skills. Interestingly, teacher-child conflict did not appear to impact the development of inhibitory control for boys. Taken together, the two main findings offer insight into the development of preschool-aged children's self-regulatory skills and the role that relational conflict in the classroom plays in the development of those skills. The current study extends previous work by focusing on socio-economically disadvantaged and ethnically diverse children and utilizing both teacher-report and observed data. Further, these results have practical implications for early intervention efforts designed to identify supports for young children.

Conflict and Children's Self-Regulation Skills

We tested two separate models to test the role that conflict may play in the development of preschool children's self-regulation skills—one examining the role of conflict on the development of children's broad self-regulation skills as reported by teachers, and one examining the role of conflict in the development of inhibitory control (a specific component of effortful control), as assessed by direct assessment. We found a significant association for the role of conflict on teacher's report of children's broad self-regulation skills. Thus, this study revealed that throughout one preschool year, teacher-child conflict was significantly associated with fewer gains in children's self-regulation skills. Regarding the non-significant finding for the direct assessment of children's inhibitory control skills, we must consider the differential skills assessed by each of the measures. The Preschool Learning Behaviors Scale assessed teachers' perceptions of children's regulatory skills across a wide range of abilities, including attention, behavior, and emotionality. Additionally, because teachers were assessing children's skills in the classroom setting, the skills assessed are proximal to the skills needed for success in the classroom. On the other hand, the pencil tap task is an important and well-validated direct assessment of a highly specific skill, known as inhibitory control, measured in a one-on-one setting. This task essentially measures how well children are able to resist their natural temptation to do something; in this case to resist the urge to tap their pencil the same number of times as the experimenter and instead to tap once if the experimenter taps twice and vice versa). The finding that conflict is more important for the development of children's broad self-regulation skills as manifest in the classroom, and not related to the development of the narrower skill of inhibitory control is quite interesting. It suggests that perhaps conflictual relationships with teachers are particularly important for the development of children's broad regulation skills, particularly those that are most relevant to the skills needed to succeed in the classroom.

Additionally, the results of the main effect of conflict on children's self-regulation skills indicate that this association was only found for teacher-child conflict, not peer-child conflict. While previous literature has found that both teacher-child and peer-child conflict are associated with negative child outcomes (Ladd & Troop-Gordon, 2003; Hamre & Pianta, 2001), perhaps for self-regulation specifically, teachers serve a unique role as facilitators in promoting self-regulation skills and scaffolding the emotional, attentional, and behavioral skills necessary to be successful in the classroom. Previous research has found that peer-child relationships are important for children's social competence and social skills (Ladd, 1990, 1999; Ladd, Kochenderfer, & Coleman, 1996), but this study lends support for the idea that perhaps teacher-child conflict is particularly important for the development of children's regulation skills, while peer-child conflict is most proximal to children's social development.

The authors hypothesize that children's regulatory skills are supported and scaffolded through consistent routines, redirection of attention, encouragement to persist on difficult tasks, and warm and sensitive interactions with teachers during the preschool years. It is through the set-up of the environment (structure, routine, and organization of the classroom, provision of activities, etc.) combined with sensitive and supportive interactions with teachers and other adults that children's behavior becomes more internally regulated rather than extrinsically managed throughout the early educational years. Children with more conflictual relationships with teachers are not afforded as many opportunities to practice and develop their regulatory skills and are likely not provided the same level of support to develop their self-regulation skills throughout the year. Recent research suggests bi-directional associations between teacher-child conflict and self-regulatory skills across the elementary school years (Berry, 2012). Thus, while bi-directional associations between conflict and children's self-regulation skills have been

proposed, this paper examined the extent to which conflict with teachers and peers in the classroom is associated with self-regulatory skills in the spring of pre-kindergarten.

Gender as a Moderator

Prior research has lent some support for the academic risk hypothesis for the detrimental role that teacher-conflict may play for boys in particular (Ewing & Taylor, 2009; Hamre & Pianta, 2001). Based on that theory, we hypothesized that teacher-child conflict would particularly inhibit the development of boys' inhibitory control and broader self-regulation skills. Interestingly, the results of this study provide evidence for the gender socialization hypothesis, with conflict being particularly detrimental for the continued development of inhibitory control for girls. Girls with low conflict displayed the strongest inhibitory control skills (compared to boys with low or high conflict and girls with high conflict), and girls with high conflict showed the smallest gains in their inhibitory control skills from the fall to spring of prekindergarten. For boys, the level of conflict with their teachers did not significantly affect the development of their inhibitory control skills.

We had hypothesized that there would be a significant gender moderation both for inhibitory control and children's broader self-regulatory skills. Interestingly, gender moderation was only found for the direct assessment of children's inhibitory control skills. Children with well-developed inhibitory control skills have the ability to restrain their impulsivity and are less likely to be disruptive in class. Overall, girls have been found to have better developed inhibitory control skills than boys (Else-Quest et al., 2006; Mendez, McDermott, & Fantuzzo, 2002; Walker, Berthelsen, & Irving., 2001). Based on the gender socialization hypothesis, it is possible that teachers have more tolerance for boys acting impulsively in the classroom. Evidence suggests that teachers do have expectations for the ways in which boys and girls should behave

in class, and differentially reward and punish children based on those conceptions (Altermatt, Jovanovic, & Perry, 1998; Koch, 2003). For example, Sadker and Sadker (1994) found that when boys interrupted in class, they were attended to, but that girls were reprimanded for interrupting. It is possible that one reason that there was a significant interaction only for inhibitory control is that that is a skill that is very noticeable for teachers (i.e. children who interrupt and are impulsive in the classroom stand out), and perhaps teachers have more tolerance for that behavior in boys, and therefore conflict is particularly detrimental for the development of inhibitory control for girls. A unique and important aspect of this finding is that all of the variables (conflict and children's fall and spring inhibitory control skills) were assessed by direct observation, eliminating teacher bias or other challenges associated with teacher-report. This study is an important contributor to the literature in that it is the first to demonstrate the interaction between gender and conflict in the development of preschool-aged children's inhibitory control skills.

Limitations

While this study offers important insights into the processes that are important for the development of children's self-regulation skills, there are some limitations that warrant mention. Firstly, we did not consider bi-directionality in this study. We were interested in examining the development of children's inhibitory control and self-regulation skills, and the role that conflict with teachers and peers played in that development. It was beyond the scope of the current study to examine how having poor self-regulation skills may set the stage for having more conflictual relationships in the classroom. In a similar vein, while the data were from a short-term longitudinal study, it was correlational in nature, and we can therefore not draw causal conclusions regarding the way that conflict is associated with the development of children's

inhibitory control and self-regulation skills. We cannot conclude that conflict causes smaller gains in children's regulation skills, nor that conflict causes girls to have particularly small gains in inhibitory control. We can only conclude that these processes are significantly associated with one another, and that the developmental models that can account for these associations are likely to be quite complex.

Second, the sample used in the current study is primarily low income and ethnically diverse. While this is an important population to study since they tend to be under-represented in research, it does limit the generalizability of the study to children from similar backgrounds. The results of this study are most likely to generalize to a similar population of children. Further research with a similar population is needed to examine whether the role of children's early self-regulation skills is different for children from a lower income ethnically diverse population. Despite these limitations, this study is one of the first to provide evidence for the role of conflict in the development of children's self-regulation skills, as well as providing support for the gender socialization hypothesis by finding that conflict is particularly detrimental for the development of inhibitory control for girls.

Implications

This study offers insights into the development of children's self-regulation skills during this critical juncture in which children are preparing for the transition to formal schooling. Future studies could further extend this research by examining the role that classroom quality (e.g. emotional support or classroom organization) play in the development of children's self-regulation skills. Such an investigation was beyond the scope of the current study as we focused on how the relationships that children have with others in the classroom influence the

development of their regulation skills, as we thought those were the most proximal classroom processes in the development of children's self-regulation skills.

The findings from the present study have important implications for intervention efforts. This study lends further support for the importance of interventions such as Banking Time (Pianta, 1999; Pianta & Hamre, 2001) which are designed to improve teacher-child relationships and prevent conflict. The novel findings regarding the way that gender interacts with conflict in the development of children's inhibitory control skills also provides an important direction for future intervention efforts. Because girls appear to be particularly susceptible to the detrimental effects of conflict in the development of inhibitory control, it will be important to work with teachers to help reduce their conflictual relationships with girls in particular. Taken together, this study offers important insights and directions for future research on the role that teacher-child conflict plays in the development of children's self-regulation skills.

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Table 1. Descriptive statistics for all covariate, independent, and dependent variables

Self-Regulation and Relationships

<i>Variable</i>	<i>M</i>	<i>SD</i>	<i>n</i>	<i>Unstandardized Range</i>	<i>Standardized Range</i>
Covariates					
Maternal Education (years)	12.7	2.35	854	8 - 20	-2.00 - 3.10
Teacher Education (years)	15.84	1.62	865	12 - 20	-2.38 - 2.57
Days Between Pencil Tap	156.83	35.95	653	84 - 273	-2.03 - 2.57
Assessments					
Days Between PLBS Assessments	152.30	36.75	605	57 - 243	-2.59 - 2.47
Independent Variables					
Fall Pencil Tap Scores	.48	.32	722	0 - 1	-1.48 - 1.61
Fall PLBS Scores	52.09	9.38	703	16 - 64	-3.85 - 1.27
Moderator Variables					
InCLASS Conflict with Teacher	1.08	.23	714	1 - 3.33	-.36 - 9.74
InCLASS Conflict with Peers	1.16	.29	714	1 - 2.67	-.53 - 5.15
Outcome Variables					
Spring Pencil Tap Scores	.61	.32	795	0 - 1	-1.91 - 1.20
Spring PLBS Scores	52.83	9.70	751	17 - 64	-3.67 - 1.15

Table 2. Correlations among covariate, independent, and dependent variables

<i>Variable</i>	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>	<i>6</i>	<i>7</i>	<i>8</i>	<i>9</i>	<i>10</i>	<i>11</i>	<i>12</i>	<i>13</i>	<i>14</i>
1. Gender	---	.03	.01	-.01	.01	.03	.02	.01	-.02	-.13**	.13**	.07	-.03	-.14**
2. Maternal Education		---	.11**	-.14**	-.14**	.07	.10*	.01	.18**	.06	.06	.04	.13**	.02
3. Teacher Education			---	-.41**	.05	.14**	.14**	-.04	.02	.03	-.11**	.10**	.06	.09*
4. Head Start				---	-.24**	.04	.14**	-.13**	-.03	.01	.05	-.03	-.06	-.07
5. Public School					---	-.08*	-.10*	.12**	-.04	.04	-.05	-.07	.02	.14**
6. Days Between PT						---	.72**	-.02	-.14**	.04	.02	-.01	-.04	.00
7. Days Between PLBS							---	.05	-.05	.06	-.02	.00	.02	-.01
8. Treatment or Control								---	-.05	-.02	-.02	.00	.05	.00
9. Fall Pencil Tap									---	.23**	-.09*	-.04	.54**	.24**
10. Fall PLBS										---	-.20**	-.17**	.26**	.63**
11. Conflict w/ Teacher											---	.43**	-.11**	-.25**
12. Conflict with Peers												---	-.10*	-.20**
13. Spring Pencil Tap													---	.26**
14. Spring PLBS														---

Table 3. Main Effect Regression Model for Pencil Tap

Variable	Standardized Coefficients	Standard Error	P-Value
Gender	.01	.07	.90
Maternal Ed	.09	.04	.02*
Teacher Ed	.03	.04	.50
Head Start	-.03	.08	.70
Public School	-.01	.08	.89
Days Between Assessments	-.01	.04	.75
Treatment or Control	.14	.07	.05*
Child Age at Assessment	.38	.08	.00**
Fall Pencil Tap	.48	.04	.00**
Conflict with Peers	-.07	.04	.07
Conflict with Teacher	.04	.04	.37

Table 4. Main Effect Regression Model for Pencil Tap

Variable	Standardized Coefficients	Standard Error	P-Value
Gender	.01	.07	.90
Maternal Ed	.09	.04	.02*
Teacher Ed	.03	.04	.50
Head Start	-.03	.08	.70
Public School	-.01	.08	.89
Days Between Assessments	-.01	.04	.75
Treatment or Control	.14	.07	.05*
Child Age at Assessment	.38	.08	.00**
Fall Pencil Tap	.48	.04	.00**
Conflict with Peers	-.07	.04	.07
Conflict with Teacher	.04	.04	.37

Table 5: Full Regression Model for PLBS

Variable	Standardized Coefficients	Standard Error	P-Value
Gender	-.08	.06	.22
Maternal Ed	-.001	-.12	.91
Teacher Ed	.03	.04	.44
Head Start	-.10	.09	.26
Public School	.17	.08	.03*
Days Between Assessments	-.04	.03	.22
Treatment or Control	-.04	.08	.62
Fall PLBS	.60	.04	.00**
Conflict with Peers	.06	.06	.33
Conflict with Teacher	-.20	.09	.02*
Gender x Conflict with Peers	-.15	.08	.07
Gender x Conflict with Teachers	.13	.10	.20

Table 6: Main Effect Regression Model for PLBS

Variable	Standardized Coefficients	Standard Error	P-Value
Gender	-.18	.15	.21
Maternal Ed	.07	.08	.35
Teacher Ed	-.14	.11	.22
Head Start	.27	.21	.20
Public School	.14	.23	.53
Days Between Assessments	-.07	.19	.70
Treatment or Control	.08	.10	.43
Child Age at Fall Assessment	.25	.20	.23
Fall PLBS (without motivation)	.59	.01	.00**
Conflict with Peers	.01	.17	.94
Conflict with Teacher	-.42	.14	.00**

Figure 1. Graph of Gender by Conflict Interaction for Pencil Tap

