TEACHER-CHILD RELATIONSHIPS, INTERACTIONS, AND PROBLEM BEHAVIOR: A LONGITUDINAL ANALYSIS EXAMINING BI-DIRECTIONAL ASSOCIATIONS

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TEACHER-CHILD RELATIONSHIPS, INTERACTIONS, AND PROBLEM BEHAVIOR: A LONGITUDINAL ANALYSIS EXAMINING BI-DIRECTIONAL ASSOCIATIONS

A dissertation submitted in partial fulfillment of the requirements for the degree of Doctor of Philosophy at Virginia Commonwealth University

by

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Dedication

For Ava, Shane, and mom.

You have made this all possible.
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Abstract

TEACHER-CHILD RELATIONSHIPS, INTERACTIONS, AND PROBLEM BEHAVIOR: A LONGITUDINAL ANALYSIS EXAMINING BI-DIRECTIONAL ASSOCIATIONS

By Rachel L. Kunemund

A dissertation submitted in partial fulfillment of the requirements for the degree of Doctor of Philosophy at Virginia Commonwealth University

Virginia Commonwealth University, 2019

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A number of preschool children engage in consistent problem behaviors that place them at-risk for developing emotional and behavioral disorders. These problem behaviors have been associated with poorer short and long-term outcomes for young children. Teacher-child relationships (i.e. conflict and closeness) and positive interactions between teachers and children may be reciprocally associated with problem behavior (e.g. teacher-child closeness reducing problem behavior). The purpose of this study was to explore the longitudinal bi-directional relations between teacher-child relationships, teacher-child interactions, and problem behavior
over a single school year. Using a cross-lagged panel model, data from a larger randomized control trial of the BEST in CLASS program, was examined across three time points, and differences based on intervention participation were examined. Results indicated that there were far fewer paths in the business as usual group compared to the BEST in CLASS group. As expected, in the comparison group, problem behavior at Time 1 predicted lower levels of closeness at Time 2, however, this relation was not significant in the BEST in CLASS group. In the BEST in CLASS model problem behavior at Time 1 negatively predicted Time 2 positive interactions and there was a cross-lagged association with problem behavior at Time 1 predicting higher levels of conflict at Time, which in turn predicted higher levels of problem behavior at Time 3. Additional findings, limitations and implications for intervention work, practice, and policy are discussed.
Chapter 1

Importance

A number of children in preschool and early elementary school display elevated levels of problem behavior (Barbarin 2007; Forness, Freeman, Paparella, Kauffman, & Walker, 2012). These young children, who are frequently at-risk for developing emotional and behavior disorders (EBD), often have difficulties that extend beyond the classroom. Additionally, as problem behaviors persist, these children often have increased negative outcomes later in school and life (O’Conner et al., 2011). Preschool and the transition into early elementary school is a critical time of development during which intervention can improve outcomes. To reduce the risk and negative outcomes of EBD, it is important to identify factors associated with improved child behavior at a young age. To this end, I aimed to investigate the longitudinal bidirectional relationships between problem behavior, teacher-child relationships, and teacher-child interactions for preschool children and their teachers.

Prevalence of EBD. While many children engage in problem behaviors, there is a lack of consistency in identifying and determining the prevalence of EBD (Brauner & Stephens, 2006; Ringeisen et al., 2017). Some researchers approximate the occurrence of EBD anywhere from 3-6% (Kauffman & Landrum, 2013) to 12% (Forness et al., 2012) with some reports as high nearly 23% of preschool children (Barbarin 2007). Both the mental health and education fields have had difficulty in determining the prevalence of EBD; this is likely due to inconsistent definitions of EBD in the literature (Brauner & Stephens, 2006). Brauner and Stephens reported that the
number of children with EBD varied throughout the mental health literature based on how inclusive defined “cut offs” were in the definitions of EBD. Estimates ranged from 5 to 26% of preschoolers at-risk for EBD; studies with more inclusive cut-offs reported higher prevalence rates. In a separate study, Forness and colleagues (2012) used related psychological disorders (e.g., conduct disorder, ADHD, oppositional defiant disorder) as their criteria for EBD. Landrum (2017) explained that there is not a standard definition and refers to the “flawed” IDEA (2004) definition of Emotional Disturbance as this is what is frequently used in school-based settings (p. 213). Emotional disturbance is defined by IDEA (2004) as:

(i) Emotional disturbance means a condition exhibiting one or more of the following characteristics over a long period of time and to a marked degree that adversely affects a child’s educational performance:
   (A) An inability to learn that cannot be explained by intellectual, sensory, or health factors.
   (B) An inability to build or maintain satisfactory interpersonal relationships with peers and teachers.
   (C) Inappropriate types of behavior or feelings under normal circumstances.
   (D) A general pervasive mood of unhappiness or depression.
   (E) A tendency to develop physical symptoms or fears associated with personal or school problems.

(ii) Emotional disturbance includes schizophrenia. The term does not apply to children who are socially maladjusted, unless it is determined that they have an emotional disturbance under paragraph (c)(4)(i) of this section.

While this definition refers to several aspects of emotional disorders, Landrum (2017) highlights the vagueness and lack of clarification within the definition, opening itself to inconsistency in application. Relatedly, without a consistent definition of EBD, identification of children in school settings with EBD becomes an issue (Brauner & Stephens, 2006; Forness et al., 2012). For example, Forness et al. (2012) estimated that while 12% of the school aged population have EBD only 1% are identified as specifically having emotional disturbance. It is likely that this 1% are those students with the most significant disability (Forness et al., 2012).
Yet, Kauffman and Landrum (2013) discuss the identification of EBD outside of diagnosed disorders in the mental health field and more so in terms of school-based identification (e.g., for special education or response to intervention services) when estimating their 3-6% prevalence rate. One issue is that there are a number of methods for identifying students as having an EBD. Many studies or school personnel rely on teacher, observer, or parent report measures (e.g., Systematic Screening for Behavioral Disorders; Walker & Severson, 1992) to identify students with increased rates of behavior problems or emotional difficulties, particularly in terms of identification for special education (Landrum, 2017). Despite the difficulty surrounding identification, most recent estimates from Ringeisen and colleagues (2017) concluded that between 9-13% of youth in the United States are identified as have a “serious emotional disorder”. These more current estimates demonstrate the need for research and the identification of supports for young children with EBD.

For the purposes of this paper, EBD included both externalizing (e.g., disruptive to others, aggressive, and/or defiance or noncompliance with teacher demands; Conroy et al., 2015), and internalizing behaviors (e.g., withdrawal, shyness; Landrum, 2017). To clarify the vague language surrounding duration or level of behavior in the federal definition, these behaviors may be identified if they meet an instrument specific criterion through teacher, parent, or observer reported ratings on behavioral or emotional related instruments or identified through mental health or psychiatric services outside of the school-based setting. The following meta-analysis in Chapter 2 focused broadly on any number of instruments measuring both internalizing and externalizing behavior. In Chapter 3, the focus moves specifically to students who were screened into a study and considered to be with or at-risk for EBD given their risk score on the Early Screening Project instrument (Walker, Walker, & Severson., 1995).
Outcomes for children with or at-risk for EBD. Despite inconsistencies in EBD identification and definitions, it is evident that a significant number of school-aged children require behavior supports and services to succeed. Without appropriate supports and services, children with or at-risk for EBD often experience negative outcomes that can have both short and long-term effects on student outcomes. Specifically, consistent emotional or behavioral difficulties can negatively impact children’s academic skills (Spilt, Koomen, Thijs, & Leji, 2012). Several studies have reported that children with EBD do not perform as well academically when compared to their same-age peers without EBD (Bradley, Doolittle, & Bartolotta, 2008; Lane, Barton-Arwood, Nelson, & Wehby, 2008; Reid, Gonzalez, Nordness, Trout, & Epstein, 2004).

Researchers describe a reciprocal association between behavior and academic performance where one may influence the other over time (Sutherland, Lewis-Palmer, Stitcher, & Morgan, 2008). To illustrate, teachers may struggle to teach and interact positively with children who display problem behaviors (Sutherland et al., 2008), resulting in fewer learning opportunities for these children (Wehby, Symons, Canale, & Go, 1998). Access to fewer learning opportunities can reduce children’s chances to demonstrate learning and participate positively in the classroom. However, when they are provided with increased opportunities to respond, they may have fewer occasions to engage in disruptive behavior and more positive and meaningful engagement with classroom instruction (Sutherland & Wehby, 2001). On the other hand, even when children are provided with opportunities to engage academically, they may not perform well. When children are struggling to perform academically and are not successful they may become frustrated and engage in problem behaviors (e.g., aggression; disruptions). To illustrate, Miles and Stipek (2006) found difficulties in reading in earlier grades were related to increased
problem behaviors (e.g., aggression) later on. Over-time, this relation between academics and behavior can become cumulative in which the child falls further and further behind academically and their behavior continues to increase in consistency and severity, further harming their relationships and interactions with teachers.

In light of these ongoing behavioral difficulties and strained teacher-child interactions, it is not surprising that children with EBD are subject to exclusionary disciplinary practices at rates much higher than their typically developing peers or those with other disabilities (e.g., learning disabilities; Bradley et al., 2008; Sullivan, Norman, Klingbeil, 2014). Specifically, Bradley and colleagues reported data from a large longitudinal study indicating that over 40% of children with EBD were suspended in a single year. Additionally, when considering young children in particular, we know that preschoolers are subject to exclusionary discipline practices at a rate three times higher than those in elementary school (Gilliam, 2005). This is important, as exclusionary discipline practices (i.e., suspension, expulsion) are frequently associated with increased negative outcomes (e.g., antisocial behavior) for children (Hemphill, Toumbourou, Herrenkohl, McMorris, & Catalano, 2006).

In addition to these poor school-based outcomes, children with consistent behavioral problems are also at-risk for negative long-term outcomes (Kerr, Reinke, & Eddy, 2013; O’Conner et al., 2011). Early problem behavior is associated with difficulties in later school-adjustment and ultimately long-term outcomes such as high-school dropout and substance abuse (Althoff; Verhulst, Rettew; Hudziak, & van der Ende, 2010; Wagner & Newman, 2012). Wagner and Newman (2012) analyzed data from a nationally representative sample of adolescents identified as having emotional disturbance (National Transitional Longitudinal Study 2; NLTS-2, Wagner et al., 2006) through the IDEA disability category and reported that nearly two thirds of
adolescents aged 18-21 with emotional disturbance had been arrested, nearly 20% had not 
completed high school, and slightly less than half were employed at the time of the study. 
Bradley et al. (2008) used data from the National Adolescent Child Treatment Study (NACTS, 
Greenbaum et al., 1996), a longitudinal study with a nationally representative sample of 800 
students aged eight to sixteen years old and identified as having EBD through a mental health 
diagnosis or IDEA disability category. Results indicated that 40% of students with EBD did not 
complete high school with the majority performing below grade level in academics. Regardless, 
these numbers offer a troubling picture of long-term outcomes for youth with EBD. Together, 
these data highlight the importance of intervening with young children at-risk for EBD to 
improve their outcomes, both within and outside of school. One promising factor associated with 
improved behavioral outcomes over time is positive teacher-child relationships.

**Teacher-child Relationships**

Teacher-child relationships are associated with children’s outcomes (e.g., academic, 
social, behavior; Hamre & Pianta, 2001, Howes, 2000). Though teacher-child relationships are 
often characterized along the domains of closeness, conflict, and dependency, this study focused 
only on conflict and closeness. For the purposes of this study, closeness was defined as a positive 
and warm relationship with increased positive interactions between an individual teacher and 
child (Hamre & Pianta, 2001; Birch & Ladd 1997). Conversely, conflict was defined as more of 
a negative construct, with fewer positive interactions and trust between the child and teacher 
(Hamre & Pianta, 2001; Birch & Ladd 1997).

Teacher-child relationships characterized by higher reported levels of closeness are 
related to academic success (Birch & Ladd, 1997; Hamre & Pianta, 2001; O’Connor, &
McCartney, 2007), as well lower levels of problem behavior (Howes, 2000). However, when teachers perceived higher conflict and experienced more negative interactions with children, these children tended to have lower school achievement and increased problem behavior later on (Hamre & Pianta, 2001). Howes (2000), for example, found that lower teacher-child closeness in preschool predicted higher levels of aggressive behavior in the second grade.

Unfortunately, few studies examined child behavior as a predictor of teacher-child closeness and conflict. In one longitudinal study, Jerome et al. (2009) reported that children’s externalizing behavior positively predicted teacher-child conflict in subsequent years. A recent study investigated the longitudinal transactional relations between teacher-child relationships (i.e., conflict, closeness) and behavior (externalizing, internalizing, and prosocial behavior) to determine how these factors relate over time for preschool boys with problem behavior (Roorda, Verschueren, Vancraeyveldt, Van Craeyveldt, & Colpin, 2014). Using a cross-lagged analysis, Roorda and colleagues found bidirectional relations between many of these variables. For example, results indicated that higher externalizing behavior earlier in the school year was associated with increased conflict later on and earlier conflict was related to higher levels of future externalizing behaviors. Closeness demonstrated a bidirectional relation with prosocial skills and was also negatively predicted by earlier ratings of child internalizing behavior. To build on prior research, gaps in the literature regarding child characteristics as predictors, limited research on momentary teacher-child interactions, and to better understand the development of the teacher-child relationship, I aimed to investigate the longitudinal bidirectional relationships between problem behavior, teacher-child interactions, and teacher-child relationships for preschool children and their teachers and whether or not these relations varied by gender.

**Teacher-child Relationships and Gender**
Research has repeatedly shown the important influence of teacher-child relationships, both positive and negative, on child outcomes (e.g., academic performance, behavior; Birch & Ladd, 1997, Hamre & Pianta, 2001; O’Connor, & McCartney, 2007). However, research indicates that boys have more externalizing behaviors than girls (Buyse, Verschueren, & Doumen, 2011; Liu, 2004). At the same time, girls tended to experience more closeness than conflict with their teachers (Birch & Ladd, 1997; Hamre & Pianta, 2001; Silver, Measelle, Armstrong, & Essex, 2005). Boys also were inclined to have more conflictual relationships with their teachers when compared to girls (Ewing-Taylor, 2016, Hamre & Pianta, 2001).

Specifically, Hamre and Pianta (2001) found that when teachers reported higher levels of conflict with their male students in kindergarten, these students scored lower in both reading and math. They also found that when girls had teacher-child relationships characterized by increased closeness, they performed better academically and behaviorally in later school years.

Higher levels of closeness have been associated with improved child outcomes while conflict has been linked to poorer long-term outcomes. Given that boys tend to experience more conflict than closeness (Ewing-Taylor, 2016, Hamre & Pianta, 2001), it is essential we explore the role of gender and whether in contribute to the prediction of teacher-child relationships, problem behavior, or interactions. When faced with child problem behaviors, teachers are more likely to use exclusionary discipline practices (expulsion, suspension) with boys, with nearly 80% of preschool suspensions being boys while they represent only half of the preschool population (Office of Civil Rights; OCR, 2014). While we are not specifically examining race as a factor, research has consistently found that Black boys are being expelled or suspended at a rate much higher than Black girls (OCR, 2014; Wallace, Goodkind, Wallace, Bachman, 2008) suggesting that gender may play a role in both teacher-child relationships and teacher discipline.
practices. In fact, in their meta-analysis, Lei and colleagues (2016) found that gender moderated the relationship between positive teacher-child relationships and behavior more strongly for girls than boys. However, this moderation did not influence the association between negative constructs teacher-child relationships and behavior. Thus, because of these mixed findings regarding gender, it was important to further explore the role of gender with teacher-child relationships, interactions and child problem behavior and to extend this research to further understand the contributions of gender.

**Teacher-child Interactions**

One factor that is both influenced by and influences teacher-child relationships (Pennings et al., 2014) and problem behavior is teacher-child interactions (McClowry, Rodriguez, Spellmann, Carlson, & Snow, 2013; Rudasill, 2011; Sutherland et al., 2018). Teacher-child interactions can be defined as moment to moment behavioral exchanges between a teacher and child (Pennings et al., 2014, Sutherland et al., 2018). For example, a child engages in a problem behavior such as a disruption and the teacher provides a response (McClowry et al., 2013), perhaps by reprimanding the child and removing them from the activity. Further, for this paper we can think of these interactions as being either positive or negative exchanges between a teacher and specific child (Conroy et al., 2015). Because interactions are theorized to contribute to the development teacher-child relationship, it is important to identify and observe interactions between a teacher and specific child. For example, Conroy and colleagues define a negative interaction as: “The teacher and the focal child are engaged in an exchange in which one or both of the parties are exhibiting negative behavior and/or conflict” (p. 149). In this case the focal child being a specific preschooler identified as at-risk for EBD.
Teachers are constantly engaging in interactions with children in the classroom throughout the day; these interactions can be in response to a child behavior but may also influence child problem behavior. When considering negative and positive interactions, teachers are more likely to engage in a negative interaction with a child exhibiting problem behavior than they are to engage in a positive interaction with a child who is not (McClowry et al., 2013; Sutherland et al. 2018). In their meta-analysis of teacher-child interactions, Jones and Dindia (2004) found that greater levels of negative interactions are associated with more problem behavior, specifically for boys.

Given the influence a teacher-child relationship can have on child problem behavior it is important to consider the teacher-child interactions that contribute to these relationships. However, there is limited research on real-time moment to moment interactions. To date, most research has focused on interactions between teachers and children more broadly through instruments such as the Classroom Assessment Scoring System (CLASS: Pianta, La Paro, & Hamre, 2008). The CLASS defines interactions as occurring between teachers and students in the classroom providing an overall score of interactions on three broad dimensions (i.e., Emotional Support, Classroom Organization, and Instructional Support); this measure considers the interaction only in the terms of the teachers’ responses to any/all students in a classroom (i.e., classroom interactions), are not measured in a moment to moment basis, and are not focused on a particular child. For example one of their interactions types, regard for student perspectives, is defined as “the degree which teachers’ interactions with students and classroom activities place an emphasis on students’ interests, motivations, and points of view” (p. 3). To gain a greater understanding of the association among real-time teacher-child interactions, problem behavior,
and teacher-child relationships, we needed to observe and measure more specific interactions in the classroom.

**Theoretical Framework**

This study was guided by a combination of two theoretical frameworks: behavioral (Skinner, 1953; 1938) and transactional (Sameroff, 2009) theories (See Figure 1). The development of an individual teacher-child relationship and its association with child behavior is both transactional and behavioral. Skinner’s (1953; 1938) theory posits that behavior occurs in response to a stimulus which is then further reinforced/punished (e.g., by a teacher-provided consequence). Transactional theory suggests that teacher-child interactions influence each other over time. This research will potentially confirm or add to the hypothesis that consistent problem behavior influences teacher-child relationships through negative or positive interactions. Longitudinal studies, with the ability to investigate these teacher-child interactions over time, are important to developing our understanding of these relationships (Sameroff & MacKenzie, 2003). Transactional theory encourages the investigation of bidirectional relationships, such as those posed in this paper. Specifically, the Sameroff and Mackenzie (2013) proposed the *bidirectional dyadic model* in which the behavior of the child influences the teacher’s perception of their relationships, and vice versa with the teacher’s perception of the relationship simultaneously influencing the child’s behavior). In their research on parent-child relationships, Sameroff and Chandler (1975) posit that behaviors of the child are maintained not only by the parents’ response but also as a product of the continuous cycle of interactions between the parent and child over time. This set of interactions maintains and influences both child and parent responses in a way that Sameroff and Chandler describe as the child behavior being influenced also by their environment (i.e., parenting responses).
These processes apply to the classroom as well, with teachers and children participating in interactions that consist of a stimulus, and both a teacher and child behavior and responses. An antecedent occurs as part of the classroom context (e.g., a teacher action); followed by a child response resulting in some type of consequence (e.g., teacher praise). These basic behavioral learning principles (Skinner, 1953) occur frequently within the classroom. The teacher response to the child behavior shapes subsequent child behaviors through behavioral learning, at the same time child behaviors influence future teacher responses. These individual interactions become part of a larger transactional process throughout the school year (see Figure 1). Sameroff and MacKenzie (2003) suggest that “transactions need to be separated from interactions” (p. 617). This may be addressed through the combination of behavioral and transactional theories, with individual interactions being understood from behavioral theory, and the cumulative effects of these interactions, and their ability to influence and alter one another over time, introduces a transactional approach.

The purpose of this study was to understand how child problem behavior and the teacher’s response influence one another over time, to inform not only the ongoing behavioral
development of the child but also the development or formation of the teacher-child relationship over the course of the year. First, I estimated the longitudinal association between child behavior and teacher-child relationships over the course of a school year using a meta-analytic approach. Next I used the results of the meta-analysis to inform a cross-lag panel model of a large data set. In this cross-lag model I explored the longitudinal predictive association between teacher-child interactions, relationships, and problem behavior across three time points during a school year.

**Rationale**

Researchers estimate the number of children with or at-risk for EBD to be anywhere from 9 to 13% of children (Ringeisen et al., 2017). The consistent and established patterns of problem behavior of children with EBD are associated with negative outcomes, as these children often struggle both academically and behaviorally throughout the school year (Sutherland et al., 2008). Children who exhibit problem behavior early in the school year also tend to have more conflictual relationships with their teachers (Roorda et al., 2014) which may further compound these problems. Early problem behaviors are associated with long-term negative outcomes, specifically increased rates of high school dropout, substance abuse, or entrance into the juvenile justice system (Bradley et al., 2008; Wagner & Newman, 2012) Given the prevalence of children with or at-risk for EBD and the associated negative outcomes, it is essential to identify potential factors through which we can reduce behavioral difficulties and improve outcomes. One such factor is the relationship the child has with their teacher. We know that positive teacher-child relationships can have positive short and long-term effects for children (Birch & Ladd, 1997; Hamre & Pianta, 2001; O’Connor, & McCartney, 2007). I focused on children in preschool and early elementary school because this is an important time developmentally, as these children are developing school readiness, such as social/emotional skills in the classroom.
Statement of Purpose

The purpose of this study was to explore the bi-directional relations between teacher-child relationships, teacher-child interactions, and problem behavior. Specifically, this study examined how these three variables influenced one another and developed over time. Given that the teacher-child relationship is a specific relationship between an individual student and her/his teacher, we examined how these relationships developed over the course of a single school year rather than focusing on long-term multi-year outcomes.

Research Aims

To investigate the bidirectional association between teacher-child relationships, interactions, and child problem behavior during a single school year the following aims are posed:

1. Determine if positive teacher-child interactions and problem behavior (e.g., disruptions, aggression, and defiance) predicted one another across a single school year.

2. Determine if problem behavior and teacher-child relationships (i.e., conflict, closeness) predicted one another across a single school year.

3. Determine if teacher-child relationships and positive teacher-child interactions predicted one another across a single school year.

4. Investigate if gender moderated the association between problem behavior and teacher-child interactions in the meta-analysis (see Chapter 2). To determine if contributed to variation in the prediction of these variables at Time 2 and Time three in a cross-lagged panel model (see Chapters 3 and 4).

5. Determine if paths in the cross-lagged panel model differed based on participation in the BEST in CLASS intervention.
Hypotheses

The sample for this study was from a large randomized controlled trial of the BEST in CLASS intervention. BEST in CLASS is a tier two intervention targeting the improvement of problem behavior for children at-risk for emotional and behavioral disorders. The BEST in CLASS intervention aims to improve child outcomes through the improvement of teacher-child interactions, specifically through teachers’ use of and children’s exposure to BEST in CLASS practices (see Chapter 4). Following participation in the BEST in CLASS intervention, children experienced increased positive interactions with their teacher, improved teacher-child relationships, and decreased instances of problem behavior (Sutherland et al., 2018). Based on the previously reviewed theoretical framework (Figure 1), I proposed that cross-lagged associations exist between: 1) positive teacher-child interactions and teacher-child relationships (i.e., conflict and closeness), 2) positive teacher-child interactions and problem behavior, and 3) teacher-child relationships and problem behavior across a single school year. To answer this overall research question I proposed five hypotheses (detailed below). Additionally, I hypothesized 18 of these pathways will differ based on intervention participation; that is, pathway significance and strength may have differed for teachers in the BEST in CLASS condition compared with teachers in the Business as Usual condition. In hypotheses 1-5 below I outlined the expected direction of effects for the Business as usual condition and the expectations for the BEST in CLASS group. Finally, given that boys tend to have higher levels of externalizing behavior (Buyse, Verschueren, & Doumen, 2011; Liu, 2004) and more conflict with their teachers compared to girls (Ewing-Taylor, 2016; Hamre & Pianta, 2001), I anticipated that gender would contribute to the prediction of variables at Time 2 and 3 (Hypothesis 6).
Hypothesis 1: In both business as usual classrooms and BEST in CLASS classrooms, I anticipated a negative reciprocal relation between positive teacher-child interactions and child problem behavior over time. This is because positive interactions (e.g., praise; Floress & Jenkins, 2015) are shown to be negatively associated with (i.e., reduce) problem behavior and child problem behavior is shown to increase the likelihood of a negative-teacher child interaction (Jones & Dindia, 2004). However, for BEST in CLASS classrooms, I expected the relation between problem behavior and positive-teacher child interactions to be non-significant. This is because BEST in CLASS teachers are being trained to increase their rate of positive interactions with focal children in their classrooms and as a result may not be as reactive to problem behaviors.

Hypothesis 2: In both business as usual classrooms and BEST in CLASS classrooms, I expected a negative reciprocal relation between positive teacher-child interactions and conflictual teacher-child relationships over time. This is because teacher-child relationships are conceptualized as a cumulative product of momentary interactions in the classroom (Penning’s et al., 2014). Thus, it was expected that repeated positive interactions may have produced a less conflictual perception of the relationship and that conflictual relationships may decrease the likelihood of positive interactions occurring. However, for BEST in CLASS classrooms, I anticipated the relation between conflictual teacher-child relationships and positive-teacher child interactions to be non-significant. This is because BEST in CLASS teachers were trained to increase their rate of positive interactions with focal children in their classrooms, and because teacher-child relationships are a product of momentary interactions, may result in a less conflictual perception of the relationship.
Hypothesis 3: In business as usual classrooms and BEST in CLASS classrooms, I expected a positive reciprocal relation between positive teacher-child interactions and teacher-child closeness. This is because momentary teacher-child interactions are thought to contribute to teacher-child relationships. However, for BEST in CLASS classrooms, I anticipated the relation between close teacher-child relationships and positive-teacher child interactions to be stronger. This is because BEST in CLASS teachers were trained to increase their rate of positive interactions with focal children in their classrooms, and because teacher-child relationships are a product of momentary interactions, may result in increased closeness of the relationship.

Hypothesis 4: In business as usual classrooms and BEST in CLASS classrooms, I anticipated a positive reciprocal relationship between problem behavior and teacher-child conflict over time. Prior research has shown that conflict predicts increases in problem behavior (Hamre & Pianta, 2001) and problem behavior can predict increased conflict (Jerome et al., 2009). However, for BEST in CLASS classrooms the association between teacher-child conflict and problem behavior was expected to be weaker. This is because BEST in CLASS is associated with decreases in both teacher-child conflict and problem behavior and BEST in CLASS teachers are being instructed to use strategies that decrease teacher-child conflict with focal children, potentially disrupting the link between problem behavior and teacher-child conflict.

Hypothesis 5: In business as usual classrooms, I expected a negative reciprocal relationship between problem behavior and teacher-child closeness over time. Research has shown that closeness predicts reductions in problem behavior (Howes, 2000) and problem behavior is related to a decreased likelihood of children and teachers sharing close relationships (Jerome et al. 2009; Roorda et al., 2014) However, for BEST in CLASS classrooms I anticipated the negative association between problem behavior and teacher-child closeness and will be weaker.
This is because BEST in CLASS has been associated with reductions in problem behavior and increases in teacher-child closeness. Moreover, BEST in CLASS teachers were trained to use strategies that increase teacher-child closeness and as a result the link between problem behavior and teacher-child closeness may be disrupted.

Hypothesis 6: Prior work shows boys tends to have higher rates of problem behavior, negative interaction, fewer positive interactions with their teacher, more conflict and less closeness compared to girls. As such, it is possible that some of the prediction of the some of the Time 2 and 3 variables varied by child gender, for example, child gender may contribute to the prediction of problem behavior or teacher-child conflict, given that boys tend to have externalizing behaviors and less positive relationships with their teachers. Given a lack of guiding research, hypotheses about gender differences in specific paths were considered exploratory.
Chapter 2

Literature Review

Children with consistent problem behaviors are often at-risk for developing EBD. These children tend to have poorer short and long-term outcomes both in and out of the classroom. Yet, children who have higher levels of warmth and closeness with their teachers may experience more positive outcomes (Birch & Ladd, 1997; Hamre & Pianta, 2001; O’Connor, & McCartney, 2007). Additionally, when considering the important effect teacher-child relationships can have on child outcomes, it is important to understand that teachers can develop positive relationships with children who display problem behaviors (Howes, 2000; Sutherland et al., 2018). This chapter will examine the bi-directional nature of teacher-child relationships and behavior over the course of a single school year through a meta-analysis of preschool and elementary school literature.

A recent meta-analysis examining 57 studies found that student-teacher relationships and externalizing behaviors were moderately related ($r = -0.263$) in expected directions (Lei, Cui, & Chiu, 2016). Lei et al. meta-analyzed studies investigating the association between teacher-child relationships and externalizing behavior problems. As expected, they found that more positive ratings of teacher-child relationships were associated with lower levels of externalizing problem behavior, while higher levels of externalizing behavior were associated with more negative teacher-child relationships. They also found that the association between conflict or negative teacher-child relationships was stronger with older children in elementary school. While these
findings highlight the important role teacher-child relationships play in child problem behavior, the Lei et al. meta-analysis did not analyze these relations longitudinally in order to investigate the predictive nature of these associations. Additionally, this study specifically examined externalizing behaviors and did not include ratings of internalizing behaviors. To build on this and other research, I conducted a longitudinal meta-analysis looking at the association between problem behaviors and teacher-student relationships in both directions (e.g., conflict at Time 1 predicting behavior at Time 2, behavior at Time 1 predicting conflict at Time 2) over the course of a single school year.

**Purpose of this Meta-analysis**

Previous research has shown a relation between teacher-child relationships and child problem behaviors in preschool and early elementary school. Little research has focused on the development of the teacher-child relationship over the course of a single school year and how child between characteristics (e.g., behavior) can influence the development of the relationship later on (Roorda et al., 2014). Because there is a lack of research investigating the contribution of child characteristics, specifically problem behavior, to teacher-child relationships one method to investigate this was to use meta-analysis to extract these data from previous studies that had included but not analyzed these variables in this manner. For that same reason, I was able to use meta-analysis to also investigate these associations within a single school year. To build prior research in this field (e.g., Lei et al., 2016), the first part of this study is a meta-analysis of current research in order to inform the second part of this study, a cross-lag panel model analyzing the longitudinal between teacher-child relationships and problem behavior with the added factor of teacher-child interactions. This cross lagged analysis focused specifically on a population of children identified as with or at-risk for EBD. The purpose of this meta-analysis
was to further our understanding of the direction of the longitudinal association teacher-child relationships and child problem behavior over the course of a single school year, and to begin to parse out the effect of child characteristics (i.e. problem behavior) on later teacher-child relationships. Understanding the development of this relationship over time will help future intervention research targeting child outcomes through teacher-child relationships. While it is of interested to examine the association between behavior and teacher-child relationships specifically for children with EBD, there were not enough studies looking specifically at students with EBD and teacher-child relationships that met the inclusion criteria. In order to investigate the research questions I included studies with samples of children who did not have EBD. Rather studies were included based on the presence of ratings of variables of interest (e.g., behavior, student-teacher relationship) at multiple time points within the same school year. Additionally, due to the small number of studies and sample sizes I used the term problem behavior which was defined as a combination of both internalizing and externalizing behavior, as measured by a number of instruments or individual subscales used in the final sample of studies.

The following research questions were addressed in this study:

1. What is the magnitude and the direction of the association between teacher-child closeness and later levels of reported problem behavior?
   a. Is this association moderated by gender?

2. What is the magnitude and the direction of the association between teacher-child conflict and later levels of reported problem behavior?
   a. Is this association moderated by gender?

3. What is the magnitude and the direction of the association between problem behavior and later levels of reported teacher-child closeness?
a. Is this association moderated by gender?

4. What is the magnitude and the direction of the association between problem behavior and later levels of reported teacher-child conflict?
   a. Is this association moderated by gender?

Method

Selection of Studies

We conducted a systematic and iterative literature search to identify published and unpublished reports that included data on student-teacher relationships for students in preschool and early elementary classrooms (i.e., pre-k to grade 5). Three electronic databases were used to conduct the search: (a) PsycINFO, (b) Elton B. Stephens Company (EBSCO), and (c) Education Research Information Center (ERIC) via Proquest. The search spanned 1996 to October, 2017 in order to capture the past 20 years of literature. The following key search terms were entered into each of the databases: ab("student-teacher" OR "teacher-student" OR "teacher-child" OR "child-teacher" OR child OR student OR pupil OR teacher OR negative OR positive OR supportive) AND ab(relation* OR conflict OR closeness) AND ab(behav* OR social* OR emotion* OR aggress* OR disrupt*) AND ab(elementary OR preschool* OR pre-K OR kindergarten* OR primary OR "early elementary"). Dissertations and studies that were not peer-reviewed were included during the initial search in an attempt to include grey literature and reduce the likelihood that the publication process will bias results. An initial hand search of a relevant literature reviews, meta-analyses (e.g., Lie et al., 2016) and journals was conducted in addition to the electronic search.

Inclusion and Exclusion Criteria
To be included in the analyses studies had to meet several inclusion and exclusion criteria at the title/abstract level and then at the full-text screening level. Three PhD students (two in Education, one in Research and Evaluation) completed the first level (abstract and title) of screening procedures using Rayyan QCRI, an online screening tool and database (Ouzzani, Hammady, Fedorowicz, & Elmagarmid, 2016). The second, or full-text, level of screening was completed by the two PhD in education students using Google sheets to maintain the article screening database. Studies were screened and inclusion/exclusion criteria were applied across two different stages. In the first stage, titles and abstracts were screened to determine if the study met the first set of criteria. Next, full-text articles were analyzed to determine if the remaining studies met the remainder of the inclusion/exclusion criteria. During full-text screening, coders scanned entire articles.

Abstract and Title Screening:

1. The majority of the participants had to fall within pre-kindergarten through fifth grade range.
2. Included teacher-child relationships or similar terms (e.g., student-teacher relationship, conflict, closeness) in the abstract.
3. Study needed to include both teacher and children/students.
4. Study took place in an education setting/school (i.e., classroom, school).
5. Studies needed to be published in English.
6. Studies were excluded if they were not quantitative designs or if they were single case designs.

Full-text screening:

1. Study measured student-teacher relationships (e.g., closeness or conflict).
2. Study included a measure of child/student externalizing behavior, internalizing behavior.

3. Studies were only included if they used a within-year longitudinal design when measuring teacher-child relationship and behavior at different time points. For example, teacher-child relationships may be measured in the fall of the school year and behavior measured at different time in the spring part of the year.

**Coding of Studies**

Each study was coded by the primary author using a coding manual developed specifically for this meta-analysis. A second coder, a PhD student in Education, coded 33% of the final study sample for reliability; discrepancies were consensus coded. First, studies were coded for the type of instrument used to measure student-teacher relationships (e.g., Student-Teacher Relationships Scale [STRS]; Pianta, 2001), as well as the subscale reliability and whether or not it was sample specific for the study. Next, in order to conduct a moderator analysis, studies were coded for gender using the number of female students in the sample. Student sample size was coded and used for the analyses to account for each STRS score because the teacher-rated STRS is used for individual student-teacher relationships. The school type (i.e., preschool, elementary, both) was also extracted from each study to be used in later exploratory analyses; however due to the small sample size school type was not used. The type of study was also coded as peer-reviewed journal article, dissertation, or other.

Effect sizes were coded as one of twelve outcomes; most studies reported multiple effect sizes. An effect size of bivariate correlations was used for this meta-analysis. The four effect sizes computed included the following: closeness predicting problem behavior, problem behavior predicting closeness, conflict predicting problem behavior, and problem behavior predicting
conflict. The term “predict” is used to delineate the two different time points within school year. For example, conflict predicting problem behavior means that conflict was measured earlier in the school year and behavior at a second later time-point. Finally, when available, the correlation between the teacher-child relationships subscale (conflict, closeness) and problem behavior (externalizing, internalizing) was coded. When the effect size (correlation) or number of female participants was not published in the study, the primary author of the article was contacted via email in the late summer of 2018 and the needed data was requested. If no response was received a second email was sent in early fall of 2018.

**Interobserver agreement.** We used IOA procedures during multiple levels of screening and coding. For this study, the author was the primary coder and a second coder was PhD student in Special Education. During the abstract and title phase 25% of the articles, both included and excluded, were randomly selected for IOA procedures to determine reliability. At the full-text screening level, 25% of the excluded articles were randomly selected and a secondary coder completed IOA coding. Finally, the author coded all of the articles independently with 33% selected for IOA coding by the second coder.

**Results**

**Literature Review**

The initial search yielded 14,060 studies (see Figure 2); after removing duplicates the number of studies was reduced to 8,854, with three additional studies resulting from a hand search of relevant literature reviews and meta-analyses. After reviewing the title and abstract, studies were screened out that did not meet initial inclusion criteria (i.e., preschool and elementary) yielding 511 results. The second level of screening included a full-text review (i.e., measure of student-teacher relationship, longitudinal studies) resulting in 26 studies. Of the 26
studies included for coding only 9 included the effect sizes (i.e., bivariate correlations between behavior and teacher-child relationship) needed.

The author emailed the authors of the remaining articles; of the 26 remaining articles, 14 emails were sent requesting the needed data (contact information for two articles could not be located). Of the 14 emails sent to study authors, data or requested effect sizes were received for 3 studies. Additional data was also acquired due to the author’s work on an intervention study with access to a large dataset including the variables of interest; an additional study and set of 8 effect sizes were added to the study. A final sample of 12 studies and 67 effect sizes were included in the following meta-analysis (Table 1).

**Sample**

The sample consisted of 7,181 preschool and elementary school students, 46.07% ($n = 3,309$) of which were female (see Table 1). Eight of the studies included only preschool students in their sample ($n = 4,219$), and 4 used only elementary school students ($n = 2,962$). All of the studies included in the sample used the Student Teacher Relationship Scale (STRS; Pianta, 1993) to measure teacher-child relationships. The STRS is intended to measure a teacher’s perception of their relationship with an individual child. The 15-item instrument uses two subscales, conflict and closeness to measure the teacher-child relationship. Closeness is considered to be the degree
Figure 2. Literature review results PRISMA Chart.
of warmth a teacher feels toward the child, or can be thought of as positive interactions and
communication (e.g., “This child and I always seem to be struggling with each other”). Conflict,
on the other hand, is a more negative aspect of the teacher-child relationship and includes
questions such as “This child is sneaky or manipulative with me” or “This child and I always
seem to be struggling with each other”. Each item is rated on a 5-point likert-type scale with 1 =
definitely does not apply and 5 = definitely applies. Pianta (2001) reports the closeness subscale
of the STRS as having high internal consistency with a Cronbach’s alpha of α = .92. The conflict
subscale also demonstrates high internal consistency with a Cronbach’s alpha α = .86 using a
normative sample (Pianta, 2001). The final sample of studies used a variety of instruments to
measure child behavior. Studies that included multiple behaviors (e.g., externalizing and
internalizing) measured them using a single measure with multiple subscales (e.g., Strengths and
Difficulties Questionnaire; Goodman, 1997).

**Data Analyses**

All data were analyzed using Stata IC 14 statistics software (StataCorp, 2015), using
robust variance estimation (RVE) random-effects model to estimate main effects. Heterogeneity
was examined using several tests. First, the Q analysis was used to indicate significance in our
between study variance. T²- and I²- were also used; specifically, I² was used to detect true
variance between studies. Additionally, I also estimated a prediction interval to provide a range
of the population of individual study effect sizes. We conducted all moderator analyses using a
robust variance estimation (RVE) framework. Using an RVE analysis allows for us to account
for dependency between multiple effect sizes within the same study (Hedges, Tipton, & Johnson,
2010; Tanner-Smith & Tipton, 2013). A sensitivity analysis was used to test the meta-regression
### Table 1

<table>
<thead>
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<th>Author</th>
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<th>Year</th>
<th>School Level</th>
<th>Child n=</th>
<th>Female n=</th>
<th>Outcome</th>
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<td>X X</td>
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<td>64</td>
<td>X</td>
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<td>2009</td>
<td>Pre-k</td>
<td>140</td>
<td>63</td>
<td>X X</td>
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<tr>
<td>Jerome</td>
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<td>2009</td>
<td>Elem</td>
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<td>1175</td>
<td>XX XX</td>
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<tr>
<td>Gunter et al.</td>
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<td>Pre-k</td>
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<td>16</td>
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<tr>
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<td>Elem</td>
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<td>Elem</td>
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<td>2014</td>
<td>Elem</td>
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<td>Pre-k</td>
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<td>1507</td>
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<td>Pre-k</td>
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<td>Pre-k</td>
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<td>80</td>
<td>XX XX</td>
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</tbody>
</table>

* PR=peer reviewed; D=dissertation; DB=database

**CL_B=Closeness predicting behavior; CO_B=Conflict predicting behavior; B_CL=Behavior Predicting Closeness; B_CO=Behavior predicting conflict
against a number of $p$ value in order to determine the impact of the $p$ value on the effect size (i.e., 0-1; Green & Higgins, 2005; Tanner-Smith & Tipton, 2013). Finally, publication bias was examined for both main effects analyses using Egger’s test, trim and fill plots, and funnel plots. Publication bias is more likely to be present when only peer-reviewed published literature is included because this tends to exclude non-significant findings or unpublished data analyzed as part of a dissertation. Initially, school-level (e.g., preschool, elementary) was included in the main effects and moderator analyses.

**Main Effects**

**Closeness and problem behavior.** A random effects correlation coefficient model was used to calculate the mean effect between teacher-rated closeness with and students’ later problem behavior using RVE. Prior to analyses correlation coefficients were converted to Fisher’s $z$ scores to correct for the small sample size. The forest plot (see Figure 3) shows the confidence interval for each study; most appear to be similar in size with the exception of studies 1 and 2 (i.e., Roorda et. al., 2014; Vancraeyveldt, 2015) which have larger confidence intervals and are positioned further away from average effect. The boxes shown on the forest plot indicate that all of the study samples were similar in size.
Teacher-child closeness was significantly related to later problem behavior with a moderate and negative correlation ($z = -0.3181; p < .05$). The confidence interval did not contain zero (95% CI = -0.5824 - -0.0539). Heterogeneity results indicate that $Q = 246.53$ is significant at $p < .001$, and $I^2 = .959$, meaning that 95.90% of the variance between studies is true variance. Next, $T^2 = 0.117$ indicates that there is a small distribution between study effect sizes.

**Problem behavior and teacher-child closeness subscale.** Using RVE, a random effects correlation coefficient model was used to calculate the mean effect between problem behavior and later teacher-rated closeness. Correlation coefficients converted to Fisher’s $z$ scores were used to correct for the small sample size and provide a mean effect. A visual analysis of the forest plot (see Figure 4) indicates that all of the study samples were similar in confidence.
interval sizes with the exception of one study (Roorda et al., 2014). Results of the RVE random effects correlation model indicated that problem behavior at time one was significantly related to later teacher-child closeness with a moderate and negative correlation ($z = -.2339; p < .001$). The confidence interval did not contain zero (95% CI= -0.3205 - -0.1473). Tests for heterogeneity indicate that $Q = 87.59$ is significant at $p < .001$, and $I^2$ results indicate that 86.3% of the variance between studies is true variance. $T^2 = 0.009$, indicating that there is a very small distribution between study effect sizes.

<table>
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</tr>
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<td>2</td>
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<td>3</td>
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<td>4</td>
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<td>5</td>
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<td>6</td>
<td>-0.23 (-0.38, -0.09)</td>
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<td>8</td>
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<td>9</td>
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</tr>
<tr>
<td>10</td>
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</tr>
<tr>
<td>11</td>
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<td>-0.07 (-0.22, 0.08)</td>
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<td>13</td>
<td>-0.03 (-0.18, 0.12)</td>
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<tr>
<td>Overall</td>
<td>-0.22 (-0.28, -0.16)</td>
<td>100.00</td>
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**Figure 4.** Forest plot of relation between problem behavior and closeness.

**Conflict and problem behavior.** A random effects correlation coefficient model was used to calculate the mean effect between teacher-rated conflict and students’ later problem behavior using RVE. Prior to analyses correlation coefficients were converted to Fisher’s $z$ scores to correct for the small sample sizes. The forest plot (see Figure 5) shows the confidence
interval for each study, most appear to be similar in size with the exception of Roorda et al. (2014). The boxes shown on the forest plot indicate that all of the study samples were similar in size. Teacher-child conflict was significantly related to later problem behavior with a large and positive correlation ($z = .4745; p < .005$). The confidence interval did not contain zero (95% CI = 0.2323 - 0.7168). Tests for heterogeneity indicated that $Q = 49.86$ is significant at $p < .001$, and $I^2 = .819$, meaning that 81.9% of the variance between studies is true variance. Additionally, $T^2 = 0.0218$ indicates that there is a small distribution between study effect sizes.

![Forest plot of relation between conflict and problem behavior.](image)

**Figure 5.** Forest plot of relation between conflict and problem behavior.

**Problem behavior and teacher-child conflict subscale.** Using RVE, a random effects correlation coefficient model was used to calculate the mean effect between problem behavior and later teacher-rated conflict. Correlation coefficients converted to Fisher’s $z$ scores were used
to correct for small sample sizes and provide a mean effect. The boxes shown on the forest plot (see Figure 6) indicate that, with the exception of Roorda et al. (2014), all of the study confidence intervals and samples were similar. Results of the RVE random effects correlation model indicated that problem behavior at time one was significantly related to later teacher-child closes with a moderate and positive correlation ($z = .3352; p < .01$). The confidence interval did not contain zero (95% CI = 0.1513 - 0.5190). Results of heterogeneity analyses show that $Q = 87.59$ is significant at $p < .001$, and $I^2$ indicates that 86.35% of the variance between studies is true variance. Finally, $T^2 = 0.0090$ indicates that there is a small distribution between study effect sizes.

**Figure 6.** Forest plot of relation between problem behavior and conflict.

**Moderator Analyses**
Gender as a moderator for closeness predicting problem behavior. In order to determine whether gender was a moderator between teacher-child closeness in the beginning of the school year and problem behavior later that same year, the percentage of females was tested as a moderator. Contrary to our hypothesis the relationship between closeness and problem behaviors was not moderated by gender (.0006; \( p = .78 \)) with a CI containing zero (-.0078 - .0090).

Gender as a moderator for problem behavior predicting closeness. Using the percentage of females in each study, gender was examined as a moderator for the relationship between early problem behavior and later teacher-child closeness. Contrary to our hypothesis gender did not moderate the relationship between closeness and problem behaviors (.00; \( p = .4979 \)) with a CI containing zero (-.0002 - .001).

Gender as a moderator for conflict predicting problem behavior. Gender was analyzed as a moderator using meta-regression and the percentage of females in each individual study sample. Contrary to the hypothesis the relationship between conflict and problem behaviors was not moderated by gender (-.008; \( p = .7371 \)) and the CI contained zero (-.0090-.0106).

Gender as a moderator for problem behavior predicting conflict. Using meta-regression and gender was analyzed as a moderator for the relationships between problem behavior and later conflict. Contrary to our hypothesis, gender did not moderate the relationship between conflict and problem behaviors (.001; \( p = .2014 \)) and the CI contained zero (-.0002 - .0005).
**Sensitivity Analysis.** Sensitivity analyses were conducted for each main effect. The results of sensitivity analysis yielded minimal to no variations across different $p$-values indicating they have little or no effect on the effect size.

**Publication bias.** To determine the existence of publication bias based on small study effects sizes, or types of literature (e.g., dissertations), we used Egger’s tests (Egger, Smith, Schneider, & Minder, 1997), trim and fill analyses (Duval & Tweedie, 2000), and visually examinations of funnel plots (Sterne, Becker, & Egger, 2006; See Appendix A for all publication bias figures). For each of the main effects, the Egger’s tests results were non-significant, indicating that there was likely no bias in this sample of studies. For example, when examining the main effect for closeness predicting problem behavior, the Egger’s tests results (see Figure 8) were not significant at 6.815 ($p = .152$).

Additional tests for publication bias, trim and fill analyses (Duval & Tweedie, 2000) were used; this method aims to assess and adjust for asymmetry in the funnel plot. Results of this analysis did not yield adjusted effect sizes for our main effects involving conflict (i.e., conflict predicting problem behavior; problem behavior predicting conflict) indicating a lack of publication bias. For the main effect analysis of closeness predicting problem behavior, the trim and fill analysis (see Figure 9) yielded four filled effect sizes with a adjusted effect size (i.e., a difference of .049) in the filled meta-analysis. Given the small change in effect size in combination with the non-significant Egger’s test, a change of this magnitude in the context of problem behavior and teacher-child relationships does have some minor practical significance.
Finally, a trim and fill analysis for the main effect of problem behavior predicting closeness (see Figure 12) was conducted. Results indicated that, with 2 filled studies, there was a slight change to -.248 in the effect size. This difference (-.0141) in combination with the non-significant Egger’s tests can be interpreted as a small to minimum change in effect size that would likely not have much practical effect.
Figure 9. Funnel plot from Trim and Fill analysis for closeness predicting problem behavior.
Discussion

The longitudinal association between the two subscales of teacher-child relationships (conflict and closeness) and child problem behavior for preschool and elementary-aged children and their teachers was examined over a single school year. These associations were examined in both directions: teacher-child relationship predicting later problem behavior, and problem behavior predicting later teacher-child relationships. Due to the individualized nature of teacher-child relationships, they are often measured in terms of a single teacher and child dyad. When considering the relation between closeness and problem behavior, results were as expected. First, we found that higher levels of teacher-child closeness earlier in the school year predicted lower rates of problem behavior ($z = -.3181; p < .05$) later in that same year. We also found that higher levels problem behavior in the first part of the school year predicted lower levels of closeness.
later during the same school year ($z = -0.2339; p < .001$). Next when looking at the association between teacher-child conflict and problem behavior, results also indicated that higher levels of conflict predicted increased levels of problem behavior ($z = -0.4745; p < .005$) later in the same school year. Finally, as expected, higher levels of problem behavior earlier in the school year predicted later levels of increased conflict ($z = 0.3352; p < .01$). Interestingly, and contrary to previous literature, gender did not moderate the relation for either conflict or closeness and problem behavior. The lack of a moderating effect for gender could be due to the small sample of studies or that two of our studies, particularly Roorda et al. (2014), had male only samples; future analyses should continue to investigate this moderating effect with larger, diverse samples.

It is not surprising that when children have higher levels of problem behavior, they experience more conflict with their teachers. Often, consistent levels of problem behavior can become frustrating for teachers over time, and may lead to more negative interactions toward an individual child (Hagekull & Hammarberg, 2004). On the other hand, children who displayed lower levels of problem behavior had closer and warmer relationships with their teachers. We know that teachers often prefer students who have more positive characteristics, such as few or no problem behaviors. Yet, it is not child characteristics alone that influence the development of the teacher-child relationship, as indicated by the meta-analysis and cross lag panel studies (e.g., Roorda et al. 2014); the association between problem behavior and teacher-child relationships (conflict and closeness) may be bi-directional. The results above highlight the important influence the relationship between a teacher and child can have on a child’s behavior. Prior research (Lei et al., 2016) has focused on the association between teacher-child relationships and behavior, but not longitudinally. Similarly, the majority of research investigating the impact of teacher-child relationships on behavior has focused on more long-term (or multi-year) outcomes.
This information helps to start to build an understanding of the development of teacher-child relationships in relation to child characteristics, and also how these relationships can influence child behavior within a school year.

**Implications and Limitations**

The results of this meta-analysis, highlighting the bidirectional relationship between teacher-child relationships and problem behavior, have important implications for future intervention work targeting teacher-child relationships. Sabol and Pianta (2012) completed a review examining current developments in research and intervention work targeting or including teacher-child relationships specifically. They discussed the role teachers play in the development of relationships and how these teacher-child relationships have been, to some degree, successfully targeted by interventions (i.e., Banking Time; Driscoll & Pianta; 2010; Lyons et al., 2009). In addition to existing intervention work, current analyses in this meta-analysis, indicated stronger associations with conflict compared to closeness. While not ideal, this underscores an opportunity in the field. Due to the stronger effect size for conflict it may be worthwhile to develop interventions targeting this specific construct, encouraging practitioners to take note of their more conflictual relationships and target this in intervention work as a mechanism for improving not only the teacher-child relationship but also child problem behavior.

As with most studies, this meta-analysis was not without its limitations. First, a small sample of studies may have contributed to the results. Because there was a small number of studies meeting our inclusion/exclusion criteria we opted to include studies outside of our population of interest (EBD) if they included a measure of problem behavior. One reason for the small sample size was the exclusion of studies that collected data across multiple years or did not measure both variables (behavior and teacher-child relationships) at multiple time points.
within the same year. While these exclusion criteria reduced our sample size it was important in examining the development of the teacher-child relationship with an individual child over the course of one school year because studies spanning multiple school years may dilute the construct of teacher-child relationships, as these can be dyad specific. Second, two studies (Roorda et al., 2014; Vancraeyveldt et al., 2015) included only male participants, potentially impacting the moderator analysis; Roorda et al. also included a large portion of the effect sizes $n = 19$ of the total $n = 47$. This large number of effect sizes, effectively a third, only including male participants could have led to a type II error, or failure to detect the effect due to bias in the data. Additionally, only one measure of teacher-child relationships (i.e., STRS; Pianta 2001) was used in the studies included in the sample, which may have biased results. Finally, while we can infer that child problem behavior can influence the later relationship with a teacher; because we did not look at other child characteristics we cannot say with certainty that behavior is the strongest predictor of teacher-child relationships. This is true of each of the four main effects included in this meta-analysis. However, we now know that it does in fact influence the relationship to some degree within a single school year.

**Future Directions and Further Analysis**

Although research suggests that teacher-child relationships are critically important for children’s positive developmental trajectories, to date we know little about the development of teacher-child relationships, and factors that influence them, over time. One of these factors may be children’s problem behaviors. Results of this meta-analysis, as well as prior work, show that children who display problem behaviors have high levels of conflict with their teachers (Jerome et al., 2009). Earlier work in this area has employed use of cross-lagged models to examine reciprocal relationships between children’s behavior (e.g., prosocial and internalizing) and
teacher-child closeness and conflict (Doumen et al., 2008; Roorda et al., 2014; Zhang & Sun, 2011).

Another important consideration is that of teacher-child interactions and their relationship to behavior and teacher-child relationships. When children display problem behaviors and teachers respond negatively, resulting in a negative teacher-child interaction, these may cumulatively result in more conflictual teacher-child relationships over time (Sutherland et al., 2018). In their study of 840 children, Howes and Smith (1995) found the beneficial effects of teacher-child interactions in that more positive teacher-child interactions were associated with higher levels of cognitive ability. Additionally, Lee and Bierman (2015) examined the positive impact both student-teacher relationships and interactions (measured through emotional support) have on student externalizing behavior. Although, these studies examined the relations between specific teacher-child interactions (i.e., positive and negative) and child problem behavior they do not examine their reciprocal association or specifically how these factors contribute to teacher-child relationships. Results of this meta-analysis provide an initial understanding of the reciprocal relationships between behavior and teacher-child relationships, yet, to further understand the development of this bi-directional relationship in real-time further research is needed with the inclusion of teacher-child interactions.

Understanding how teacher-child interactions progress over time in relation to child problem behavior and eventually influence and are influenced by teacher-child relationships is important for understanding how we may improve both child and teacher outcomes. Identifying these associations may highlight malleable factors such as positive/negative student interactions which can aid in professional development and intervention efforts to improve child outcomes. For example, negative interactions and conflict may be more influential on student behavior and
therefore would be a more effective intervention target than positive interactions and relationships.

Finally, while this meta-analysis included both preschool and elementary aged children, given developmental considerations I focused on preschool students in the second study because this is when a child may become at-risk for developing EBD. There are a number of risk-factors, (e.g., low socioeconomic status, problem behavior, internalizing behaviors; Duncan, Brooks-Gunn, & Klebanov, 1994; Mesman, Bongers, & Koot, 2001; Poulous, 2015;) that, if present during preschool age, place a child at higher risk for later development of more significant EBD. For example, children who display ongoing problem behaviors during this stage are often at higher risk for developing EBD or more significant behavioral difficulties in the later school years (Fanti & Henrick, 2010; Poulou, 2015). Thus, it is important to investigate the relationship between some of these early risk factors (e.g., problem behavior, internalizing behaviors), teacher-child relationships, and teacher-child interactions.

Therefore, the purpose of the following study was to investigate the associations between preschool child problem behaviors, the nature of their interactions with teachers over time, and how this relates to teacher-child relationships (e.g., increased externalizing behavior and negative teacher-child interactions relates to a more conflictual child-teacher relationship). The results of this meta-analysis provided support for a relationship between behavior and teacher-child relationships that informed the next step of this research program: a further investigation of this association specifically for children with or at-risk for EBD, and a more in-depth analysis of this association including an analysis of the contributions of teacher-child interactions.
Chapter 3
Methodology

In order to investigate the transactional association between teacher-child relationships and problem behavior and the role teacher-child interactions play, this study used a quantitative analysis. Data from this study were collected as part of a multisite cluster randomized controlled trial of a Tier 2 intervention, BEST in CLASS (Conroy, Sutherland, Algina, Werch, & Ladwig, 2018; Sutherland et al., 2018; Sutherland, Conroy, Vo, & Ladwig, 2015; Vo, Sutherland, Conroy, 2012). BEST in CLASS was designed to improve teacher-child interactions by increasing the quantity and quality of teacher delivery of evidence-based practices with targeted focal children. This current study used a cross-lagged panel model to look at the associations between problem behavior and teacher-child interactions at three time-points across a school year as well as the association of teacher-child relationships at two time points. I also examined whether or not there are differences in this model based on participation in the BEST in CLASS intervention compared to a business as usual (e.g., control) group. Finally, child gender was also investigated in terms of its contribution to the prediction of Time 2 and 3 variables.

BEST in CLASS

Design and randomization. BEST in CLASS was a four-year study with data collection across two different states in the southeast. The study design included three levels of nesting: individual children (i.e., focal children who were screened into the study as being at-risk for developing EBD) were nested within teachers’ classrooms, and teachers were then nested within
schools/site with new teachers and students entering the study each year. Due to the nested nature of this trial, a multi-site cluster randomized trial design (Spybrook et al., 2011) was used. Participants were randomized into the BEST in CLASS condition or the Business as usual (business as usual model) condition at the teacher level, meaning that a teacher and the focal children \((n = 1-3\) per classroom) in his/her classroom would be in treatment or business as usual model condition. More than half \((n = 48)\) of the schools included more than one teacher; in these cases teachers within a school were randomized into one of the two conditions. In schools with only one teacher this teacher would be randomized into either the business as usual or BEST in CLASS condition.

BEST in CLASS is a multi-component intervention targeting specific children in the classroom who are at-risk for developing EBDs. Teachers receiving the BEST in CLASS intervention received a professional development workshop on each of the BEST in CLASS practices: Rules, Precorrection, Opportunities to Respond, Behavior Specific Praise, Corrective Feedback, Instructive Feedback, and Linking and Mastery. Following this training, teachers were paired with individual coaches and received a 14-week cycle of practiced based coaching. During this process the coach would conduct weekly observations of the teacher’s use of the practices with individual focal children, as well as focal child behavior (e.g., disruptions, aggressions, defiance). Following the observation the teacher and coach would meet to review feedback and collaboratively create a goal for the teacher and focal children. This process repeated weekly with a new practice being introduced every two weeks. In addition to the weekly coaching data collected, data staff collected observational data at pre-test (Time 1), post-test (Time 2), and maintenance (Time 3) time points (see Figure 19 for data collection schedule for measures in the present study). Additionally, teacher and child data from teacher report
measures (e.g., STRS; Pianta, 2001) were collected at pre and post-test (Time 1 and 2). Teachers assigned to the business as usual condition did not receive any coaching but data were collected on these teachers at the same three time points. In the business as usual condition teachers and children participated in typical classroom instruction and curriculum with no additional intervention.

<table>
<thead>
<tr>
<th>Time point</th>
<th>Pre-test</th>
<th>Post-test</th>
<th>Maint.</th>
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<tr>
<td>Student Teacher Relationship Scale</td>
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<tr>
<td>TCIDOS: Interactions and DADS</td>
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<td>Demographic Data: Teacher and Child</td>
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*Figure 19. Data collection timeline.*

**Participants**

**Teachers.** There were a total of 185 teachers in the study; 92 were randomized into the BEST in CLASS condition and the remaining 94 were in the business as usual condition. As expected, the majority of the teachers ($n = 181$) were female. More than half of the teachers ($n = 72$) had a bachelor’s degree, with 48 having a master’s degree. Just under half of the teachers ($n = 88$) identified as African American, 86 were Caucasian, 5 were Hispanic, 2 were Asian, 2 teachers selected other, and 2 did not report. Teachers had a wide range of years of experience teaching, ($M = 12.09$ years). Finally, the teachers taught across a variety of settings, with the majority (96%) teaching in federally funded (e.g., Head Start) or state funded programs serving children from low-income families with only four schools serving children in privately funded settings.
**Children.** Four hundred and sixty-nine children participated in the study with 232 assigned to the BEST in CLASS condition. Most of the children (66%) were identified by their caregivers as African American, 16.8% Caucasian, less than 5% Hispanic, with the remaining 6.8 responding as other or multiracial. The children were on average about 4 years old upon entering the study, and 65% were male. Within each classroom there were on average 17.75 children with 2.21 adults, typically a lead and assistant teacher. In order to participate in the study, children were screened and identified as being at-risk for EBD using the Early Screening Project (ESP; Walker et al., 1995). This screener was used to identify children using a two-phase process of teacher rating of externalizing behavior and additional ratings on three subscales of behavior (i.e., critical events index, maladaptive, aggressive, and adaptive behavior). Finally, children who fell outside of the normal range on the Batelle Developmental Inventory, Second Edition (BDI II; Newborg 2005) were not considered eligible for the study. All participating children needed to have a signed consent from a parent or other caregiver in order to participate.

**Measures**

**Student-teacher relationship scale** (STRS; Pianta, 1993). The STRS is self-report measure of the teacher’s perception of their relationships with a specific child or student in their classroom. The STRS is a commonly used and well-validated instrument with three subscales (conflict, closeness, and dependency). For this paper I used the conflict and closeness subscales. Both conflict and closeness are measured on this 15-item instrument on a 5-point likert-type scale (1 = definitely does not apply and 5 = definitely applies). Closeness can be considered as a measure of warmth between the teacher and child, and can include components oriented towards the more positive aspects of the relationships and open communication (e.g., “If upset, the child
will seek comfort from me.’’). On the other hand, conflict represents a negative and less warm aspect of the teacher-child relationship and includes questions such as “This child is sneaky or manipulative with me” or “This child and I always seem to be struggling with each other”. Both the conflict and closeness subscales have high internal consistency. The Time 1 closeness subscale of the STRS had a Cronbach’s alpha of $\alpha = .62$ while Time 2 was $\alpha = .61$. The Time 1 conflict subscale has a Cronbach’s alpha $\alpha=.85$ and Time 2 was $\alpha = .88$ (Pianta, 2001).

**Teacher-child interaction direct observation scale** (TCIDOS; Conroy et al., 2015; Sutherland Conroy, Vo, & Ogston, 2013). The TCIDOS is a direct observation system that measures both teacher and child behavior as well as teacher-child interactions. The system uses a partial-interval coding system during which the coders observe for 10 second intervals followed by a 5 second interval during which they could enter the codes. All data were recorded on computers using the Lily (Tapp, 2010) software and analyzed using Intman (Tapp, 1996), a software that calculates the percentage of intervals of teacher-child interactions and child behavior. Both coaches and research assistants served as trained coders and recorded teacher-child interactions, teacher use of the BEST in CLASS practices, and focal child behavior. TCIDOS data were collected at Times 1, 2, and 3, as part of the larger BEST in CLASS intervention study. While teacher use of the practices was recorded, this data will not be included in this study. Teacher-child interactions were scored during each interval as either positive or negative. Positive and negative interactions were defined as:

- “Positive Interaction: The teacher and the focal child are engaged in an exchange in which both parties are exhibiting positive/neutral behavior and/or affect.”
- “Negative Interaction: The teacher and the focal child are engaged in an exchange in which one or both of the parties are exhibiting negative behavior and/or conflict.” (Conroy et al., 2015)
For student problem behavior coders would record presence or absence of disruptive, aggressive, and defiant behavior, also known as DADs and hereafter referred to as problem behavior, during each interval using the partial interval recording system.

- “Disruption: Verbalization, physical act, or gesture that either interrupts or has the potential (e.g., teacher does not see the FC throw a toy) to interrupt classroom instruction.
- “Potential” is included here since some behaviors that are DADs may not actually interrupt instruction because the teacher does not stop instruction to respond/doesn’t see the behavior. These behaviors should still be coded as DAD.
- Aggression: behavior aimed at causing harm or pain or personal injury (verbal or physical).
- Defiance: Challenging; non-compliant; confrontational; openly and boldly challenging and resisting authority.” (Conroy et al., 2015)

Coders conducted fifteen-minute observations, focusing on the interactions between the teacher and a specific focal child; during the observation the coder would also code problem behavior for a specific focal child. Interobserver agreement was conducted for 23.9% of the observations with high agreement for each code ranging between 94.1% and 96.21% (Sutherland et al., 2018).

Data Analysis Plan

A cross-lagged panel model was used to examine the associations between teacher-child interactions, child problem behavior, and teacher-child relationships at three time-points within a single school year (see Figure 20 for overview of model). Data were collected at pre-test Time 1 in early fall, post-test Time 2 in mid-spring, and finally at a maintenance collection period at Time 3 in the late spring. A cross-lagged panel model is a variation of a structural equation model that was appropriate for the current research questions because it models the influence of different variables on one another across time points while controlling for other associations for the stability paths of same variables across multiple time points. The analyses were conducted using Mplus Version 8 statistical software (Muthen & Muthen, 1998-2011) and data used for these analyses were collected as part of an IES Goal 3 Efficacy and Replication study (BEST in
CLASS Pre-K, IES Grant R324A110173). In this model teacher-child interactions and child problem behavior were analyzed at three time points, while teacher-child relationships were only examined at Times 1 and 2. These data collection time points were previously determined and collected as part of the larger intervention study and data collection procedures.

**Variables.** To measure teacher-child interactions I will create a proportion score of *positive interactions* from the TCIDOS observation system. This proportion score was calculated by dividing the number of positive interactions by the number total number of intervals where there was an opportunity for behavior for each observation. Given the nature of the data collection system, using a proportion of positive interactions was more appropriate for this study. Specifically, because problem behavior and negative interactions were always coded together (i.e., when problem behavior was coded a negative interaction was also coded) they were not mutually exclusive, violating the assumption of independence. However, positive interactions and problem behavior were mutually exclusive and this did not violate the assumption that the variables were independent. Child problem behavior was also measured using the TCIDOS; for this model I used the proportion of intervals a problem behavior was observed during each total observation for each of the three time points. To be clear, this proportion score was created by dividing the number of intervals in which a problem behavior was observed by the total number of intervals. Finally, we used the STRS subscales of conflict and closeness, measured at Times 1 and 2.
Figure 20. Overview of cross-lag panel model examining association between teacher-child interactions, child problem behavior, and teacher-child relationships.

* While displayed together for simplicity, closeness and conflict will be separated in the actual analysis in order to parse out the different effects each may have on behavior and interactions.
**Cross-lagged panel model.** The nature of the cross-lagged model aligned well with the Sameroff’s (1983) transactional framework as this modeling strategy examined the effects of the variables on one another across multiple time points. In terms of fitting the statistical model and selection of variables to the theoretical model in Chapter 1 (see Figure 1), study variables were used across multiple time points and analyzed in a cross-lagged model. Teacher-child interactions are represented through the A-B-C contingencies and cycles of teacher-child interactions influencing one across time in the theoretical model. The teacher-child interactions are also theorized to influence and be influenced by both the teacher-child relationship and problem behavior. To model this in the statistical model, teacher-child interactions were included at three time points and both autoregressive and cross-lagged paths with other study variables (i.e. teacher-child relationships and problem behavior) were estimated. To capture the problem behavior, depicted as part of the ABC three-term contingency, it was also included at three time points. Both auto-regressive and cross-lagged paths with other study variables were estimated for problem behavior. Finally, the teacher-child relationship (i.e. conflict and closeness), represented as influencing and being influenced by both teacher-child interactions and problem behavior, was included in the model at two time points (see Chapter 5 for limitations). Although only included at Time 1 and 2, autoregressive and cross-lagged paths were estimated for the teacher-child relationship.

As reviewed, there were several paths of interest in the cross-lagged panel model. First, I examined the bi-directional relations between teacher-child interactions and problem behavior by estimating the association of Time 1 teacher-child interactions on Time 2 problem behavior (while simultaneously controlling for the association between Time 1 problem behavior and Time 2 teacher-child interactions). This same path was of interest from Time 2 to Time 3.
Second, I was interested in the reciprocal relation between teacher-child relationships (conflict, closeness), and problem behavior. To identify these associations I looked at the paths between Time 1 closeness and Time 2 problem behavior. Finally, I also looked at the influence of Time 1 teacher-child interactions and Time 1 problem behavior on Time 2 teacher-child closeness. These analyses were repeated for teacher-child conflict at both Time 1 and Time 2. Kearney (2017) identifies several assumptions that must be met to for a cross-lag panel model: synchronicity, stationarity, measurement error, timeframe of effect, omitted variables, and stability. The data used in this analysis met each of these assumptions, for example, time frame of effect, the measurement periods occurred at three time points over a single school year which is appropriate given our variables of interest (i.e., teacher-child relationships, interactions, and problem behavior) in terms of a dyadic relationships between a specific child and teacher.

**Power analysis.** A Monte Carlo simulation power analysis was conducted in order to determine if the current sample size would be sufficient enough detect significant effects given this specific cross-lag panel model. The Monte Carlo simulation power analysis uses parameter estimates for a given model and produces multiple models of a population (Muthen & Muthen 2002). For this study, I used correlations from previous published literature (e.g., Roorda et al., 2014; Rudasill, 2011) in order to estimate the size or magnitude of the effect. Because I conducted a multi-group analysis with control and intervention groups, a separate Monte Carlo simulation was conducted for each. The results of Monte Carlo power analysis simulation indicated that for the business as usual group (n = 237) the majority (n = 16) of parameters had an estimated power of .85 or higher, however n = 7 had power that was low to medium ranging from .061 to .80. For the treatment group model (n = 232) the majority (n = 16) of parameters had an estimated power of .90 or higher, however n = 7 had power that was low to medium
ranging from .062 to .079. Overall, results of the Monte Carlo simulation indicate the sample has sufficient power for the model with a few exceptions which is addressed in the limitations.

**Other variables of interest.** Prior research has shown that compared to girls, boys tend to have higher levels of externalizing behavior (Buyse, Verschueren, & Doumen, 2011; Liu, 2004;) and more conflictual teacher-child relationships. (Ewing-Taylor, 2016; Hamre & Pianta, 2001), thus I expected gender to contribute to variation in the prediction of Time 2 and 3 variables in my model. However, given inconsistent findings on the role of child gender based on Lei et al., 2016, and the non-significant moderation findings in my meta-analysis, as well as significant associations with problem behavior and teacher-child relationships in prior literature, I examined gender and its potential role in these models. Additionally, these data have a known difference in teacher education by site (Sutherland et al., 2018), therefore, site was included as a covariate to account for this difference.

**Multi-group framework.** BEST in CLASS is a tier 2 intervention that aims to improve child problem behavior through the improvement of teacher-child interactions. Due to the nature of the study design from which these data are collected, I analyzed data using a multi-group model to determine if there were differences between intervention group and the control group in the associations between study variables (i.e., teacher-child interactions, relationships, and child problem behavior) throughout the school year.

**Missing data.** Missing data were handled in Mplus using maximum likelihood estimation. The lowest reported covariance coverage had a value of 73.3%. Additionally, 27% of the data had a value of 90% or higher coverage. However, the majority of the paths had 80% or more coverage; in other words, most of the paths had less than 20% missing.
Chapter 4

Results

Preliminary Analysis

Bivariate correlations were run between the variables of interest for each of the time points, correlations were run separately based on study group participation. In other words, correlations for BEST in CLASS participants are provided in Table 2, while those for the business as usual group are shown in Table 3. Below are descriptions of the significant bivariate correlations found for each group.

BEST in CLASS group bivariate correlations. As expected closeness and conflict were negatively and significantly related across both time points (e.g., Time 1 Closeness and Time 2 Conflict \( r = -.23 \)). Interestingly, closeness was not significantly correlated with any other variable; however, this is not entirely surprising given the stronger results for conflict than closeness in association with problem behavior in the meta-analysis. On the other hand, conflict was significantly and positively related to problem behavior at each of the three time points. Correlations between conflict and problem behavior ranged from .197 to .281. With the exception of Time 2 conflict and Time 2 positive interactions, conflict was not correlated with positive interactions. Finally, problem behavior was negatively and significantly associated with positive interactions across all three time points with small to large correlations ranging from -.160 to -.745. All variables were relatively stable across time, each significantly associated with
the same at each time point (e.g., Time 2 problem behavior and Time 3 problem behavior correlated at .538) except for Time 1 positive interactions and Time 3 positive interactions.

**Business as usual group bivariate correlations.** Closeness at Times 1 and 2 was significantly and negatively correlated with conflict at both time points, except for closeness Time 1 and conflict Time 2. Similar to the BEST in CLASS group, closeness (at both time points) was also positively but not significantly associated with any positive interactions. Closeness at Time 2 was also negatively associated with problem behavior at Time 1. Again, conflict had more significant associations when compared to closeness. Conflict was positively associated with problem behavior at both Time 1 and 2, but not at Time 3. Regarding positive interactions, conflict at both Time 1 and Time 2 was negatively associated with Time 2 positive interactions. Similar to the BEST in CLASS group, problem behavior and positive interactions were negatively and significantly associated across all three time points ranging from -.203 to -.798. Finally, the majority of auto-regressions were significant, meaning that each variable demonstrated some stability across the school year.

While the number of significant correlations for both the BEST in CLASS and business as usual model groups provide preliminary evidence for some interesting associations between variables of interest, these results should be taken with some caution for a couple of reasons. First, unlike the cross-lag panel models, these correlations do not control for previous time points. Additionally, gender is not included as a variable of interest as it is in the following cross-lagged analyses.

**Study variable descriptives.** Descriptive statistics (i.e., mean scores, standard deviations, and sample size) are provided in Table 2 and 3 along with the bivariate correlations.
In the BEST in CLASS group closeness means increased from Time 1 (pre-test) to Time 2 (post-test) while conflict mean scores decreased across time. As expected, when comparing BEST in CLASS participant mean scores of problem behavior, these decreased consecutively across the three time points from .08 to .03. Finally, in the BEST in CLASS group, positive interactions increased from Time 1 to Time 2 but decreased slightly at Time 3. In the business as usual condition the closeness mean scores increased but by a slightly smaller amount. Similarly, conflict mean scores decreased by a smaller amount from Time 1 to Time 2. Problem behavior lessened from Time 1 to Time 2 but from Time 2 to Time 3. Lastly, positive interactions followed the same pattern from the BEST in CLASS condition, increasing from Time 1 to Time 2, followed by a very small decrease at Time 3.

**Model fit.** Model fit was estimated for both the BEST in CLASS and business as usual groups together using root mean square error of approximation (RMSEA), CFI, TLI, and standardized root mean square residual (SRMR). Fit was estimated separately using the Chi-Square test of model fit with a chi-squared contribution from each group. Keith (2014) suggests that an RMSEA score of 0.10 or greater is suggestive of poor model fit, for these models RMSEA = 0.166 indicating poor model fit. A CFI above .95 is indicative of good fit, however the CFI was low at 0.696. The TLI score for this analysis was 0.295, while the SRMR = 0.116; both scores again demonstrate poor fit. The total chi-square test of model fit was $\chi^2 = 326.52$ ($df = 44, p = 0.00$) again indicating below adequate fit for these models. The chi-squared contribution based on intervention participation were $\chi^2 = 155.56$ for the BEST in CLASS group
Table 2

*BEST in CLASS study variable descriptives and bivariate correlations.*

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<tr>
<th></th>
<th>N</th>
<th>M(SD)</th>
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<td>1. STRS Closeness T1</td>
<td>229</td>
<td>3.58(63)</td>
<td>1</td>
<td>5</td>
<td>-</td>
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<td></td>
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</tr>
<tr>
<td>2. STRS Closeness T2</td>
<td>205</td>
<td>3.91(48)</td>
<td>2.43</td>
<td>4.86</td>
<td>.568**</td>
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<td>-.221*</td>
<td>-.187**</td>
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<td>4. STRS Conflict T2</td>
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<td>-.247**</td>
<td>-.420**</td>
<td>.591**</td>
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<td>5. DAD T1</td>
<td>226</td>
<td>.08(.11)</td>
<td>0</td>
<td>.63</td>
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<td>.274**</td>
<td>-</td>
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<td>6. DAD T2</td>
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<td>0</td>
<td>.33</td>
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<td>-.089</td>
<td>.230**</td>
<td>.281**</td>
<td>.383**</td>
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<td>7. DAD T3</td>
<td>186</td>
<td>.03(.07)</td>
<td>0</td>
<td>.45</td>
<td>-.069</td>
<td>-.017</td>
<td>.220**</td>
<td>.230**</td>
<td>.256**</td>
<td>.538**</td>
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<tr>
<td>8. Pos. Interactions T1</td>
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<td>.096</td>
<td>-.069</td>
<td>-.096</td>
<td>-.431**</td>
<td>-.160*</td>
<td>-.054</td>
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<td>9. Pos. Interactions T2</td>
<td>196</td>
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<td>.112</td>
<td>.098</td>
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<td>-.392**</td>
<td>.242**</td>
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<td>10. Pos. Interactions T3</td>
<td>186</td>
<td>.96(.08)</td>
<td>.48</td>
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<td>.061</td>
<td>.009</td>
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<td>-.109</td>
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<td>-.765**</td>
<td>.056</td>
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Table 3

*Business as usual study variable descriptives and bivariate correlations.*

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<th>N</th>
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<th>Min</th>
<th>Max</th>
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<th>4</th>
<th>5</th>
<th>6</th>
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<tbody>
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<td>2. STRS Closeness T2</td>
<td>193</td>
<td>3.78(49)</td>
<td>2</td>
<td>5</td>
<td>.487**</td>
<td>-</td>
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<td>226</td>
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<td>-.173**</td>
<td>-.215**</td>
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<tr>
<td>4. STRS Conflict T2</td>
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<td>-.251**</td>
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<tr>
<td>5. DAD T1</td>
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<td>0</td>
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<td>-.182**</td>
<td>.159**</td>
<td>.157*</td>
<td>-</td>
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<tr>
<td>6. DAD T2</td>
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<td>.375**</td>
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<td>-.143</td>
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<td>.070</td>
<td>.433**</td>
<td>.308**</td>
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<tr>
<td>8. Pos. Interactions T1</td>
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<td>-.503**</td>
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<tr>
<td>9. Pos. Interactions T2</td>
<td>184</td>
<td>0.93(10)</td>
<td>.17</td>
<td>1</td>
<td>-.009</td>
<td>.070</td>
<td>-.044</td>
<td>-.188*</td>
<td>-.215**</td>
<td>-.798**</td>
<td>-.203**</td>
<td>.157*</td>
<td>-</td>
</tr>
<tr>
<td>10. Pos. Interactions T3</td>
<td>177</td>
<td>0.92(14)</td>
<td>.00</td>
<td>1</td>
<td>.164*</td>
<td>.131</td>
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<td>-.084</td>
<td>-.209**</td>
<td>-.249**</td>
<td>-.601**</td>
<td>.125</td>
<td>.307**</td>
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</tbody>
</table>

59
and $\chi^2 = 170.95$ for the business as usual group. Overall, model fit for both cross-lagged panel models was poor to adequate. While model fit is not as essential in estimating cross-lagged models compared to other analyses (e.g., confirmatory factor analysis; Little, 2013), the lack of goodness of fit is addressed in the limitations.

**BEST in CLASS Group Model**

Two models were estimated based on participation in the BEST in CLASS intervention. After imputing missing data using maximum likelihood estimation (MLR in Mplus) this model retained a sample of $n = 232$ children. Figure 21 displays the BEST in CLASS model paths with a significance of $p = .05$ or lower, both autoregressive and cross-lagged paths were estimated between each of the study variables (i.e., Time 1 problem behavior, Time 2 problem behavior, Time 3 problem behavior, Time 1 positive interactions, Time 2 positive interactions, Time 3 positive interactions, Time 1 conflict, Time 2 conflict, Time 1 closeness, and Time 2 closeness).

There were a number of significant autoregressive and cross-lagged paths in the BEST in CLASS condition model. In regards to positive interactions at Time 1 and 2, it did not significantly predict any other Time 2 or 3 study variable (i.e., problem behavior, conflict, or closeness), nor did it have a significant autoregressive path. However, positive interactions autoregressive did predict from Time 2 to Time 3 ($\beta = .341, p = .025$). Problem behavior retained significant and moderate autoregressive paths through the entire model at both Time 1 to Time 2 ($\beta = .141, p = .005$) and again from Time 2 to Time 3 ($\beta = .584, p = .00$). As expected, both conflict and closeness had significant autoregressive paths between Time 1 and Time 2 (i.e., closeness $\beta = .441, p = .00$ and conflict $\beta = .55, p = .00$) indicating stability among these constructs across the school year. There was an interesting cross-lagged relationship between conflict and problem behavior. Specifically, there were two significant cross-lagged paths
between conflict and problem behavior representing a potential transactional relationship with Time 1 problem behavior predicting Time 2 conflict with a large coefficient ($\beta = 1.38, p = .01$) and Time 2 conflict predicting Time 3 problem behavior ($\beta = .009, p = .015$). Interestingly, there was a moderate cross-lagged relationship between Time 1 problem behavior and Time 2 positive interactions with problem behavior negatively and significantly predicting positive interactions ($\beta = -.101, p = .03$). Relatedly, there was a very small but significant predictive negative cross-lagged relation between Time 1 conflict and Time 2 positive interactions ($\beta = -.008, p = .037$), suggesting that higher levels of both conflict and problem behaviors (i.e., problem behavior) predict fewer positive interactions. Finally, there was a single cross-lagged relation between conflict and closeness with Time 1 closeness negatively predicting Time 2 conflict ($\beta = .142, p = .046$).

*Figure 21.* BEST in CLASS group cross-lagged model with significant paths.
In addition to the cross-lagged and autoregressive paths, covariances were also estimated between the four variables at Time 1 and again with the two variables (i.e., Time 3 DADs and Time 3 positive interactions). At Time 1, problem behavior were significantly related to Time 1 positive interactions ($\beta = -.007, p = .00$) and Time 1 conflict ($\beta = .021, p = .001$) in expected directions; problem behavior were not significantly related to Time 1 closeness. Interestingly, Time 1 positive interactions were not significantly related to either conflict or closeness. Finally, as anticipated conflict and closeness were significantly and negatively related at Time 1 ($\beta = -157, p = .017$)

**Business as Usual Group Model**

Like the BEST in CLASS model the business as usual group model included three time points of problem behavior and positive interactions and two time points of conflict and closeness and included a final sample of $n = 236$ children. Cross-lagged and auto-regressive paths were estimated between each of these variables; significant paths are show in Figure 22. Contrary to expectations, the business as usual group had far fewer significant paths than the BEST in CLASS group model. Autoregressive paths between problem behavior at all three time points were significant and moderate in size; Time 1 positively predicted Time 2 ($\beta = .202, p = .023$) and Time 2 to Time 3 ($\beta = .350, p = .008$) indicating stability in this variable across the school year. Similar to the BEST in CLASS group, autoregressive paths between Time 1 and 2 positive interactions were not significant; however, Time 2 significantly predicted Time 3 ($\beta = .639, p = .019$). Conflict and closeness autoregressive paths were both stable over time with Time 1 conflict also positively predicting Time 2 ($\beta = .660, p = .00$) and closeness at Time 1 predicting Time 2 ($\beta = .424, p = .00$). Unexpectedly, there was only one significant cross-lagged path in the business as usual model, Time 1 problem behavior negatively predicting Time 2 closeness with a
negative and moderate coefficient ($\beta = -.515$, $p = .031$). There were not any significant cross-lagged paths between Time 2 and Time 3 study variables.

![Diagram of cross-lagged model](image)

**Figure 22.** Business as usual group cross-lagged model with significant paths.

As in the BEST in CLASS group model covariances at the same time point were estimated between each variable at Time 1 and again at Time 3. Interestingly, despite the differences in the overall model results, covariances were very similar across the two models. Problem behavior at Time 1 was negatively related to Time 1 positive interactions ($\beta = -.012$, $p = .00$), and Time 1 conflict ($\beta = .027$, $p = .036$). Time 1 positive interactions were not significantly associated with any other Time 1 variable (i.e., conflict, closeness). Conflict and closeness and Time 1 were negatively associate ($\beta = -.111$, $p = .013$). Finally, there was a small and negative association between Time 3 positive interactions and Time 3 problem behavior ($\beta = -.010$, $p = .008$).
Comparison of Two Groups.

While the number and type of significant paths differed greatly between the two models (i.e., BEST in CLASS and business as usual model), I wanted to determine if the overall models themselves were significantly different based on intervention participation. To do this, the models were run again with all paths constrained to be equal and chi-squared tests of model fit were compared between the constrained and unconstrained models. Chi-square test of model fit was $\chi^2 = 326.52$ ($df = 44$, $p = 0.00$) for the unconstrained model with chi-square contributions from BEST in CLASS and business as usual groups being $\chi^2 = 155.56$ and $\chi^2 = 170.96$ respectively. Chi-square contributions from the BEST in CLASS group increased by 33.86 to $\chi^2 = 189.74$ and by 48.21 to $\chi^2 = 219.17$ for the business as usual group. The chi-squared test of model fit increased by 82.32 to $\chi^2 = 408.91$ ($df = 80$, $p = 0.00$) and degrees of freedom nearly doubled indicating significant differences between models based on intervention participation. Finally, in Table 4 all path results, inclusive of non-significant findings, are shown alongside confidence intervals for both models.

Gender differences. Gender was included on all paths in both models and was dummy coded male=1, female=0 to determine if child gender contributed to the prediction of Time 2 (i.e., problem behavior, positive interactions, conflict, and closeness) and Time 3 variables (i.e., problem behavior, positive interactions). In the BEST in CLASS group model gender did not significantly account for variance in the prediction of any Time 2 variables and Time 3 variables. In business as usual classrooms, gender did account for a portion of the variance in Time 2 problem behavior, suggesting that there was a decrease in problem behavior for boys compared to girls ($\beta = -0.36$).
Table 4. Model path results with confidence intervals

<table>
<thead>
<tr>
<th></th>
<th>BEST in CLASS</th>
<th>Business As Usual</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>β</td>
<td>C.I.</td>
</tr>
<tr>
<td><strong>Auto-regressive paths</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>T1 Problem Behavior → T2</td>
<td>.141*</td>
<td>.01-.27</td>
</tr>
<tr>
<td>Problem Behavior</td>
<td></td>
<td></td>
</tr>
<tr>
<td>T2 Problem Behavior → T3</td>
<td>.584*</td>
<td>.17-.99</td>
</tr>
<tr>
<td>Problem Behavior</td>
<td></td>
<td></td>
</tr>
<tr>
<td>T1 Positive Interactions → T2</td>
<td>.030</td>
<td>-.05-.11</td>
</tr>
<tr>
<td>Positive Interactions</td>
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<td></td>
</tr>
<tr>
<td>T2 Positive Interactions → T3</td>
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<td>-.05-.73</td>
</tr>
<tr>
<td>Positive Interactions</td>
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<td></td>
</tr>
<tr>
<td>T1 Conflict → T2 Conflict</td>
<td>.550*</td>
<td>.40-.70</td>
</tr>
<tr>
<td>T1 Closeness → T2 Closeness</td>
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<td>.29-.56</td>
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<td><strong>Cross-lagged paths</strong></td>
<td></td>
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<tr>
<td>T1 Problem Behavior → T2</td>
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<td>-.22-.02</td>
</tr>
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<td>T1 Problem Behavior → T2</td>
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<td>T1 Problem Behavior → T2</td>
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<td>T1 Positive Interactions → T2</td>
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Additionally, gender also significantly accounted for variance in business as usual Time 2 closeness, there was an increase in closeness for boys compared to girls ($\beta = .125$).
Chapter 5
Discussion

The purpose of this dissertation study was to investigate the within year reciprocal associations between teacher-child interactions, problem behavior, and teacher-child relationships (i.e. conflict and closeness) for preschool children with or at-risk for EBD. Specifically, the aims of this study were to:

1. Determine if positive teacher-child interactions and problem behavior (e.g., disruptions, aggression, and defiance) predicted one another across a single school year.
2. Determine if problem behavior and teacher-child relationships (i.e., conflict, closeness) predicted one another across a single school year.
3. Determine if teacher-child relationships and positive teacher-child interactions predicted one another across a single school year.
4. Investigate if gender contributed to the predictive of Time 2 and 3 variables.
5. Determine if paths differ based on participation in the BEST in CLASS intervention.

Two approaches were used to investigate the aims: (a) a meta-analysis of studies examining the relation between teacher-child relationships (conflict and closeness) and problem behavior at multiple time-points within a school year, and whether gender moderated these relationships; (b) a secondary data analysis using cross-lagged panel models. Given the lack of research on momentary teacher-child interactions, this second approach was necessary in order to investigate the contribution of these interactions to the overall theoretical model.
The meta-analysis included a total of 12 studies (8 studies from pre-school and 4 from elementary school) and 67 effect sizes that measured teacher-child relationships and problem behavior at different time points within a single school year. Results from the meta-analysis indicated reciprocal relations between teacher-child relationships and problem behavior. Specifically, higher levels of closeness predicted lower levels of problem behavior later in the year and higher levels of problem behavior predicted lower levels of teacher-child closeness later in the same school year. Similar results were found for conflict, such that conflict was related to higher levels of later problem behavior and vice versa. In their cross-sectional meta-analysis, Lei and colleagues (2016) found that externalizing problem behaviors and positive teacher-child relationships (e.g., closeness) were negatively related while externalizing problem behavior and negative teacher-child relationships (e.g., conflict) were positively and more strongly related.

To expand on the results of the meta-analysis and the theorized model to include teacher-child interactions, I conducted the secondary data analysis using data from a preschool intervention study. In addition to the association between teacher-child relationships and problem behavior, teacher-child interactions were included based on the theorized model in Figure 1. In this model teacher-child interactions and problem behavior are reciprocal and influence one another in a transactional nature over time; at the same time, these interactions and behavior are influenced by and influence the ongoing teacher-child relationship. To analyze this theorized model statistically, a cross-lagged panel model was used in which paths between each of the study variables at three different time-points (two time points for teacher-child relationships) were examined to determine if reciprocal relations existed (see Figure 20).

Overall, the results of the models were not as expected, particularly with path differences based on intervention participation. Contrary to the hypotheses that intervention participation
would simply alter the strength some of these associations in comparison to the business as usual model group, the BEST in CLASS group had far more significant paths. In fact, with the exception of the autoregressive paths (i.e., paths between the same variable across multiple time points), the groups did not have any of the same paths. However, the paths that were significant, were predictive in the directions expected.

**Problem Behavior and Teacher-Child Relationships**

The cross-lagged panel model for each group (BEST in CLASS and business as usual) included three time points of problem behavior and two time points for each subscale of teacher-child relationships (i.e., closeness and conflict; see Figure 23).

![Figure 23](image)

*Figure 23. Hypothesized associations between problem behavior and teacher-child relationships*

For the associations between teacher-child relationships and problem behavior, it was hypothesized that:

a) In business as usual classrooms and BEST in CLASS classrooms, I expected a positive reciprocal relationship between problem behavior and teacher-child conflict over time. However, for BEST in CLASS classrooms the association between teacher-child conflict and problem behavior was expected to be weaker.
b) In business as usual classrooms, I expected a negative reciprocal relationship between problem behavior and teacher-child closeness over time. However, for BEST in CLASS classrooms I expected the negative association between problem behavior and teacher-child closeness and would be weaker. Contrary to the hypotheses, there was not a significant positive relation between problem behavior and conflict in the business as usual group. Interestingly, however, this relation was present in the BEST in CLASS group; there was weak a cross-lagged relation with Time 1 problem behavior predicting Time two conflict ($\beta = 1.38$, $p = .014$), and in turn Time 2 conflict predicted more Time 3 problem behavior ($\beta = .009$, $p = .015$). Because the intervention targeted the improvement of child problem behavior through the improved quality of teacher-child interactions and relationships, I anticipated weaker paths for BEST in CLASS participants. Though the absence of this relation in the business as usual condition was surprising, the relations in the BEST in CLASS group were not strong. This suggests that while intervention participation did not weaken the relations compared to the business as usual group, it did not cause an exceptionally strong reciprocal association. Additionally, as shown in Figure 21, this relation did become weaker from Time 2 to Time 3 which is what we would expect after participating in the entire intervention. It is difficult to determine why this relation existed in the intervention group and not the business as usual condition. However, one potential cause may be the use of coaching in the BEST in CLASS intervention. As teachers were coached in a number of practices aimed at improving their interactions with the focal child, they may have been more aware of the focal children’s behavior when completing measures of the teacher-child relationship, particularly compared to the business as usual teachers. In other words, it is possible that the association between conflict and problem behavior does not exist in typical classrooms as theorized (see Figure1) and that the focus on these components in the intervention made teachers more cognizant of both the problem behavior and their relationship with the focal child.
Additionally, there are several measurement limitations associated with, as described below, that could have influenced these findings. Overall, this finding is surprising and contrary to the proposed theoretical framework given that BEST in CLASS is shown to reduce both problem behavior and teacher-child conflict (Sutherland et al., 2018).

Next, I hypothesized that a negative reciprocal relation existed between problem behavior and teacher-child closeness in the business as usual condition and that BEST in CLASS would weaken this association. While not a reciprocal relation as anticipated, problem behavior at Time 1 did predict lower levels of closeness at Time 2 (β = -.515, p = .031) in the business as usual group, while problem behavior did not predict lower levels of closeness in the BEST in CLASS group. This indicates that, despite children having disruptive problem behaviors, it did not impact their closeness with the teachers who participated in the intervention.

**Teacher-Child Interactions and Problem Behavior**

To examine the longitudinal associations between positive teacher-child interactions and problem behavior, these factors were included at three time points each in both models. For these associations I hypothesized that in both business as usual classrooms and BEST in CLASS classrooms there would be a negative reciprocal relation between positive teacher-child interactions and child problem behavior over the school year. However, for BEST in CLASS classrooms, I anticipated the relation between problem behavior and positive-teacher child interactions to be non-significant.
In the BEST in CLASS model, problem behavior at Time 1 significantly predicted lower levels of Time 2 positive interactions ($\beta = -0.101, p = .031$). However, this path was not maintained following intervention participation. Time 2 problem behavior to Time 3 positive interactions. This might be interpreted to mean that positive interactions were influenced by behavior during intervention participation, but following receipt of the entire intervention, the association between child problem behavior and positive interactions was no longer significant. Given these results, the BEST in CLASS intervention may reduce the impact of child problem behavior on their positive interactions with the teacher. This could provide an opportunity for future research on intervention work in which interventions such as BEST in CLASS are targeted as a mechanism for reducing the impact problem behavior has on positive teacher-child interactions. Perhaps intervention participation improved the teachers’ perception of the problem behavior and their ability to maintain more positive interactions with the children despite problem behavior. At the same time, the hypothesized relation between problem behavior and positive interactions was not significant in the business as usual condition, again contrary to the theorized model. The lack of significant pathways here may be explained by the fact that teachers in BEST in CLASS experienced an overall increase in in both the quality and number of

*Figure 24. Hypothesized associations between problem behavior and teacher-child interactions.*
positive teacher-child interactions by intervention end at Time 2 (Sutherland et al., 2018) while business as usual teachers did not. Given this change in teacher-child interactions at post-test, there may have been more opportunity or sensitivity to detect change in business as usual classrooms. However, with little research using observational measures of momentary teacher-child interactions, these findings should be considered exploratory.

Contrary to hypothesis, the relation between positive teacher-child interactions and problem behavior was not reciprocal as positive interactions both in the BEST in CLASS and the business as usual groups did not predict lower rates of problem behavior. It is possible that the data were not sensitive enough to detect effects due to the method of coding (presence/absence), or the use of positive interactions over negative in the models. Conflict has been shown to demonstrate stronger effects than closeness (see results of Chapter 2), and because teacher-child relationships are theorized to be a product of moment to moment interactions, I would expect that, had I used negative interactions, it is possible there would have been a stronger or more significant effect. It is also feasible that this association does not exist at all. If this association does exist and was simply not detected due to data limitations, I hypothesize that the association would have been stronger for the BEST in CLASS group as they had fewer problem behaviors and better quality positive interactions at Time 2 (Sutherland et al., 2018). Given the lack of research on positive interactions, specifically those measured during observations between a specific child and teacher, further research is needed to fully understand the longitudinal relationship between positive interactions and behavior.
**Positive Interactions and Teacher-Child Relationships**

The relationship between teacher-child relationships and positive teacher child interactions was investigated across three total time points (two for teacher-child relationships). I proposed the following hypotheses (see Figure 25):

a) In business as usual classrooms and BEST in CLASS classrooms, I expected a positive reciprocal relation between positive teacher-child interactions and teacher-child closeness. However, for BEST in CLASS classrooms, I expect the relation between close teacher-child relationships and positive-teacher child interactions to be stronger.

b) In business as usual classrooms and BEST in CLASS classrooms, I expected a negative reciprocal relationship between positive-interactions and teacher-child conflict over time. However, for BEST in CLASS classrooms the association between teacher-child interactions and conflict is expected to be weaker.

*Figure 25*. Hypothesized associations between teacher-child relationships and teacher-child interactions.

Contrary to the overall hypothesized theoretical model (see Figure 1) no significant reciprocal association was present between closeness and positive teacher-child interactions in either the BEST in CLASS or business as usual models. In fact, there was not a significant
relation between the two variables in either direction. Had negative interactions been used in these analyses, it is possible a significant relationship may have existed. There were also not any reciprocal pathways present between conflict and positive interactions. However, there was one significant pathway; in the BEST in CLASS group conflict at Time 1 predicted lower levels of positive interactions at Time 2 ($\beta = -.008, p = .031$) yet this relationship did not hold from Time 2 to Time 3. While this is a very small relation, it is difficult to interpret since this association was not significant in business as usual as anticipated. Similar to the interpretation above with problem behavior and positive interactions, this result could be attributed to intervention dosage. Meaning that it is possible that once teachers received the intervention in its entirety, it negated the effects of more conflictual relationships and improved the ability maintain positive interactions with focal children. However, the original hypothesis stated that this association would occur throughout the entire business as usual model and to a weaker extent in the BEST in CLASS model. While it is promising that BEST in CLASS appears to have ameliorated the effects of conflict on positive interactions following intervention completion, it is difficult to determine why this association does not exist at all under typical classroom conditions. This could be due to limitations surrounding issues with measurement or data collection, or perhaps this association simply may not exist under typical conditions as theorized. Hypotheses with including momentary positive teacher–child interactions should be considered exploratory as research in this area is scant.

Additional Findings

While the findings above addressed the proposed hypotheses and research questions, there were additional significant findings worth mentioning. First, in the BEST in CLASS group, closeness at Time 1 predicted lower levels of conflict at Time 2; this did not hold true for the
business as usual group. Participation in BEST in CLASS may have strengthened the teachers’ perceptions of closeness and their ability to reduce negative feelings of conflict. Second, for both groups, positive interactions at Time 1 did not predict positive interactions at Time 2, but both had that autoregressive path from Time 2 to Time 3. Because Time 1 and Time 2 were further apart than Time 2 to Time 3, this finding could be interpreted to mean that positive interactions do not maintain long-term effects beyond a month or two. However, because this was not the focus of the study this finding should be interpreted with caution. Next, in both the BEST in CLASS and business as usual groups the predictive power of problem behavior in the autoregressive paths became stronger over the school year. It positively predicted later problem behavior in both groups from Time 1 to Time 2 and was even stronger from Time 2 to Time 3; suggesting that not only is problem behavior relatively stable, but at the end of the school year problem behavior increases and may become stronger in its influence on future behavior due to a cumulative effect of these behaviors over the school year. Again, this finding should be interpreted with caution as data at Time 2 and Time 3, where the stronger associations were found, were collected closer together. This could also indicate that the effects of current problem behavior on later problem behavior diminish over time given that the longer time between Time 1 and 2 showed weaker effects than those between Time 2 and 3. Interestingly, the only other study variable that predicted problem behavior was conflict, suggesting that no other variable in the model were strong enough to reduce or influence future occurrences of problem behavior.

**Findings regarding gender.** Gender was included in the analyses (coded as male=1, female=0) in all model paths to examine if child gender contributed to the prediction of Time 2 (i.e., problem behavior, positive interactions, conflict, and closeness) and Time 3 variables (i.e., problem behavior, positive interactions). I hypothesized that gender would contribute to the
prediction of Time 2 and Time 3 variables in both the business as usual and BEST in CLASS models, due differences in problem behavior and quality of teacher-child relationships between boys and girls. For example, there may be an increase in T2 conflict and a decrease in closeness for boys compared to girls. This is because prior research has demonstrated that boys typically engage in higher levels of externalizing behavior (Buyse, Verschueren, & Doumen, 2011; Liu, 2004) and experience more conflict than closeness with their teachers compared to girls of the same age (Ewing-Taylor, 2016; Hamre & Pianta, 2001). However, because of mixed findings in two prior meta-analyses (see Chapter 2), hypotheses about the contribution of child gender in each path were considered exploratory. There were several findings regarding gender that are worth mentioning. First, in the BEST in CLASS group gender did not significantly account for variance in the prediction of Time 2 variables (problem behavior, positive interactions, conflict, and closeness) and Time 3 variables (problem behavior, positive interactions). This is surprising given a higher number of boys in the sample and that boys tend to have higher rates of externalizing behaviors (Liu, 2004; Buyse, Verschueren, & Doumen, 2011). This finding may be of interest in understanding the role that interventions, such as BEST in CLASS, play in the anticipated effects of gender on behavior and teacher-child relationships. In contrast, in business as usual classrooms, gender did account for a portion of the variance in Time 2 problem behavior, suggesting that there was a decrease in problem behavior for boys compared to girls. Gender also accounted for variance in business as usual Time 2 closeness, there was an increase in closeness for boys compared to girls. Interestingly, these findings are contrary to what was expected based on prior research on gender differences for teacher-child relationships and problem behavior. These findings could be attributed to characteristics of the sample, specifically, children were specifically screened in based on levels of problem behavior and risk
for EBD. Findings regarding gender should be considered exploratory and therefore should be interpreted with caution. It is worth noting that gender played a role only in the business as usual model and not the BEST in CLASS model, suggesting that some aspect of the BEST in CLASS intervention may have offset the effects of gender. Because boys tend to have increased rates of problem behavior compared to girls, perhaps the decrease in problem behavior as a result of the intervention ameliorated some of the effects of gender on Time 2 variables.

**Limitations**

First, this study utilized extant data from a larger intervention study; because of this there was no control over the data collection time points, leading to several limitations. Specifically, the last two data collection time points were relatively close together (i.e., approximately a month), and since time was an important factor in the cross-lagged model this is a limitation that should be considered. Additionally, teacher-child relationship data was only collected at Times 1 and 2, thus limiting our ability to interpret the transactional associations between the study variables across all time points. Had these additional time-points been collected the associations may have varied in one or both models. Lastly, because Time 3 was collected as maintenance after the intervention had ended there were larger amounts of missing data at this time point compared to the others. For limitations related to the meta-analysis see Chapter 3.

There were also several limitations associated with the measurement of study variables. Because conflict has historically demonstrated stronger associations with behavior and child outcomes (see Chapter 2 for meta-analysis results and additional literature), it could be hypothesized that weaker effects existed when using positive compared to negative interactions, which would likely have stronger effects. Negative interactions could not be used in this study because problem behavior and negative interactions were coded with same occurrence, causing
these two variables to be too highly correlated thus violating the assumption of independence. Next, due to the nature of how data were entered (i.e., entire observation period rather than each time sample) proportions were created out of the entire observation period rather than the more specific individual time samples during each observation which made for less sensitive proportions and possibly led to a type II error. Finally, there were variations in how study variables included in the model were measured. Specifically the STRS provides a more global picture of teacher-child relationships, while problem behavior and interactions, as measured using the TCIDOS, provided momentary measures of these variables. Although we know that the STRS is somewhat sensitive to change, due to findings in increased closeness and decreased conflict in the BEST in CLASS trial (Sutherland et al., 2018), it is possible that the STRS is not as sensitive to change as variables measured in real-time using the TCIDOS.

A Monte Carlo simulation was conducted to determine if the models had enough power to detect effects. However, some of the estimated associations were underpowered according to the simulation, potentially leading to some underpowered or missed effects. Additionally, model fit statistics indicated that, for both models, there was poor to adequate fit. While model fit is not as concerning for cross-lagged panel models, this should still be considered when interpreting findings. Finally, there were several potential limitations associated with the larger proportion of boys than girls in the sample. Boys typically experience higher levels of both conflict with their teachers and externalizing behaviors compared to girls; because associations between conflict and behavior were analyzed together this gender difference in variables may have influenced the results. To investigate some of these potential influences, gender was included on all pathways predicting Time 2 and 3 variables, and no differences were found in the BEST in CLASS model and gender only contributed to the prediction of two variables in the business as usual model.
Finally, it is important to consider that children in the sample were screened in based on ratings using the ESP rating scale (Walker et al., 1995) as at-risk for EBD, meaning that they already had higher rates of problem behavior and with the majority of the sample being boys, this may have affected the results.

**Implications and Future Directions**

With the most recent estimates indicating that somewhere between 9 – 13% of children have or are at-risk for EBD (Ringeisen et al., 2017) there is certainly a need for research to identify potential factors that may improve child outcomes and reduce rates of problem behavior. One such factor may be positive teacher-child relationships, which have been found to be indispensable for children’s positive developmental trajectories. Positive teacher-child relationships and teacher-child interactions have been found to be associated with higher levels of cognitive ability (Howes & Smith, 1995) and improved levels of externalizing behavior (Lee & Bierman, 2015). For example, in both the Lei et al. (2016) meta-analysis and the findings of the current meta-analysis in this study, conflict was shown to have stronger relation with child problem behavior than closeness, and therefore may be an effective intervention target for teachers of children with or at-risk for EBD.

On the other hand, based on the findings of the current study is important to consider other components of the teacher-child relationship, such as closeness. In the business as usual model, problem behavior predicted less closeness at Time 2, however this path was not significant in the BEST in CLASS model. This suggests that BEST in CLASS intervention participation disrupted this path, conceivably as the result of the coaching and training teachers were able to maintain feelings of closeness with their students regardless of their problem behavior. Additionally, for the BEST in CLASS group closeness at the beginning of the school
year predicted lower levels of conflict at the end of the school year, yet this did not hold true for the business as usual condition. Closeness has been associated with more positive child outcomes (e.g., Birch & Ladd, 1997; Hamre & Pianta, 2001; Howes, 2000; O’Connor, & McCartney, 2007) and conflict has been shown to be related with more negative outcomes (Hamre & Pianta, 2001). Thus, it is important to consider the positive impact an intervention, such as BEST in CLASS, can have on the teacher-child relationship and child outcomes, particularly for children with or at-risk for EBD. Because there were a number of unexpected findings, further research of these associations with a more intentional sampling and measurement design for this particular model is recommended in order to address some of the limitations and potentially parse out additional effects.

Given that exclusionary disciplinary practices (e.g., suspension and expulsion) are associated with higher rates of negative outcomes for young children (Hemphill, Toumbourou, Herrenkohl, McMorris, & Catalano, 2006), it is not surprising that there is policy focusing on the reduction of these practices, particularly in early education (i.e., preschool) settings. For example, the U.S. Departments of Health and Human Services (DHHS) and Education (DOE) (2016) released a policy statement including recommendations to reduce the frequency of use of exclusionary disciplinary practices. In the policy statement, both the DHHS and DOE provided recommendations for practices and interventions aimed at reducing rates of exclusionary disciplinary practices. This is particularly important for children with EBD, such as those in this study, as children with EBD tend to be subject to exclusionary disciplinary practices at rates much higher than their peers (Bradley et al., 2008; Sullivan, Norman, & Klingbeil, 2014). For example, in a large longitudinal study it was found that over 40% of children with EBD were suspended within a single school year (Bradley et al., 2008). Because the present sample
included preschool children, it is important to recognize preschoolers are three times more likely to be subject to exclusionary discipline compared to older students (Gilliam, 2005). Higher levels of closeness in teacher-child relationships are associated with lower levels of problem behavior (Howes, 2000); this maybe important in to consider when selecting or creating interventions. In other words, it could be beneficial to select or create interventions that target the improvement of teacher-child relationships and interactions (e.g., BEST in CLASS) to ameliorate the disciplinary practices and enhance the use of more evidence-based strategies. For example, teachers who participated in BEST in CLASS were shown to maintain higher levels of closeness despite child problem behaviors. It would be prudent to consider whether interventions such as BEST in CLASS may indirectly lead to lower rates of exclusionary disciplinary practices through increased teacher-child closeness between teachers and these young children at-risk for EBD.

Given the findings and limitations of this study, there are several suggested future directions and next steps. First, with the sample and measurement limitations, the study should be replicated again at the preschool level with the purpose of focusing specifically on the research questions addressed in this study. A number of the limitations could be addressed through a replication, for example more thoughtful measurement regarding time points (e.g., more time between Time 2 and Time 3; three rather than two teacher-child relationships time points). To address limitations regarding varying sensitivity to change between the current instruments additional measures could be included in a replication. For example, in addition to observational measures of behavior, teachers could also report more globally on child problem behavior to map on more closely to the STRS. On the other hand, while no such measure yet exists, an observational measure of teacher-child relationships should be considered. Additionally, given the hypothesized stronger effects of negative interactions, the next study
should include a more sensitive measure of negative interactions in order to more fully understand the reciprocal associations between problem behavior, teacher-child relationships, and teacher-child interactions. Data collection could also be altered to capture moment to moment interactions rather than observation totals so that a more accurate proportion of interactions could be calculated. To address the limitations of power (e.g. weak or underpowered paths), future analyses could include post-hoc analyses of power to determine if missing paths were effected by power. A replication of this nature could aid in addressing a number of the limitations and contribute to a more comprehensive understanding of the associations between child problem behavior, relationships, and interactions with teachers. In addition to a replication at the preschool level, the same study conducted with elementary school students may provide insight in the power and development of the teacher-child relationships and interactions with problem behavior over the course of a school year. Collecting these data with the intention of addressing the limitations in this study for both replications could also provide a clearer picture of the effect an intervention, such as BEST in CLASS, can have child outcomes. Through these replications we could understand how interventions such as BEST in CLASS-PreK and the more recent BEST in CLASS-Elementary improve child outcomes through a focus on teacher-child interactions and relationships.

Due to unexpected findings regarding intervention participation in this study, it would be beneficial to meta-analyze intervention effects for any intervention targeting teacher-child relationships in whole or part. Identifying which interventions or aspects of interventions were both successful and unsuccessful in improving teacher-child relationships can influence future intervention work. Indeed, with replications and future work focusing on intervention effects, we could further consider implications for interventions based on findings. For example, there may
be specific paths (e.g., conflict to problem behavior) that could be worth targeting in as intervention mechanisms for improving child outcomes, or even individual variables (e.g., interactions) that may be used as a leverage point for improving either outcomes. Based on the results of this study, continued investigation of teacher-child relationships, interactions, and problem behavior is recommended in order to understand how if at all these factors are related and how researchers can use them to improve both teacher and student outcomes.

Overall, findings were not as expected, with there being far fewer paths in the business as usual group compared to the BEST in CLASS group. It is promising that while problem behavior at Time 1 did predict lower levels of closeness at in the business as usual group, problem behavior did not predict lower levels of closeness in the BEST in CLASS group. Participation in BEST in CLASS may have acted as a type of protective factor against the negative influence problem behavior is expected has on teacher-child closeness. Given that boys typically have higher instances of problem behavior and less closeness with teachers compared to boys, it is encouraging that some aspect of the BEST in CLASS intervention may have reduced or negated the effects of gender. The overall lack of consistency in the findings with the theoretical model and with the meta-analysis suggest that there is clearly a need for additional research in the area of teacher-child relationships and interactions for young students with or at-risk for emotional and behavioral disorders.
References


StataCorp, L. P. (2015). *STATA 12* [Computer software]. *College Station, TX: StataCorp LP*.


Appendix A

Publication Bias Test Figures

Closeness predicting problem behavior

*Figure 7.* Funnel plot examining distribution of individual study effect sizes (Fisher’s z) and standard errors for closeness predicting problem behavior.
Problem behavior predicting closeness

*Figure 10.* Funnel plot examining distribution of individual study effect sizes (Fisher’s z) and standard errors.
Conflict predicting problem behavior

Figure 13. Funnel plot examining distribution of individual study effect sizes (Fisher’s z) and standard errors.
Figure 14. Eggers test examining publication bias.
Figure 15. Funnel plot from Trim and Fill analysis.

Problem behavior predicting teacher-child conflict
Figure 16. Funnel plot examining distribution of individual study effect sizes (Fisher’s z) and standard errors.
Figure 17. Eggers test examining publication bias.

Figure 18. Funnel plot from Trim and Fill analysis.