



# Characterizing the Social Ecology of the Preschool Classroom and Exploring Its Relationship With Young Children's Long-Term Experience of Peer Rejection and Development of Social Competence

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**Characterizing the Social Ecology of the Preschool Classroom and Exploring its  
Relationship with Young Children's Long-term Experience of Peer Rejection and  
Development of Social Competence**

Monica Yudron

Stephanie M. Jones

John B. Willett

Hirokazu Yoshikawa

A Thesis Presented to the Faculty of the Graduate School of Education of Harvard  
University in Partial Fulfillment of the Requirements for the Degree of Doctor of  
Education

2015

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@ 2015

Monica Yudron

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## Dedication

I dedicate this thesis and all it represents to my husband and best friend Mauricio. Mauricio has never failed, even in his darkest, most uncertain moments, to support my passions and pursuits. He has hoisted me up when I have faltered and grounded me when I have drifted too far. Mauricio's kindness and patience are constant reminders that life is meant to be shared generously with others. He is the most perfect father to Sofia. From her first day in this world, he has shaped his life around being available for her care and protection. He tumbles and plays with, teases and shouts, comforts and cuddles Sofia. She is a strong, opinionated girl—not afraid to shout, “NO!” when needed—because of all the time she spends with Mauricio. Both Sofia and I are blessed to have Mauricio in our lives.

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**Characterizing the Social Ecology of the Preschool Classroom and Exploring its  
Relationship with Young Children’s Long-term Experience of Peer Rejection and  
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**Abstract**

The social ecology of a classroom—comprising settling-level features that emerge from the characteristics and interactions of the people in the classroom—shapes the opportunities a child has for forming relationships, as well as the way children experience these relationships (Bierman, 2004). In this dissertation, I examined how two aspects of the preschool classroom’s social ecology influenced children’s subsequent experience of peer rejection and subsequent development of social competence during elementary school. Unlike the majority of research published about social competence, peer rejection, or preschool classroom characteristics, in this dissertation I took a longitudinal approach and examined the independent and joint contributions of two aspects of the preschool classroom social ecology—the classroom composition of child externalizing behaviors and the quality of the emotional and relational climate of the classroom—to the subsequent development of my outcomes of interest. I found that, on average children’s trajectories of peer rejection did not demonstrate change over time (*estimated IRR* = 1.00,  $p = 0.76$ ). I also found that, on average, children’s social competence grew from age four to age five ( $\beta = 0.32$ ,  $p < 0.001$ ). In addition, the preschool classroom composition of externalizing behavior was related to the elevation of children’s subsequent developmental trajectories of social competence from age 4 to age 5 such that children in preschool classrooms with relatively lower proportions of children with externalizing behaviors displayed subsequent developmental trajectories of social competence with

higher elevations than did children in preschool classrooms with relatively higher proportions of children with these behaviors. This relationship, in turn, was moderated by the preschool classroom emotional quality such that children had subsequent trajectories of social competence that were higher in elevation when they had attended preschool classrooms with more positive emotional climate compared to children taught in preschool classrooms with less positive emotional climate, providing the level of the preschool classroom composition of externalizing behaviors was held constant. I discuss these findings and their implications in the following thesis.

# **Characterizing the Social Ecology of the Preschool Classroom and Exploring its Relationship with Young Children's Long-term Experience of Peer Rejection and Development of Social Competence**

## **Overview**

Ours is a social species. Starting at birth and continuing throughout our lives, the nature and quality of our relationships have powerful implications for our survival and well-being. In this dissertation, I focused on the earliest non-familial relationships of young children—those that form in preschool classrooms. The social ecology of preschool classrooms shapes the opportunities a child has for forming relationships, as well as the way children experience these relationships (Bierman, 2004). A preschool classroom's social ecology is initially defined by the behavioral norms, expectations, and routines established by the teachers in charge of the classroom (Farmer, Lines, & Hamm, 2011; Farmer, Reinke, & Brooks, 2014). As children engage with one another and physical aspects of the classroom, their characteristics as individuals and as a group, interact with these teacher-determined boundaries to define the social ecology further (Houts, Caspi, Pianta, Arseneault, & Moffitt, 2010). In this dissertation, I have examined how two aspects of the preschool classroom's social ecology, each measured at the beginning of the preschool year, influence children's subsequent long-term experience of peer rejection in elementary school and development of social competence. I introduce the salience of young children's relationships and the two aspects of the preschool classroom social ecology in the remainder of this overview.

The quality and nature of the relationships that children form with peers exerts a powerful, sustained impact on child development and learning. In preschool, children's

social competence has the power to enhance or inhibit their learning (Hamre, 2014). Social competence is a child's ability to form cooperative, positive relationships with their peers and preschool teachers (Hamre, 2014). Prior research has found that children with high ratings of social competence in preschool had higher academic performance in kindergarten and first grade compared to preschoolers who were less socially competent (Oades-Sese, Esquivel, Kaliski, & Maniatis, 2011). Recently, Jones and colleagues (2015) found that children who received high social competence ratings from their kindergarten teachers performed better on a range of health and employment outcomes 20 years later.

As children enter out-of-home care settings and engage in ever-widening social circles, their social competence develops rapidly (Fabes, Gaertner & Popp, 2006; Howes, 1987). This is hypothesized to occur because in the preschool period (3-5 years-of-age) a child's understanding of her peer group is emerging (Howes, 1987). Preschool-aged children have a nascent sense of group membership, and of their own status within the peer group, and are able to articulate preferences for social partners based on other children's behaviors (Howes, 1987).

Interestingly, it is in preschool that a child may both experience and be aware of her experience of peer rejection. Peer rejection is defined as isolation from one's peer group often due to intentional exclusion (Bukowski & Hoza, 1989). Peer rejection is seen widely as a stressor in the lives of children who experience it and is hypothesized to impede children's positive development (Dodge, et al., 2003; Parker & Asher, 1987). For example, children who were consistently rejected by their peers from age 6 to age 14, exhibited more risk-taking behaviors and higher levels of aggression in adolescence,

when compared to children who experienced no or sporadic peer rejection over the same period (Ettekal & Ladd, 2015). In fact, Bagwell and colleagues (1998) found that peer rejection had a more detrimental impact on later adjustment than did peer neglect or social withdrawal. Furthermore, children who experienced chronic (rather than no or sporadic) peer rejection fared the worst in measures of psychological adjustment to school (Buhs, Ladd, & Herald, 2006; DeRosier, Kupersmidt, & Patterson, 1994; Dodge, et al., 2003).

While some research indicates that social competence reduces a child's probability of experiencing peer rejection (Bierman, 2004) as well as buffering the negative impact of peer rejection (Sandstrom, Cillessen, & Eisenhower, 2003), in this dissertation, I did not seek to investigate social competence and peer rejection in conjunction with one another. Disentangling the complex relationship between these two important child outcomes was beyond the scope of this study, and must await future research. Nevertheless, in this dissertation, I did seek to advance our understanding of each of these two outcomes and investigate how children's experiences of peer rejection and development of social competence are related to their early classroom experiences in preschool.

Grounding in the theoretical work of Piaget and Vygotsky, developmental scientists have emphasized the importance of the social ecology of preschool classrooms to the development of a range of behavioral and academic outcomes (Rubin, Bukowski, & Laursen, 2009). Yet, while prior research motivates the importance of the development of social competence and experience of peer rejection, few studies have examined

whether aspects of the social ecology of children's preschool classrooms influence social competence or peer rejection.

Two aspects of the classroom social ecology have been investigated in depth. The first is the classroom-level composition of child characteristics such as age, socioeconomic status, language skills, and aggressive behaviors. Yudron, Jones, and Raver (2014) summarized recent research in which individual child outcomes were hypothesized to be influenced by classroom-level composition of child characteristics. They found that, while studies differed in how they operationalized the classroom-level composition of child characteristics, this aspect of the classroom's social ecology—particularly the classroom-level composition of child behaviors—shows a consistent relationship with individual child outcomes. As one example, children in classrooms in which the preschool classroom-level composition of externalizing behaviors was high, and in which there was wide distribution around the classroom mean, had lower ratings of social competence in kindergarten when compared to children who were in classrooms with the same average classroom-level composition of externalizing behaviors, but a narrower distribution around the classroom mean (Yudron, Jones, & Raver, 2014).

The second aspect of the preschool classroom social ecology that has been studied in depth is the quality of the classroom's emotional and relational climate. This has generally been measured using a classroom observation protocol that focuses on teacher-child or teacher-children interactions (Pianta & Hamre, 2009). A classroom's emotional and relational climate can be considered a representation of one way in which teachers shape the social ecology of the classroom. There is a large body of research that illustrates the benefits that accrue to children who attend classrooms with emotionally-



supportive climates. For example, children were more socially competent and had fewer behavior problems when in classrooms where the teacher-child relationships were rated as positive and characterized by sensitivity (Mashburn et al., 2008).

In this thesis, I extended this work by investigating whether, and, if so, how children's long-term experience of peer rejection (from age 4 to age 10) and development of social competence from preschool to kindergarten were influenced by the initial social ecology of their preschool classrooms. Unlike the majority of the current research on peer rejection, social competence, or preschool classroom characteristics, I took a longitudinal approach and examined the independent and joint contributions of two aspects of the initial preschool classroom social ecology—classroom composition of child externalizing behaviors and the quality of the emotional and relational climate of the classroom—on my outcomes of interest.

I have organized the remainder of this thesis in two essays. First, in Essay 1, I explore the relationship between the developmental trajectories of children's peer rejection from age 4 through age 10 and the externalizing behaviors of their preschool peers. I do this in two stages. In Stage 1, I explore the use of a composite built from responses to the Teacher Rating Form (TRF; Achenbach, 1991) to characterize the peer rejection experiences of children in the classroom. In Stage 2, using values of this latter composite as my outcome, I explore the development of peer rejection from age 4 (when most children are in preschool) to age 10 (when most children are in fifth grade), with a specific emphasis on the role that experiences with early peer groups play in shaping peer rejection. I hypothesized that children in preschool classrooms with initially high classroom-level of externalizing behaviors would experience higher rates of growth in

peer rejection over time compared to children in preschool classrooms with average or low-levels of externalizing behaviors.

In Essay 2, I investigate the relationship between the developmental trajectories of children's social competence in early childhood (from age 4 to age 5) and the externalizing behaviors of their preschool peers. As with Essay 1, I examine the degree to which growth in social competence is promoted or hindered by preschool classroom-level child characteristics. In Essay 2, I hypothesize that children in classrooms in which there are many children with high-levels of externalizing behaviors at the beginning of the preschool year (having received ratings higher than the sample 75<sup>th</sup> percentile) will have developmental trajectories of social competence that are lower in elevation and have slower rates of change than children in classrooms where few children have high-levels of externalizing behaviors. I hypothesize these associations because available evidence suggests that children are less likely to practice and refine social-competence skills with children who are aggressive or disruptive (Bierman, 2004).

Finally, in both essays, I explore whether and, if so, how the emotional and relational climate of the preschool classroom—the second aspect of the preschool classroom social ecology I discuss above—moderates the relationships I observed between classroom-level composition of child externalizing behaviors and my outcomes of interest. I end each essay with a discussion of the limitations of each study as well as an exploration of the implications of the findings.

## Essay 1:

### **Exploring the Measurement and Development of Peer Rejection in Early and Middle Childhood: Do Preschool Classroom Characteristics Matter?**

#### **Introduction**

Essay 1 examines two sets of research questions related to peer rejection. In the first set, I explore the use of teacher ratings as a measure of peer rejection among children in preschool. This was motivated by the challenges posed by implementing sociometric interviews (long-viewed as the gold standard in characterizing the social status of children) in longitudinal studies that follow children across classrooms and schools. I discuss the challenges of using such measures below. I also discuss the specific teacher-rating instrument, which I built from the *Teacher Report Form* (TRF; Achenbach, 1991) and employed in my study, as an alternative. In the first part of this essay, I describe the internal consistency (reliability) and concurrent validity of teacher-ratings of child peer rejection.

In the second set of research questions, I examine children's individual trajectories of peer rejection from age 4 through age 10. In this study, I explore the relationship between children's long-term experiences of peer rejection and the initial classroom-level child externalizing behaviors present in their preschool classrooms. Additionally, I explore whether, and if so how, teacher contributions to the classroom social ecology, specifically the quality of the emotional and relational climate, moderate this relationship.

## **Background and Context**

### **Defining Peer Rejection**

When young children form friendships and other positive relationships with their peers, they experience many opportunities for learning about themselves and others (Guay, Boivin, Hodgers, 1999; Hinde, 1987; Ladd, 2005). Peer rejection deprives children of these opportunities and occurs when a child is not accepted nor liked by the children with whom she shares a social context (Bukowski & Hoza, 1989). For example, a child may experience peer rejection when the children in her preschool classroom refuse to include her in play even when she attempts to join.

It is important to distinguish peer rejection from social withdrawal or peer neglect. Social withdrawal refers to an action on the part of a child to refrain from engaging actively with other children and may be a coping strategy of socially wary children (Bukowski, Buhmester, & Underwood, 2011). A child experiences peer neglect when other children in the social context do not restrict her entry into play or social exchanges actively but do not invite it either (Bierman, 2004). Importantly, in prior research, children who experienced peer rejection exhibited more externalizing behaviors and other adjustment difficulties compared to neglected children (Coie, Dodge, & Kupersmidt, 1990). Additionally, some evidence suggests that children's experiences of peer neglect may differ across social contexts whereas children whose peers in one context rejected them were often also rejected by peers in a new social group (Coie & Kupersmidt, 1983).

### **Short- and Long-term Implications of Peer Rejection**

Theorists describe the experience of peer rejection as a major stressor that interferes with a child's typical development and learning (Ladd, Herald, & Kochel, 2006; Sandstrom, Cillessen, & Eisenhower, 2003). In fact, Parker and Asher (1987) hypothesize that peer rejection interferes actively with the development of positive adjustment among young children. Furthermore, many researchers suggest that the longer a child experiences peer rejection, the higher the probability s/he will exhibit problem behaviors or struggle with the social, emotional and academic tasks of school (Lin & Ensel, 1989).

The deleterious impacts of peer rejection have been documented in a large body of research, accumulated since the 1970s. For instance, Kupersmidt and Coie (1990) found that children who were aggressive and rejected by their peers in fifth grade (when the children were between 10 and 11 years old) had a substantially higher risk for high-school dropout compared to children who were neither aggressive nor rejected. Children who were rejected by their peers in kindergarten had declining classroom participation from kindergarten through fifth grade and avoided school more than children who were accepted by their peers (Buhs, Ladd, & Herald, 2006). Furthermore, children who were rejected by their peers experienced psychiatric problems in adolescence (Lansford & Chall, 2007; Parker & Asher, 1987). And whereas peer acceptance promotes learning and adjustment, children who are rejected by their peers had higher externalizing and internalizing behaviors compared to accepted children (Guay, Boivin, Hodgers, 1999). Importantly, children who experienced sustained peer rejection were at greater risk for a variety of these negative outcomes compared to children who experienced sporadic or no

peer rejection (Ladd & Troop-Gordon, 2003). Therefore, I argue that it is important to understand what early experiences distinguish children who are rejected chronically by their peers from age 4 to age 10 from those who are not.

### **Correlates of Peer Rejection in Preschool**

While children who are rejected by their peers do not always lack social competence, some literature suggests that there is a moderate, negative correlation between prosocial skills and peer rejection (Hay, Payne, & Chadwick, 2004; Vitaro, Gagnon, & Tremblay, 1990). Many studies have shown that rejected children, on average, have more externalizing behavior problems and are both physically and relationally aggressive (Crick, Casas, & Mosher, 1997). Additionally, children who struggle with emotional and cognitive regulation have a higher probability of being rejected by their peers (McDowell, O'Neil, & Parke, 2000).

### **How Do Children Experience Peer Rejection Over Time?**

In 1983, Kupersmidt and Coie reported on a study in which they placed children who experienced peer rejection in fourth grade into summer camps with a new group of peers. They found that roughly 50% of the children who had been rejected by their peers in fourth grade were also rejected by their new peers. For some researchers, this seemed to be evidence that peer rejection was fairly stable over time or at a minimum, over time. That is, children experienced the same level of peer rejection even when their social context shifted, because rejected children had social skill deficits.

More recently, evidence has emerged that some children's experiences of peer rejection do change over time. For example, in a sample of children followed from age 6 to age 11, Ettekal and Ladd (2015) found that children's experiences of peer rejection

over time fell into one of three classes. In the largest group, 47.5% of the children experienced consistently low levels of peer rejection over the study period. In the smallest group, 18.3% of the children experienced high and increasing peer rejection over time. The remainder of the children experienced moderate and constant levels of peer rejection over time. Similarly, Ladd, Herald-Brown and Reiser (2008) defined five peer-rejection categories in a sample of kindergarten students who were followed through age 12 (when most of them would have been in sixth grade). They found that children who experienced sustained rejection during this period had poorer academic achievement at age 12 compared to children did not have sustained rejection. Additionally, Lynne-Landsman, Bradshaw, and Jalongo (2010) found that peer rejection in early childhood set off a cascade of other problematic peer-relationship issues, such as associating with deviant peers. Importantly, in none of these studies did the researchers investigate whether and how classroom characteristics may have contributed to the different peer rejection paths that children followed during the study period.

### **Preschool Classroom Characteristics Matter for Children's Experiences of Peer Rejection**

To date, the strongest predictor of peer rejection in early and middle childhood is the presentation of externalizing or aggressive problem behaviors before, and at entry into, the peer group (Boivin, et al., 2013). Prior research suggests that classroom-level peer characteristics—that is, peer characteristics operationalized at the level of the classroom—represent, and generate classroom norms for individual children's behavior and achievement (Henry & Rickman, 2007). A growing body of evidence links negative classroom-level peer climate, including peer aggression, to subsequent short- and mid-

range maladaptive child outcomes (Kellam, et al., 1998; Molano, Jones, Brown, & Aber, 2013; Thomas, Bierman & Powers, 2011). In particular, aggregate levels of peer aggressive or externalizing behaviors appear to be especially salient for young children's subsequent outcomes. In this context, externalizing behaviors are defined as disruptive or aggressive actions toward social partners (Campbell, Shaw, & Gilliom, 2000). Thus, children in preschool classrooms with high aggregate levels of peer externalizing behavior have been found to have greater difficulties in school adjustment subsequently, compared to children in classrooms with low levels of, or no, peer externalizing behavior (Aber, Jones, Brown, Chaundry, & Samples, 1998; Hoglund & Leadbeater, 2004; Kellam et al., 1998).

And while children in classrooms with high aggregate levels of aggression fare worse on subsequent measures of attention, internalizing behaviors, and academic achievement than children in classrooms with low levels or no aggression (see Yudron, Jones, & Raver, 2014 for a review of these studies), less attention has been paid to the degree to which classroom characteristics may influence peer rejection. Dodge and Frame (1982) posit that children in classrooms with high aggregate levels of externalizing or aggressive behaviors experience a classroom social context in which both the teacher and the children have different norms for social problem-solving. Indeed, children tend to form relationships with other children who use similar social problem-solving strategies (Snyder, Horsch, & Childs, 2005; van den Oord, Risponds, Goudema, & Vermande, 2000). This suggests that children who are outliers in their classrooms, either due to their own unusually high or low externalizing or internalizing behaviors, may be more likely to be rejected by their peers.



The preschool-classroom social context is shaped by the teachers who are present. In fact, a key indicator of preschool classroom quality has been found to be the degree to which teachers establish and maintain warm, predictable, and responsive relationships with, and between, children (Hamre & Pianta, 2007; Yoshikawa, et al., 2013). The powerful role of such relationships has been illustrated in research documenting that children had better short- and long-term academic and behavioral outcomes through age 15 after having attended preschool classrooms in which their teachers established a climate of responsive and warm relationships (Vandell, Belsky, Burchinal, Steinberg, & Vandergrift, 2010). Classrooms with these relational climates are hypothesized to encourage constructive peer interactions that then allow children to learn and practice social-competence skills subsequently (Hamre, 2014). Yet, teachers in classrooms with high aggregate problem behaviors may find it difficult to form and maintain high quality relationships with children. On the other hand, skilled teachers may take advantage of the opportunities to teach social problem-solving skills explicitly when faced with a large concentration of externalizing behaviors in one classroom grouping of children.

### **The Measurement of Peer Rejection**

Since the 1970s, studies of child and adolescent peer status, including peer rejection, have used sociometric interviews as the central approach to measurement (Asher, Singleton, Tinsley, & Hymel, 1979). In a typical sociometric interview with young children, children are shown a roster of their classmates that includes photographs of each child in the classroom. Then, one-by one, the interviewer will ask each child in the classroom to nominate children s/he likes most, likes least, and children with whom s/he prefers to play. Some interview protocols limit the number of nominations each child

can make—often to 3 or 4. Peer rejection status is given to children who have the least number of “likes most” nominations and the most “likes least” nominations (Bierman, 2004; Coie & Dodge, 1983).

Sociometric instruments have been modified over time, and the technology used to analyze the data they yield has evolved, but the sociometric approach retains four characteristics that pose challenges for its administration. First, sociometric instruments ask children about their own and/or others social experiences, but children’s reports about social experiences are known to be fairly unstable from one interview administration to the next. Second, compared to other methods, sociometric measurements are inordinately sensitive to the presence of missing data. That is, in order to characterize a child’s peer status relative to her classmates, a majority of the children in a classroom must be interviewed and have responded. And this leads to the third concern among researchers, parental consent. Despite evidence to the contrary, some worry that children will be affected adversely by answering questions about their own and others’ social experiences. In light of these concerns, some school leaders, teachers, and parents may not be eager to offer access nor consent to the children under their care (McKown, Gumbiner, & Johnson, 2009; Shin, Kim, Goetz, & Vaughn, 2014). Finally, given the concerns above, the use of sociometric instruments in longitudinal studies that follow a cohort of children across classrooms and schools may be costly in terms of financial and human resources, and yet not provide data of sufficient quality to measure or model change over time.

### **The Teacher Rating Form: Design and Use**

Rather than rely on the responses of many peers in the same room to estimate each child’s level of peer rejection, the *Teacher Rating Form* (TRF; Achenbach, 1991)

asks teachers to consider each child in his or her classroom and respond to 118 items regarding the child's behavior and academic performance. These questions prompt teachers to rate how true it is that children behaved in a range of ways in the two months preceding the survey administration. The TRF was designed to capture children's overall adaptive functioning, and their behavioral/emotional problems as viewed from the perspective of the teacher who can (for better or worse) report on each child in relationship to all children with whom the teacher has had experience working (Achenbach, 1991).

The TRF is most commonly used to indicate the degree to which a child is exhibiting internalizing or externalizing behaviors, and has been used in a number of nationally representative studies for this purpose (e.g., Raver, Jones, Li-Grining, Metzger, Smallwood, & Sardin, 2008). However, in this essay, I employed teachers' responses to four items from the TRF to specifically measure children's experiences of peer rejection.

I list these four items in Table 1, and provide summary statistics for each, estimated using the dataset which is the focus of analyses presented below. In the first item, the teacher is asked: how true it is that the child doesn't get along with others. This item requires the teacher to consider the success (or lack thereof) of social interactions that the child being rated has with his or her peers. Similarly, the second item asks: how true it is that the child gets in many fights. Taken together, the first two questions prompt teachers to think about whether the child's exchanges with peers are fraught with conflict or not without consideration of who might be the initial instigator of the conflict. Alone, these items do not necessarily indicate a child who experiences peer rejection because the child could be the aggressor in each case. However, the third question seeks to clarify the

child's social position within the classroom. The third question asks: how true it is that the child gets teased a lot. Children who are teased, have a higher probability of being recipients, rather than instigators, of negative social interactions. The fourth, and final, question asks: how true it is that the child is not liked by others. This item further clarifies the child's social position in the classroom. It is part of most sociometric interview protocols. While there is some evidence to suggest that aggressive children may also be accepted by their peers and be rated as socially competent, children who are rated as being in fights and as having other negative social interactions by their teacher and, at the same time, are rated as not liked, may have a higher probability of experiencing peer rejection than children who are liked, or well-liked, by their peers.

Taken together, these items provide a window into the child's social position in the classroom. The specific combination of these items helps rule-out the likelihood that children rated as high on these four items are actually socially neglected (and unlikely to be actively disliked or treated poorly) or socially withdrawn (and unlikely to be drawn into fights) (Bierman, 2004).

### **Conclusion: Specific Research Questions**

To date, there has been little to no research in which differences in developmental trajectories of peer rejection among children have been examined in relation to variation in classroom-level peer externalizing behaviors. In this study, I address this omission in two steps. First, I explore the use of teacher ratings of peer rejection as an alternative measure for this key aspect of children's classroom experience. Second, I examine the relationship between the level of and the rate of change in children's developmental trajectories of peer rejection (measured through teacher report, rather than

sociometrically by peers) from early through middle childhood and their early exposure to classroom-level peer externalizing behaviors in preschool. Based on the literature synthesized above, I hypothesize that children who experienced preschool classrooms in which a high classroom-level of peer externalizing behaviors was evident will exhibit subsequent developmental trajectories of peer rejection that have higher elevations and grow more rapidly than do those of children in preschool classrooms with a low level of aggregate peer externalizing behaviors.

In addition, given that the peer externalizing behaviors of interest are experienced in the broader classroom context, I will also examine whether the relational quality of the preschool classrooms, operationalized as the degree to which the preschool teachers form emotionally supportive, responsive relationships with children, moderates this hypothesized relationship. I hypothesize that, for example, two children who experienced preschool classrooms with equal levels of aggregate peer externalizing behaviors, the child in the preschool classroom with higher relational quality will experience a subsequent developmental trajectory of peer rejection that is both lower in elevation and growth rate compared to the child in the preschool classroom with lower relational quality. In the remainder of this essay, I investigate the following research questions:

1. In the absence of sociometric data on child relationships, can teacher ratings of child behaviors on the TRF be used to measure peer rejection adequately?
  - a. *Reliability*: What is the internal consistency reliability of responses to the four items from the TRF intended to measure child peer rejection?

- b. Construct Validity: Do teacher ratings of children's peer rejection have a positive, statistically significant correlation with children's concurrently measured aggressive behaviors?
2. What is the relationship between the developmental trajectories of children's peer rejection from age 4 through age 10 and the externalizing behaviors of their preschool peers?
- a. What developmental trajectory does a child's peer rejection follow from age 4 through age 10? In particular, does a linear trajectory provide an adequate summary of change over time, and if so what are the average elevations and rates of change of such trajectories?
  - b. Do children who, at age 4, attended preschool classrooms characterized by initial high classroom-levels of peer externalizing behaviors display trajectories of peer rejection (from age 4 to age 10) with higher elevations and rates of change than children who attended preschool classrooms with initial low classroom-level of peer externalizing behaviors?
  - c. Does the relational climate of the preschool classroom moderate the relationship between the initial classroom-level peer externalizing behaviors in preschool and child trajectories of peer rejection from age 4 through age 10?

## **Research Design**

### **Data Set**

I addressed my research questions using data drawn from the *Chicago School Readiness Project* (CSRP; for a detailed description of the study design, the intervention, and a summary of its impacts on children's developmental outcomes see Raver, Jones,

Li-Grining, Metzger, Smallwood, & Sardin, 2008; Raver et al., 2009, 2011; Zhai, Raver, & Li-Grining, 2012). The CSRP was a preschool intervention and evaluation study that sought to improve behavioral and school readiness outcomes in a population of Head-Start students in some of Chicago's lowest resourced Head-Start centers. In intervention classrooms, CSRP provided intensive professional development in classroom-behavior management and the weekly support of a trained mental-health specialist to teachers. Control classrooms received neither training nor supports. Importantly, in the current study, I only analyzed data from the control classrooms. This allowed me to isolate how the development of children's peer rejection depended upon preschool classroom characteristics (peer externalizing behaviors and classroom relational quality) without having to account for the impact of the intervention on this outcome.

The CSRP data are ideal for the current study for three reasons. First, teachers provided ratings of children's peer rejection at four different time points over a 7-year time frame (at the end of preschool, and in January of kindergarten, third grade, and fifth grade). Thus, I was able to apply multilevel modeling of change (Singer & Willett, 2003) to estimate children's developmental trajectories of peer rejection over time. Second, data on peer externalizing behaviors were gathered at baseline, for almost all of the children in each preschool classroom—an average of 90% of the children in each preschool classroom. Third, teacher relational quality was observed and rated in all classrooms at baseline. Thus, unlike other studies in which aggregate classroom-level peer characteristics were operationalized using data on only a small proportion of children within each classrooms (Justice et al., 2011; Mashburn, et al., 2008), I was able to

mobilize nearly complete classroom information to summarize the classroom composition of peer externalizing behavior at the beginning of the preschool year.

### **Sample**

My analytic sample contained the 277 children who participated originally in any of the 17 CSRP control classrooms. These children were present in the first Head-Start (i.e., preschool) wave of data collection and in all subsequent follow-up waves in kindergarten, third and fifth grade. Given the analyses described below, using the *Optimal Design* software (Raudenbush, et al., 2011), I determined that I had sufficient statistical power (0.80) to detect moderate effect sizes of about a quarter of a standard deviation, at usual levels of Type I error ( $\alpha=0.05$ ).

### **Procedures**

The CSRP provides a rich dataset in which children are followed throughout their early schooling. Parents and teachers were surveyed at the beginning and end of preschool, and January of the kindergarten, grade 3, and grade 5 school years. At some but not all time points, children were also assessed using a small battery of direct-child assessments of language and literacy, social emotional, and executive functioning skills. Furthermore, during the preschool year, classrooms were observed by external raters and assessed using the *Classroom Assessment Scoring System* (CLASS). Peer rejection ratings on the children were gathered in May of the preschool year, and in January of kindergarten, third grade, and fifth grade from classroom teachers familiar with each child. I used parent-ratings of child externalizing behavior obtained in September of the preschool year. Child and teacher demographic information was gathered in September of the preschool year.



## Measures for Addressing Research Question 1

**Peer Rejection.** I built a measure of peer-rejection by compositing teachers' responses to four items from the TRF. As described earlier, the four items asked if the child: doesn't get along with others, gets in many fights, gets teased a lot, and is not liked by others. Children received a 2 on any item if the teacher felt that item was very true, a 1 if the teacher felt the statement was true, and a 0 if the teacher felt the statement was not true. In keeping with how other composites are generated from TRF data (Achenbach, 1990), I summed teacher responses to the four items selected to represent peer rejection. In Table 1, I present summary statistics for these four items relevant to this question. Note that the items have fairly similar means (average of values) and standard deviations (range of values).

**Behavioral Correlates.** In this study, to examine the construct validity of the new composite measure, I examined the relationship between the new measure of peer rejection and seven other scales of behavioral adjustment measured concurrently. Four of these scales were derived from teacher-ratings on the *Behavior Problems Index* (BPI; Zill & Peterson, 1990). The BPI was developed originally to gauge parent perceptions of problem behaviors in their children. It was modified for use in the CSRP by making minimal changes to stem language, so that items would be appropriate for both parents and teachers. The four BPI subscales that contributed scores in this study were the internalizing, externalizing, antisocial, and peer conflict/social withdrawal subscales. In prior studies, children who experienced peer rejection, on average, received higher ratings of internalizing and externalizing problem behaviors (Boivin, et al., 2013). While I hypothesize that peer rejection as measured by the new TRF-generated composite will

have a positive, statistically significant correlations with all four of these scales, extant research suggests that the bivariate correlations between peer rejection and antisocial and peer conflict/social withdrawal may be smaller in magnitude than the correlations with the externalizing and internalizing scales. Support for this comes from Bierman (2004) and others (Bukowski and Hoza (1989), and Guay, Boivin, and Hodgers (1999)) who suggest that children who are rejected may attempt to engage their peers but are actively turned away.

The other three indicators that I used to confirm the construct validity of the new teacher-rated composite measure of peer rejection were derived from the ratings of external classroom observers on the *Penn Interactive Peer Play Scale* (PIPPS; developed by Fantuzzo et al., 1995; adapted by Milfort & Greenfield, 2002). Whereas this scale was designed originally for use by teachers, it was modified to be administered by an external observer in the CSRP. External raters observed classrooms for four 20-min blocks during the course of the school day to rate the play behaviors of a subset of 89 children using a 30-item rating scale. Each question asked the rater to record a 1 if the behavior in question was observed and a 0 if the behavior was not observed during the 20-minute block.

Prior reliability and validity studies of the teacher-version of PIPPS support the formation of three constructs from the 30-items (Fantuzzo, et al., 1998). The three composites are: play interaction ( $\alpha = 0.71$ ) which includes items that target helpful behaviors that lead to successful peer play; play disruption ( $\alpha = 0.71$ ) including items such as the child argues, calls others names, and takes toys from peers; and play

disconnection ( $\alpha = 0.64$ ) including items meant to gauge behaviors that impede active engagement in play (Mendez, Fantuzzo, & Cicchetti, 2002).

I investigate the bivariate correlation between peer rejection as measured by the TRF-generated teacher-ratings and each of the three PIPPS scales. A child who is rejected by his or her peers is not actively engaging in play and should not receive a high rating of play interaction (Parker & Asher, 1987). Therefore, I hypothesize that there will be a negative, statistically significant bivariate correlation between the teacher-generated measure of peer rejection and the play interaction scale of the PIPPS. Because play disruption focuses on aggressive behaviors, I hypothesize that there will be a positive, statistically significant relationship between this scale and peer rejection. I further hypothesize that there will be a positive, statistically significant bivariate correlation between my new peer rejection measure and the PIPPS play disconnection scale.

### **Data Analysis for Research Question 1**

*Research Question 1.a: Reliability: What is the internal consistency reliability of responses to the four items from the TRF intended to measure the child's peer rejection?*

I addressed my first research question by investigating both the internal consistency (reliability) of the new composite measure of peer rejection and its construct validity. To examine the internal consistency, I generated statistics summarizing teacher responses to each of the items included in the final composite. Specifically, I estimated the items' sample means and standard deviations, and the bivariate correlations among them. Then, I conducted a principal-components analysis to determine whether responses to this combination of items could be readily combined into a single unidimensional

composite, or whether more than one dimension of information exists in the data. For this four-item composite, I then estimated Cronbach's alpha reliability.

*Research Question 1.b: Construct Validity: Do teacher ratings of a child's peer rejection have a positive, statistically significant correlation with a child's concurrently measured behavioral adjustment?*

To assess the construct validity of the new composite, I examined bivariate correlations between scores on the final composite and ratings on seven key scales (described above) shown in other studies to have concurrent correlations with measures of peer rejection.

## **Measures for Research Question 2**

To address my second research question, I set up my analytic dataset in a person-period format, meaning that each child contributed up to four rows of data—one row per wave of data that he or she contributed to the study in preschool, kindergarten, third grade, and fifth grade. This format allowed me to capture the time-varying nature of peer rejection, for each child, between the end of preschool (age 4) and fifth grade (age 10) and is the appropriate format for fitting multilevel models for change (Singer & Willett, 2003).

Below, I describe briefly each of the measures whose values are recorded in this dataset, organized in the following categories: outcomes, question predictors, moderator, and covariates.

### ***Outcome.***

- *PEER\_REJECTION* is a time-varying, child-level, ordinal outcome variable, with values entered into each of the four rows in the person-period dataset, for each

child on each occasion, when available. At each wave (May of the preschool year, and January of the kindergarten, third and fifth grade years) children's peer rejection was measured using teachers' responses to a subset of questions from the *Teacher Report Form* (TRF; Achenbach, 1991). I computed the values of the overall peer rejection construct by summing teacher ratings across the 4 items within each child to provide an ordinal variable with a possible range of 0-8. As I noted above, this strategy has been used in other studies using TRF-based composites to represent externalizing and internalizing behaviors (for an example of such a study, see: Raver, et al., 2009).

***Question Predictors.*** I examined the relationship between children's developmental trajectories of peer rejection and two question predictors, as follows:

- *TIME*, is a time-varying variable that counts the number of months that elapsed since September in the fall of the preschool year and the collection of each subsequent wave of data. Thus, by its coding, it accounts for the different spacing of assessments, by wave, across children. The beginning of the study is indicated by a value of 0.
- *EXTERNALIZING\_PROP75* is a time-invariant measure of preschool classroom-level externalizing behaviors and was constructed in the following manner. In September of the preschool year, parents used the *Behavior Problems Index* (BPI; Zill, 1990) externalizing problem-behaviors scale (Cronbach's alpha reliability = 0.92) to report on individual child behaviors. The 18 items in this subscale each seek responses on a 3-point scale (0 = not true, 2 = very/often true). Sample items address how true it is that the child is

high strung, cheats or lies, or argues. Importantly, by using a parent-rating of these behaviors before the children's behaviors were able to be influenced by peers, I can characterize the children's contribution to the social ecology of the classroom absent teacher influences. Because this instrument is meant to capture the number as well as the severity of externalizing behaviors observed by the reporter, I summed ratings on the individual items to create a subscale score with a potential sample range of 0-36 ( $M = 5.77$ ,  $SD = 4.79$ ). Then, I created a classroom-level composite which recorded the proportion of students in each classroom whose parent-rating of externalizing behavior was equal to, or above, the sample 75<sup>th</sup> percentile ( $M = 0.39$ ,  $SD = 0.14$ ).

I operationalized the preschool classroom-level of peer externalizing behaviors in this way because it described the number of children with high levels of externalizing behaviors in the room. I regard it as a better index of exposure than the classroom mean-level of externalizing behaviors (which is typically employed, e.g., Thomas, Bierman, & Powers, 2011) because the latter statistic is more sensitive to the presence of a small number of individuals with extreme values. If a child is in a classroom with a high proportion of peers with high levels of externalizing behaviors, the probability they will interact with such a peer is higher. The mean is less sensitive in this regard because two classrooms may have the same mean level of peer externalizing behavior but contain different proportions of children whose individual ratings are high.

Therefore, *EXTERNALIZING\_PROP75* represents the baseline externalizing behaviors present in the classroom, in the aggregate, at the beginning of the preschool year before children were immersed in the social context of the classroom. In Figure 1, I

present the proportion of students whose parental ratings of externalizing behaviors were above the sample 75<sup>th</sup> percentile in each of the 17 study classrooms, at the beginning of preschool. I have plotted the proportion of students (vertical axis) versus the classroom ID (horizontal axis). Notice that, in the classroom with the lowest classroom-level of externalizing behaviors, only 13% of parents rated their children as having externalizing behaviors at or above the sample 75<sup>th</sup> percentile. This is in contrast to the classroom with the highest classroom-level of externalizing behaviors in which 64% of children were rated by their parents as having externalizing behaviors at or above the sample mean.

***Moderator.***

- *POSITIVE* is a time-invariant classroom-level measure that was gathered in each classroom in September of the preschool year, via a rating process conducted by an external observer using the *Classroom-Assessment Scoring System* (CLASS; Pianta & Hamre, 2009). This measure was designed to describe the quality of the preschool classroom on several dimensions, by rating child-teacher interactions. *POSITIVE* indicates the quality of teacher responsiveness to children's needs and the extent to which teachers provided a secure base within the classroom. I constructed *POSITIVE* ( $\alpha = 0.77$ ) by averaging the raters' responses to four items from the CLASS observation protocol that reflect a teacher's awareness of children, responsiveness to children, ability to comfort children, and manner of addressing problems (Pianta & Hamre, 2009). This choice is consistent with how the instrument designers and researchers using the CSRP CLASS data have constructed this composite, in other studies (Raver, et al., 2008). Each item has a range of 1-7

with 7 indicating the highest rating possible. The final composite therefore had a possible range of 1-7 ( $M = 5.06$ ,  $SD = 1.04$ ).

**Covariates.** In selected statistical models, I also included a short-set of critical child and teacher covariates, in order to increase the precision of my estimation and the statistical power of my analyses. These covariates included: dichotomous indicators of individual children's sex and race/ethnicity, a dummy variable to indicate whether each teacher has a BA/BS degree, class size and an indicator of the economic risk a child's family faced. In Table 1, I present summary statistics for all the covariates I examined in this study. In the equations presented below, I represent this vector of covariates with this symbol:  $Z$ .

### **Data Analysis for Research Question 2**

In order to address the parts of my second research question and account for the longitudinal nature of my data, I fit 2-level multilevel models for change in which time was nested within children. I fit these models in a person-period data set in which each child contributes a row for each time that s/he on his or her peer rejection. Therefore, all children in the dataset have between one to four rows of data each. This design allowed me to account for the lack of independence of the child-level responses across measurement instances within children (Singer & Willett, 2003). Please note that in my analyses I do not account explicitly for the nesting of children in their preschool classrooms because—during the Kindergarten, third grade, and fifth grade portion of the study period—children were no longer nested in their original preschool classrooms, but were dispersed widely throughout the elementary education system.



Additionally, please note that the peer rejection composite is an ordinal variable best thought of as a count (each child receives a value of 1 or 2 if the behavior was present, the difference between the 1 and 2 rating may be thought of as either the intensity of the observed behavior or the frequency with which the teacher observed the behavior in the 2 months prior to the question). Also, child values of this peer rejection composite cluster at zero at each wave of data collection. I checked these data for evidence of over dispersion<sup>1</sup> and did find that, on average at each wave, the variance is double that of the mean. Negative binomial models are often used in skewed data with over dispersion. Yet, as I considered whether to use a multilevel negative binomial model rather than a multilevel mixed-Poisson model, I heeded the warnings of Rabe-Hesketh and Skrondal (2012) and opted for a model in which the population estimates would be easier to interpret. Therefore, I chose to fit multilevel, mixed-Poisson models using the `xtmepoisson` command in STATA 14.0 software (Stata Corporation, College Station, TX, USA). This procedure is sufficiently robust to help me address each of the remaining research questions in Essay 1. A random-effects multilevel Poisson model will allow the intercepts to vary across individuals and may address the evidence of potential over dispersion (Rabe-Hesketh & Skrondal, 2012).

Also, I use the `xtmepoisson` command so that I may fit random intercepts, random slopes models. This allows the estimation of individual trajectories of peer rejection over time that can vary in elevation and rate of change (Rabe-Hesketh & Skrondal, 2012).

*Research Question 2.a: What developmental trajectory does a child's peer rejection follow from age 4 through age 10? In particular, does a linear trajectory provide an*

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<sup>1</sup> Over dispersion occurs when the variance is much larger than expected compared to the mean

*adequate summary of the development over time, and if so what are the typical elevations and rates of change of such trajectories?*

I fit the following model, representing growth of peer rejection as a function of time, for child  $i$  at time  $j$ :

*Level 1 Model:*

$$PEER\_REJECTION_{ij} = \exp(\pi_{0i} + \pi_{1i}TIME_{ij} + \varepsilon_{ij})$$

*Level 2 Model:*

$$\pi_{0i} = \gamma_{00} + \zeta_{0i}$$

$$\pi_{1i} = \gamma_{10} + \zeta_{1i}$$

In the hypothesized composite model, individual growth parameter  $\pi_{0i}$  represents the  $i$ th child's initial true level (intercept) of peer rejection, and  $\pi_{1i}$  represents the linear rate of true change (slope) in the child's trajectory. The level-2 parameter  $\gamma_{00}$  represents the population average of the level-1 intercepts and the level-2 parameter  $\gamma_{10}$  represents the population average of the level-1 slopes. I hypothesized that—overall—estimates of population averages  $\gamma_{00}$  and  $\gamma_{10}$  would be positive and statistically significant, indicating that children's experience of peer rejection was non-zero at age 4 (the beginning of the study) and increased over time.

Because the peer rejection of children was measured a maximum of four times in the study period, I am able to compare the fit of a linear growth model to that of a model in which time has a quadratic specification (allowing the trajectories to have curvature). I can determine whether the linear specification of time adequately explains within-person variation over time by comparing the fit statistics of both models.

Become some theorists propose that children experience the same level of peer rejection over time, I can also compare the level-1 residual variance,  $\sigma_{\varepsilon}^2$ , from the unconditional growth model shown above to the level-1 residual variance of the unconditional means model. The unconditional means model examines the manner in which the total variation in the outcome, peer rejection, was partitioned within each person and across people without the consideration of the role of time. Therefore, the degree to which the inclusion of time reduces the level-1 residual variance (which represents the portion of the outcome that exists within each individual) is an indication of the degree to which linear time explains within person variation in peer rejection. Therefore, I address my first research question by also examining the reduction of the level-1 residual variation from the unconditional means to the unconditional growth models and then by examining  $\gamma_{00}$  and  $\gamma_{10}$ .

*Research Question 2.b: Do children who, at age 4, attended preschool classrooms characterized by high initial levels of classroom-level peer externalizing behaviors display trajectories of peer rejection (from age 4 to age 10) with lower elevations and rates of change than children who attended preschool classrooms with low initial levels of classroom-level peer externalizing behaviors?*

I addressed this research question by extending the multilevel model fitted above to include a time-invariant indicator of preschool peer externalizing behaviors at level-2.

*Level 1 Model:*

$$PEER\_REJECTION_{ij} = \exp(\pi_{0i} + \pi_{1i}TIME_{ij} + \varepsilon_{ij})$$

*Level 2 Model:*

$$\pi_{0i} = \gamma_{00} + \gamma_{01}EXTERNALIZING\_PROP75_{ij} + \gamma_{02}\mathbf{Z}_{ij} + \zeta_{0i}$$

$$\pi_{1i} = \gamma_{10} + \gamma_{11}EXTERNALIZING\_PROP75_{ij} + \gamma_{12}\mathbf{Z}_{ij} + \zeta_{1i}$$

I addressed my second research question by estimating level-2 parameters  $\gamma_{01}$  and  $\gamma_{11}$ . A statistically significant and negative estimate for  $\gamma_{01}$  will indicate that children who had experienced higher classroom-levels of peer externalizing behaviors in preschool also displayed developmental trajectories of peer rejection with lower elevation, on average. A statistically significant and negative estimate for  $\gamma_{11}$  will indicate that children who experienced classrooms with higher classroom-levels of peer externalizing behaviors had lower rates of growth in the developmental trajectories of peer rejection, on average.

*Research Question 2.c: Does the relational climate of the preschool classroom moderate the relationship between the initial classroom-level peer externalizing behaviors in preschool and child trajectories of peer rejection from age 4 through age 10?*

*Level 1 Model:*

$$PEER\_REJECTION_{ij} = \exp(\pi_{0i} + \pi_{1i}TIME_{ij} + \varepsilon_{ij})$$

*Level 2 Model:*

$$\begin{aligned} \pi_{0i} = & \gamma_{00} + \gamma_{01}EXTERNALIZING\_PROP75_{ij} + \gamma_{02}POSITIVE_{ij} \\ & + \gamma_{03}EXTERNALIZING\_PROP75 \times POSITIVE_{ij} + \gamma_{04}Z_{ij} \\ & + \zeta_{0i} \end{aligned}$$

$$\begin{aligned} \pi_{1i} = & \gamma_{10} + \gamma_{11}EXTERNALIZING\_PROP75_{ij} + \gamma_{12}POSITIVE_{ij} \\ & + \gamma_{13}EXTERNALIZING\_PROP75 \times POSITIVE_{ij} + \gamma_{14}Z_{ij} \\ & + \zeta_{1i} \end{aligned}$$

While not of primary interest, statistically significant, positive estimates of population parameters  $\gamma_{02}$  and  $\gamma_{12}$  would indicate main effects of preschool classroom relational quality on developmental trajectories of peer rejection for children in classrooms in which none of the children were reported by their parents as having

externalizing behaviors above the sample 75<sup>th</sup> percentile. This would indicate that, on average, the growth trajectories of peer rejection would have a higher elevation (indicated by a positive, statistically significant estimate of  $\gamma_{02}$ ) and more rapid growth (indicated by a positive, statistically significant estimate of  $\gamma_{12}$ ) in classrooms with higher ratings of relational quality, independent of the classroom-level of externalizing behaviors.

Instead, my third research question is addressed by estimating parameters  $\gamma_{03}$  and  $\gamma_{13}$ . Parameter  $\gamma_{03}$  describes the difference in elevation in the developmental trajectory of peer rejection due to the two-way interaction of classroom-level peer externalizing behaviors and classroom relational quality. A statistically significant estimate for  $\gamma_{03}$  will indicate that, classroom-level peer externalizing behaviors has a differential relationship with the elevation of children's developmental trajectories of peer rejection depending upon the relational quality in the preschool classroom. Parameter  $\gamma_{12}$  describes how the rate of change in children's developmental trajectories of peer rejection is shaped by the three-way interaction among time, classroom-level peer externalizing behaviors, and preschool classroom relational quality. A statistically significant estimate for  $\gamma_{12}$  will indicate that, on average, classroom relational quality alters the manner in which classroom-level peer externalizing behaviors influence the rate of change in peer rejection over time.

## Results

### **RQ 1: The Teacher-Generated Measure of Child Peer Rejection is Unidimensional and has Reasonable Concurrent Construct Validity**

*Unidimensionality/Reliability.* In Table 2, I present estimates of the bivariate correlations among teachers' responses to the four items. All four have statistically

significant, positive and moderately-sized correlations with one another, suggesting that they may be measuring a single construct, but with considerable error. When I conducted the corresponding principal-components analysis (PCA), I found there was a single component with an eigenvalue above 1. This component accounted for 2.4 of the original 4 units of variance in the teachers' response to the four items, or 60% of the overall variance in the four individual items. The component weights were all of similar magnitude, ranging from 0.42 to 0.54. This suggests that there is a single construct underlying the measurement of peer rejection with the TRF. Based on this evidence, and principally that the component weights were all similar, I chose not use the weighted composite yielded by the PCA itself in my subsequent analyses, but rather made a more straightforward composite by summing the scores of all four items. The final composite had a possible range of 0 to 8. The Cronbach's alpha internal-consistency reliability of the final composite was 0.77.

*Construct Validity.* In Table 3, I present the estimated bivariate correlation coefficients of peer rejection with the seven scales presented in the measures section of this essay. With the exception of the correlation between peer rejection and play interaction, these estimated correlations are small to moderate in magnitude, statistically significant and positive. The bivariate relationship between peer rejection and play interaction, while not statistically significant, is in the hypothesized negative direction. Thus, I argue that this TRF-generated teacher-rating of peer rejection performs as expected based on prior literature exploring the relationship between peer rejection and concurrent child problem behaviors.

**RQ 2.a: On Average, Children’s Experiences of Peer Rejection Do Not Change over Time.**

In Table 4, I list estimated incidence-rate ratios, approximate  $p$ -values, standard errors, and model fit information for all multilevel models fitted to address research question 2.a. On average, children experienced peer rejection at a value close to zero (*estimated IRR* = 0.36,  $p < 0.001$ ) at the end of preschool. Following preschool, children’s experience of peer rejection did not change over time. That is, the relationship between time and peer rejection was not statistically significant and the incidence-ratio rate is equal to 1.00 which indicates that there is a 0% increase in children’s experience of peer rejection per one month increase in time ( $p = 0.89$ ). Nevertheless, M2 which includes a linear specification of time is a better representation of our data than either M1 (unconditional means model) or M3 (in which a quadratic, or curvilinear specification of time is included). I determined this by comparing the -2 log likelihood statistics generated by fitting each model. Therefore, it might be possible that we did not have sufficient statistical power to detect the relationship between time and peer rejection.

**RQ 2(b): Trajectories Of Peer Rejection Do Not Differ Systematically By Classroom-Level Composition Of Externalizing Behaviors.**

I expected to find that children’s long-term experience of peer rejection would vary systematically with classroom-level composition of parent-rated externalizing behaviors. In Table 5, I present estimated incidence-rate ratios, approximate  $p$ -values, standard errors, and model fit information for all multilevel models fitted to address research question 2.b. As shown in Table 5, M4, the relationship between initial classroom-level of externalizing behaviors and subsequent peer rejection is not

statistically significant. The estimated incidence-rate ratio of 1.19 ( $p = 0.76$ ) indicates that for children in two classrooms which differ by one unit in the proportion of children in the classroom with parent-ratings of externalizing behaviors above the 75<sup>th</sup> percentile, the child in the classroom with the higher proportion would experience 19% more peer rejection. To place this in perspective, I operationalized classroom-level externalizing behaviors as a proportion and, in my sample, the largest difference between classrooms was 0.51 (lowest classroom-level of externalizing behaviors = 0.13 and highest = 0.64). Therefore, based on the estimated relationship between peer rejection and the classroom-level of externalizing behaviors, children in the classroom with the lowest level would experience a little under 10% less peer rejection than children in the classroom with the highest classroom-level of externalizing behaviors. While this relationship is in the predicted direction, the lack of statistical significance indicates that it is indistinguishable from zero. Again, it is possible that I lacked sufficient statistical power to detect a relationship between these variables in the population.

**RQ 2(c): There Is a Complex Relationship between Peer Rejection, Classroom-level of Externalizing Behaviors, and Classroom Emotional and Relational Climate.**

The quality of the emotional and relational classroom climate does appear to moderate the relationship between the classroom-level of externalizing behaviors and children's long-term experience of peer rejection. Models M7 and M6 in Table 6 contain estimated incidence-rate ratios, approximate  $p$ -values, standard errors, and model fit information for all multilevel models fitted to address research question 2.c. The results of these models are difficult to interpret. Therefore, I present an example to illustrate the estimated role of classroom emotional and relational climate. If two children are in



classrooms with equal proportions of children whose parents rated them at or higher than the sample 75<sup>th</sup> percentile, the child in a classroom with a quality rating of 3 will experience 4% more peer rejection than the child in a classroom with a quality rating of 4 ( $p < 0.001$ ).

## Discussion

Peer rejection is an experience children can only have in social contexts. For many children, preschool classrooms are the first social contexts in which they interact with peers. I had two primary goals in this study. First, I explored a measure of peer rejection built from teacher responses on the TRF. I was motivated to do this because many typically used measures of peer rejection rely on surveying or interviewing the majority of children in each classroom in which children of interest are nested. When studies seek to follow children across time and schools, this approach is costly and logistically challenging. As a researcher broadly interested in the development of child social skills over time, I am also interested in measures that can be reliably, effectively, and affordably deployed in longitudinal studies.

Second, in this study, I investigated whether, and if so, how initial characteristics of the preschool classrooms such as the classroom-level of externalizing behaviors and the relational climate of the classroom were related to children's long-term experience of peer rejection in elementary school. I hypothesized that children in classrooms in which a high proportion of children had high parent-ratings of externalizing behaviors at the beginning of preschool would experience more peer rejection from the end of preschool through fifth grade.

In pursuing the first aim of this study, I selected four items from the TRF—a teacher measure of child behaviors—that were aligned with definitions of peer rejection commonly used in the research literature. These four items each asked how true the teacher thought that the child doesn't get along with others, gets in many fights, gets teased a lot, and is not liked by others. To explore if they represented a single underlying construct, I conducted a principal components analysis and found a single component solution accounted for 60% of the total variance contained in the four items. Furthermore, this was the only composite with an eigenvalue over 1. The small to moderate, statistically significant correlations between this peer rejection composite and six of the seven theoretically-related child behavior scales suggests that this teacher-rating of peer rejection, built from the TRF may be a reasonable indicator of peer rejection. Indeed other studies have indicated that teacher ratings, while not optimal in detecting all peer dynamics, may be best used to identify the more extreme forms of peer rejection (Bierman, 2004). While teachers are not party to all child interactions in their classrooms, teachers' experience with many groups of children over time and their likely ability to distinguish between social withdrawal and peer rejection gives them some advantages over young children who may not be able to understand this distinction. In future research, I propose to investigate the relationship between this teacher-generated composite of peer rejection and peer rejection indicators built from sociometric interviews.

To address my second research question, I used the teacher-generated measure of peer rejection to investigate children's long-term experience of peer rejection. Children's experience of peer rejection did not change over time (*estimated IRR* = 1.00, *p* = 0.76).

This echoes the findings of Kupersmidt and Coie (1983) who observed that children experienced the same level of peer rejection despite changing peer contexts. In this study, children switched classrooms 4 different times and schools at least one time, between preschool and fifth grade. Regardless, on average, in the population, teachers rated children as having largely the same experience of peer rejection in each new social context. Of additional interest, the initial characteristics of the preschool classrooms in which these children were enrolled did not have a statistically significant relationship with their subsequent experience of peer rejection. What this suggests is that some children may enter social contexts with a propensity for acceptance or isolation from peer play. Children's long-term experience of acceptance or isolation may be influenced by this initial propensity because accepted children gain opportunities to practice and develop more skills for integration into peer groups while initially isolated children are denied these opportunities therefore reinforcing the behaviors that may have led to the initial peer rejection. Of course, the behaviors and propensities of the child experiencing acceptance or rejection form only one half of the situation. Children who are rejected by their peers are, by definition, being acted upon by others. That is, there must be some children who are rejecting others. Beyond our focus on physical aggression, which itself is thought of as a risk for peer rejection but not generally indicated as a way that children are kept from social groups, we know little about the etiology of behaviors that underlie the act of rejecting a peer from group membership. In future work, I plan to investigate the social processes by which children are accepted or rejected into peer groups in preschool and elementary school. I also plan to investigate whether or not it is possible to

intervene in the social ecology of classrooms in order to alter children's experiences of peer rejection.

Table 1.

Means and standard deviations (SD) of key variables in the Chicago School Readiness Project. The first two columns (labeled RQ1 Sample 1) show descriptive statistics for the sample analyzed in the part of research question 1 that explores the relationship between the TRF-generated measure of peer rejection and the four BPI composites (n = 271). The third and fourth columns (labeled RQ1 Sample 2) contain means and standard deviations for the subsample of children rated on the PIPPS (n = 89). The last two columns (labeled RQ2 Sample) contains descriptive statistics for the sample analyzed in research question 2 (n = 277).

Variables	RQ1 Sample 1		RQ1 Sample 2		RQ2 Sample	
	Mean	SD	Mean	SD	Mean	SD
<i>Child characteristics</i>						
Male student	0.42	0.49	0.44	0.50	0.42	0.49
Age of Child in Months at beginning of Head Start	49.00	7.52	48.67	7.27	48.93	7.42
Caucasian student	0.05	0.22	0.03	0.18	0.05	0.23
African American student	0.64	0.48	0.70	0.46	0.64	0.48
Hispanic student	0.27	0.45	0.24	0.43	0.27	0.45
<i>Adult characteristics</i>						
Head Start teacher with BA/BS	0.61	0.49	0.55	0.50	0.60	0.49
<i>Classroom characteristics</i>						
Proportion of all children in each Head Start classroom with parent ratings of externalizing behaviors higher than sample 75 <sup>th</sup> percentile					0.39	0.15
Head Start class size					19.14	5.10
CLASS-Positive Climate Rating					5.63	0.84

*Table 2.*

Sample inter-correlations among teachers' responses to the four items included in the peer-rejection composite created from the *Teacher Rating Form* (n=271).

Child...	1	2	3	4
1. doesn't get along with others	–			
2. gets in many fights	0.52	–		
3. gets teased a lot	0.40	0.39	–	
4. not liked by others	0.60	0.45	0.37	–

*Note:* All correlations are statistically significant at  $p < 0.05$ .

*Table 3.*

Sample inter-correlations between teachers' responses on the peer rejection composite created from the Teacher-Rating Form, BPI student-behavior problems subscales (n=271), and the PIPPS play behaviors subscales (n=89).

	Peer rejection bivariate correlation coefficient
BPI internalizing	0.31***
BPI externalizing	0.74***
BPI antisocial	0.71***
BPI peer conflict/ social withdrawal	0.68***
PIPPS play interaction	-0.07 $p = 0.51$
PIPPS play disruption	0.33**
PIPPS play disconnection	0.22*

*Note:* \*\*\*  $p < 0.001$ , \*\*  $p < 0.01$

Table 4.

Estimated incidence rate ratios, approximate  $p$ -values and standard errors for multilevel mixed effect Poisson regression models fit to examine trajectories of child peer rejection from the end of preschool through fifth grade, as a function of time ( $n = 277$  children, followed across four data collection waves).

	M1 IRR (se)	M2 IRR (se)	M3 IRR (se)
<i>Fixed Effects</i>			
Intercept	0.42*** (0.04)	0.37*** (0.06)	0.33*** (0.06)
Time		1.00 (0.003)	1.01 (0.01)
Time X Time			1.00 (0.0001)
<i>Random Effects (Variance Components)</i>			
Median incidence-rate ratio Level-2 (between person)	2.89	3.44	3.54
In initial status	1.24*** (0.20)	1.68*** (0.35)	1.76*** (0.37)
In rate of change		0.0005*** (0.0001)	0.0005*** (0.0001)
Covariance		-0.02 (0.006)	-0.02 (0.006)
<i>Model Fit Statistics</i>			
-2LL	-2079.52	-2037.66	-2036.62
AIC	2083.52	2047.66	2048.62
BIC	2093.05	2071.48	2077.21

\*\*\*  $p < 0.001$ ; \*\*  $p < 0.01$ ; \*  $p < 0.05$ ; ~  $p < 0.10$



Table 5.

Estimated incidence rate ratios, approximate  $p$ -values and standard errors for multilevel mixed effect Poisson regression models fit to examine trajectories of child peer rejection from the end of preschool through fifth grade, as a function of time and classroom-level of externalizing behaviors (n = 277 children, followed across four data collection waves).

	M4 IRR (se)	M5 IRR (se)
<i>Fixed Effects</i>		
Intercept	0.34*** (0.09)	0.26*** (0.09)
Classroom-level externalizing behaviors	1.19 (0.70)	2.39 (1.95)
Time	1.00 (0.003)	1.01 (0.007)
Time X Classroom-level externalizing behaviors		0.98 (0.02)
<i>Random Effects (Variance Components)</i>		
Median incidence-rate ratio Level-2 (between person)	3.43	3.42
In initial status	1.29*** (0.14)	1.29*** (0.003)
In rate of change	0.02*** (0.003)	0.28*** (0.06)
Covariance	-0.55 (0.11)	-0.55 (0.11)
<i>Model Fit Statistics</i>		
-2LL	-2037.57	-2036.10
AIC	2049.57	2050.10
BIC	2078.15	2083.44

\*\*\*  $p < 0.001$ ; \*\*  $p < 0.01$ ; \*  $p < 0.05$ ; ~  $p < 0.10$

Table 6.

Estimated incidence rate ratios, approximate  $p$ -values and standard errors for multilevel mixed effect Poisson regression models fit to examine trajectories of child peer rejection from the end of preschool through fifth grade, as a function of time and classroom-level of externalizing behaviors (n = 277 children, followed across four data collection waves).

	M6 $\beta$ (se)	M7 $\beta$ (se)
<i>Fixed Effects</i>		
Intercept	0.0005*** (0.001)	0.0008** (0.002)
Classroom-level externalizing behaviors	721000000*** (4600000000)	329000000* (2290000000)
Positive classroom climate	2.92*** (1.21)	2.42* (1.08)
Externalizing $\times$ Positive <sup><math>\phi</math></sup>	0.04*** (0.04)	0.06* (0.07)
Child Age (in months)		1.01 (0.01)
Child was male		1.21 (0.20)
Child was white		0.44 (0.20)
Economic risk of child's family		1.04 (0.08)
Class size		1.00 (0.02)
Teacher had a BA/BS		1.00 (0.19)
Time	1.0007 (0.003)	1.00 (0.003)
<i>Random Effects (Variance Components)</i>		
Median incidence-rate ratio	3.35	3.32
Level-2 (between person)		
In initial status	1.61*** (0.34)	1.59*** (0.34)
In rate of change	0.0005*** (0.0001)	0.0005*** (0.0001)
Covariance	-0.02 (0.005)	-0.02 (0.005)
<i>Model Fit Statistics</i>		
-2LL	-2042.63	-2018.50
AIC	2040.63	2046.50
BIC	2078.74	2113.19

\*\*\*  $p < 0.001$ ; \*\*  $p < 0.01$ ; \*  $p < 0.05$

Note: Classroom-level externalizing behaviors is operationalized as the proportion of students in each preschool (Head Start) classroom which were rated by parents as having externalizing behaviors at or

above the sample 75<sup>th</sup> percentile.

<sup>φ</sup>This refers to the interaction between the classroom-level externalizing behaviors and the classroom relational climate.

## **Essay 2:**

# **Investigating the Relationship between the Developmental Trajectories of Children's Social Competence in Early Childhood and the Externalizing Behaviors of their Preschool Peers**

## **Introduction**

The construct of social competence encompasses a discrete set of skills that are considered important for the formation of positive relationships with others (Fabes, Gaertner & Popp, 2006; Raver & Zigler, 1997). In early childhood, as children enter out-of-home care settings and engage in ever-widening social circles, the skills that comprise social competence -- including the ability to engage others in cooperative play, and communicating and coordinating actions and plans with social partners -- develop rapidly (Fabes, Gaertner & Popp, 2006; Howes, 1987). This is hypothesized to occur because, in the preschool period (3-5 years-of-age), a child's understanding of her peer group is emerging (Howes, 1987). Preschool-aged children have a nascent sense of group membership, of their own status within the peer group, and are able to articulate preferences for social partners based on other children's behaviors (Howes, 1987). At the same time, children in this age range are beginning to demonstrate skill in labeling and regulating their own emotions in the context of interactions with social partners (Raver, 2002).

In preschool, children's ability to form cooperative, positive relationships with their peers and with preschool teachers has the power to enhance or inhibit their learning (Hamre, 2014). Prior research has found that children with high ratings of social competence in preschool have higher academic performance in kindergarten and first

grade, compared to less socially competent preschoolers (Oades-Sese, Esquivel, Kaliski, & Maniatis, 2011). Finally, children who were rated as more socially competence by their kindergarten teachers had better physical and mental health more than twenty years later compared to children were rated as less socially competence (Jones, Greenberg, & Crowley, 2015).

Interestingly, at the same time, children are shaping the preschool classroom's social context actively as they interact with a range of social partners, often with little direct adult supervision. Navigating these interactions successfully and forming positive relationships with peers has lasting impacts on children's ultimate development. For example, children who are well-liked, or accepted, by their peers in preschool are found to be better adjusted to regular school at the transition to kindergarten and beyond (Johnson, Ironsmith, Snow, & Poteat, 2000).

The preschool-classroom social context is also shaped by the teachers who are present. In fact, a key indicator of preschool classroom quality has been found to be the degree to which teachers are able to establish and maintain warm, predictable, and responsive relationships with, and among, children (Hamre & Pianta, 2007; Yoshikawa, et al., 2013). The power of such relationships has been illustrated in research documenting that children had better short- and long-term academic and behavioral outcomes through age 15 after having attended preschool classrooms in which their teachers established a climate of responsive and warm relationships (Vandell, Belsky, Burchinal, Steinberg, & Vandergrift, 2010). Classrooms with these relational climates are hypothesized to encourage constructive peer interactions that then allow children to learn and practice social-competence skills (Hamre, 2014).

Thus, while prior research motivates the importance of the construct of social competence, few studies have investigated the manner in which its development is related to critical characteristics of the children's preschool classrooms. I argue that it is important to fill this gap because children attend preschool at a time when their social-competence skills are beginning to develop rapidly and are, potentially, sensitive to the characteristics of the social context of the classroom in persistent ways (Fabes, Gaertner & Popp, 2006; Howes, 1987). For instance, findings from a recent study provide evidence for such sensitivity, in that children who attended preschool classrooms characterized by low average levels of peer aggressive or externalizing behaviors received higher ratings of social competence in kindergarten (Yudron, Jones, & Raver, 2014).

In this essay, I extend this latter work by taking a longitudinal perspective. In my research, I examined the developmental trajectories of children's social competence over the course of early childhood (from age 4 through age 5). I describe the shape, including the elevation and rate of change, of these developmental trajectories and then investigate whether children whose trajectories had a lower elevation and/or had grown less quickly attended preschool classrooms with higher initial classroom-levels of peer externalizing behaviors. Furthermore, I examine whether children who were in preschool classrooms that were similar in their classroom-level of externalizing behaviors experienced different developmental trajectories of social competence when the emotional and relational supportiveness of the teachers differed. To accomplish this, I drew on the first three waves of data from the *Chicago School Readiness Project (CSRP)*. The CSRP was a longitudinal randomized experimental evaluation of a classroom-level intervention aimed

at providing teachers with behavior-management tools and social-emotional support (Raver, Jones, Li-Grining, Metzger, Smallwood, & Sardin, 2008). While the CSRP intervention was implemented in Head-Start<sup>2</sup> preschool classrooms, children were followed over several subsequent years as they progressed through the Chicago Public Schools. This dataset is ideal for my own study because child social competence was measured from age 4 to age 5 using valid and vertically aligned measures, and it contains data from 90% of all children in each preschool classroom that participated in the project. However, note that I do not evaluate the impact of the intervention itself, as that work has already been completed by others (Raver, Jones, Li-Grining, Metzger, Smallwood, & Sardin, 2008; Raver et al., 2009, 2011; Zhai, Raver, & Li-Grining, 2012). Instead, I analyzed data on only those children and classrooms that participated in the control group of the original study. By focusing on this subset of participants – and because of the sample size, the repeated measurement of the outcomes and the sophistication of the analyses -- I possessed sufficient statistical power to address my research questions, while avoiding having to control features of the original experimental design.

## **Background and Context**

### **What Is Social Competence?**

Many theorists (e.g., Fabes, Gaertner & Popp, 2006; Raver & Zigler, 1997; Waters & Sroufe, 1983) identify social competence as an organizing developmental construct—the enactment of a set of emotional, regulatory, and cognitive skills adapted to the specific contexts in which a child finds herself. These experts argue that in order to

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<sup>2</sup> Head Start is the federally-funded preschool program for low income families in the United States.

become socially competent, a child must develop, over childhood: (1) positive relationships with others, (2) the ability to coordinate and communicate her actions and feelings with social partners, and (3) the ability to recognize and regulate her emotions and actions in social settings (Howes, et al., 2011).

### **The Importance of Social Competence**

Social competence develops rapidly in early childhood, and that development has important implications for a wide range of concurrent and later outcomes (Fabes, Gaertner & Popp, 2006; Howes, 1987). For instance, scholars have found that bilingual preschool children who were rated as more socially competent in preschool ultimately received higher scores on direct assessments of their literacy, English language, and mathematics skills in kindergarten and first grade, when compared to their less socially competent peers (Oades-Sese, Esquivel, Kaliski, & Maniatis, 2011). Studies in a variety of preschool populations have found similar relationships. For example, Head-Start preschool children who received higher teacher ratings of social competence performed better on concurrent, direct assessments of their mathematics and language skills in preschool compared to less socially competent Head-Start children (Arnold, Kupersmidt, Voegler-Lee, & Marshall, 2012). Furthermore, preschool children who engaged in interactive peer play and who were rated as more socially competent in Head Start also had more positive approaches to learning and were better able to regulate their attention in Head-Start classroom contexts compared to children who engaged less successfully with peers (Fantuzzo & McWayne, 2002).

These, and related studies, illustrate the very important links between social competence and later child behavioral and learning outcomes. Yet, they tell us little about



the actual development of children's social competence over time. To date, most studies of social competence have focused on the relationship between social competence at one point in the preschool year and outcomes measured either concurrently or after the initial measures of social competence have been obtained. While these cross-sectional and early/late designs have established the important role that social competence plays in a child's well-being, they do little to illustrate how the child's social competence actually develops over time, particularly in relationship to the early experiences that children have had in preschool settings. In this essay, I address this gap.

### **Social Competence Develop In Early Childhood**

Other than the early/late prediction studies noted above, there are few truly longitudinal studies of social competence in which multiple waves of data on individual children's social competence are obtained and used to model their developmental trajectories. The studies that do exist suggest that developmental trajectories of social competence may be sensitive to early care experiences, including the quality of preschool experienced and the nature, quality, and intensity of peer interactions. For example, in a study of 52 children followed from 18 months to age 15, children who attended high-quality preschool classrooms had higher observed social-competence skills throughout the measurement period compared to children who attended low-quality preschool classrooms (Campbell, Lamb & Hwang, 2000). Two things are important to note about this latter study. First, in it, classroom quality was operationalized as the degree to which the physical space was safe and designed to be accessible for young children (Campbell, Lamb & Hwang, 2000). Second, the study used estimates of Pearson product-moment correlations to summarize the wave-by-wave relationships among pairs of social

competence observations. Thus, while it provides important evidence for the persistent influence of early care experiences on social competence over time, this study does not describe explicitly the development trajectories of social competence that children display over time.

More recently, a study of preschool children in Portugal has adopted a more direct longitudinal approach and applied the methods of latent growth-modeling to examine developmental trajectories of social competence in children from age 3 to age 5 (Santos, Vaughn, Pecequina, Daniel, & Shin, 2014). The researchers found that differences among children in their trajectories of social competence were stable over the course of this age range and that all children experienced growth in social competence from age 3 through age 5. Yet, the authors did not examine whether children's developmental trajectories differed systematically by differences in their preschool classroom characteristics (Santos, Vaughn, Pecequina, Daniel, & Shin, 2014). In this essay, I built on the strengths of these longitudinal studies by modeling children's developmental trajectories of social competence by fitting multilevel models for change (Singer & Willett, 2003). I then examine the relationship between these trajectories and two important preschool classroom characteristics, which I introduce and describe below.

### **Preschool Classroom Characteristics Matter for the Development of Social Competence**

Young children learn and practice their social-competence skills in three main contexts. First, their social-competence skills begin to develop in the home context. Parents of young children model central aspects of social competence in the home, including the skills of: (1) experiencing and expressing emotions (Nelson, et al., 2013),

(2) engaging in collaborative interactions with one or more social partners (Feldman, Bamberger & Kanat-Maymon, 2013), and (3) navigating conflict with adult and peer social partners (Rispoli, McGoey, Koziol & Schreiber, 2013). Then, in their early and middle childhood, children begin to express these skills themselves, outside the home (Howes, et al., 2011).

The second context in which children learn and practice their new social skills is in out-of-home care settings. For many children, such settings take the form of preschool classrooms. In these classrooms, preschool teachers also model social-competence skills and may structure social interactions intentionally to focus children's attention on enhancing their discrete skills of social competence (Farmer, Reinke, & Brooks, 2014). Indeed, a large body of research describes how children received higher ratings of social competence when they were present in classrooms characterized by: (1) warm, responsive relationships between children and teachers, (2) age-appropriate routines, and (3) predictable behavior management approaches, than did peers in classrooms with few or none of these characteristics (e.g., Burchinal, Peisner-Feinberg, Pianta, & Howes, 2002). Such high-quality classroom environments are known to reinforce a range of positive child outcomes (Leyva et al., 2015; Yoshikawa, et al., 2013) and to mitigate the negative effects on children of aggressive peer contexts or peer victimization (Palermo, Hanish, Martin, Fabes, & Reiser, 2007).

Children's social competence is also hypothesized to be influenced by a third context—the peer social context (Yudron, Jones, & Raver, 2014). In the current essay, I am interested specifically in the impact of the peer social context, as it is manifested in preschool classrooms, on the subsequent development of social competence. Prior

research suggests that classroom-level peer characteristics—that is, peer characteristics understood at the level of the classroom (often through aggregating individual characteristics) represent and generate classroom norms for individual children's behavior and achievement (Henry & Rickman, 2007). There is a growing evidence base linking negative classroom-level peer climate, including peer aggression, to subsequent short- and mid-range maladaptive child outcomes (Kellam, et al., 1998; Molano, Jones, Brown, & Aber, 2013; Thomas, Bierman & Powers, 2011). In particular, aggregate levels of early peer aggressive or externalizing behaviors appear to be particularly salient for young children's subsequent outcomes. In this context, externalizing behaviors are those disruptive or aggressive actions toward social partners (Campbell, Shaw, & Gilliom, 2000). Children in preschool classrooms with high-aggregate levels of peer externalizing behavior have been found to have greater difficulties in subsequent school adjustment, compared to children in classrooms with low levels of, or no, peer externalizing behavior (Aber, Jones, Brown, Chaundry, & Samples, 1998; Hoglund & Leadbeater, 2004; Kellam et al., 1998).

### **Conclusion: Specific Research Questions**

To date, there has been little or no research in which differences among children in the developmental trajectories of social competence during elementary school have been examined in relation to differences in earlier preschool classroom-level peer externalizing behaviors. In an important first step, a recent study (Yudron, Jones, & Raver, 2014) reported that children in preschool classrooms in which peers displayed higher levels of aggregate externalizing behavior exhibited lower levels of social competence themselves later, in kindergarten, when compared to children in Head-Start

classrooms in which peers had exhibited lower classroom-levels of externalizing behaviors. In this paper, I built directly on this early research, by extending the measurement and modeling of social competence longitudinally.

In particular, I examine the relationship between how the level and rate of change in children's developmental trajectories of social competence from early in preschool when most children are 4-years-old through the middle of kindergarten when most children are 5-years-old differed by their early exposure to classroom-level peer externalizing behaviors in preschool. I hypothesized that children who experienced preschool classrooms with high aggregate levels of peer externalizing behaviors would exhibit subsequent developmental trajectories of social competence that had lower elevations and grew less quickly than did those of children in preschool classrooms with low levels of aggregate peer externalizing behaviors. In addition, given that the peer externalizing behaviors of interest were experienced in the broader classroom context, I also examined whether the relational quality of the preschool classrooms, operationalized as the degree to which the preschool teachers formed emotionally supportive, responsive relationships with children, moderated this hypothesized relationship. In fact, I hypothesized that if two children were engaged in preschool classrooms with equal levels of aggregate peer externalizing behaviors, the child in the preschool classroom with higher relational quality would experience a subsequent developmental trajectory in social competence that was both higher in elevation and growth rate compared to the child in the preschool classroom with lower relational quality. Thus, in my research, I address the following research questions:

1. What developmental trajectory does a child's social competence follow from age 4 through age 5? In particular, does a linear trajectory provide an adequate summary of change over time and, if so, what are the average elevations and rates of change of such trajectories?
2. Do children who, at age 4, attended preschool classrooms characterized by higher aggregate levels of classroom-level peer externalizing behaviors (as reported by parents) display trajectories of social competence development (from age 4 to age 5) with lower elevations and rates of change than children who attended preschool classrooms with lower levels of aggregate peer externalizing behaviors?
3. Does the relational climate of the preschool classroom moderate the relationship between the initial classroom-level peer externalizing behaviors in preschool and child trajectories of social competence from age 4 through age 5?

## **Research Design**

### **Data Set**

I addressed my research questions using data drawn from the *Chicago School Readiness Project* (CSRP; for a detailed description of the study design, the intervention, and a summary of its impacts on children's developmental outcomes see Raver, Jones, Li-Grining, Metzger, Smallwood, & Sardin, 2008; Raver et al., 2009, 2011; Zhai, Raver, & Li-Grining, 2012). The CSRP was a preschool intervention and evaluation study that sought to improve behavioral and school readiness outcomes in a population of Head-Start students in some of Chicago's lowest resourced Head-Start centers. In intervention classrooms, CSRP provided intense professional development in classroom-behavior management and the weekly support of a trained mental-health specialist to teachers.

Control classrooms received neither training nor supports. Importantly, in the current study, I only analyzed data from the control classrooms. This allowed me to isolate how the development of children's social competence depended upon preschool classroom characteristics (peer externalizing behaviors and classroom relational quality), without having to account for the impact of the intervention on this outcome.

The CSRP data are ideal for the current study for three reasons. First, children's social competence was rated by teachers at three different time points over a 2-year time frame (twice in preschool and once in kindergarten). Thus, I was able to implement the multilevel modeling of change (Singer & Willett, 2003) to estimate children's developmental trajectories of social competence over time. Second, data on the peer externalizing behaviors were gathered at baseline, for almost all of the children in each preschool classroom -- an average of 90% of the children in each preschool classroom. Third, teacher relational quality was observed and rated in all classrooms at baseline. Thus, unlike other studies in which aggregate classroom-level peer characteristics are operationalized using data on only a small proportion of children within each classroom (Justice et al., 2011; Mashburn, 2008), I was able to mobilize nearly complete classroom information to summarize the classroom composition of peer externalizing behavior in the preschool year.

### **Sample**

My analytic sample contained the 279 children who participated originally in any of the 17 CSRP control classrooms. These children were present in the first preschool data-collection wave and at the follow-up waves in kindergarten. Given the analyses described below, using the *Optimal Design* software (Raudenbush, et al., 2011), I

determined that I had sufficient statistical power (0.80) to detect moderate effect sizes of about a quarter of a standard deviation, at usual levels of Type I error ( $\alpha=0.05$ ).

### **Procedures**

CSRP provides a rich dataset in which children were followed throughout their early schooling. Social competence ratings on the children were gathered in three waves, in September and May of the preschool year and January of the kindergarten year. In the current study, I used parent-ratings of child externalizing behavior obtained at baseline. Child and teacher demographics were also gathered at baseline.

### **Measures**

I set up my analytic dataset in a person-period format, meaning that each child contributed up to three rows of data—one row per wave of data that he or she contributed to the study in preschool and kindergarten. This format allowed me to capture the time-varying nature of social competence, for each child, between the beginning of preschool and kindergarten and is the appropriate format for fitting multilevel models for change (Singer & Willett, 2003).

Below, I describe briefly each of the measures that I employed. I have organized their descriptions into the following categories: outcomes, question predictors, moderator, and covariates.

#### ***Outcome.***

- SOCIAL\_COMPETENCE is a time-varying, child-level, continuous outcome variable, for each child. At each wave in preschool and kindergarten, children's social competence was measured using the *Social Competence and Behavior Evaluation Scale-Short Form* (SCBE-30; LaFreniere & Dumas,



1995, 1996). The SCBE-30 contained 10 items which asked teachers to rate how often, on a 6-point scale (1 = never, ..., 6 = always), each child comforts another child, assists a child in difficulty and related actions. Based on preliminary exploratory factor analysis, I found that these items loaded on a single factor (Yudron, Jones, & Raver, 2014). Thus, as in other studies using the CSRP data (see for example: Raver, Jones, Li-Grining, Metzger, Smallwood, & Sardin, 2008), I first recoded the original scale so that it ranged from 0=never..., through 5=always. Then, I created a single social-competence score by adding teacher responses on each of the ten items, resulting in a composite with a possible range of 0-50 ( $M = 27.27$ ,  $SD = 10.50$ ). While this does not preserve the metric of the original items it is consistent with how this measure is used in the field (LaFreniere & Dumas, 1995, 1996).

***Question Predictors.*** I examined the relationship between children's developmental trajectories of social competence and two principle question predictors, as follows:

- *TIME*, is a time-varying variable that counts the number of months that elapsed since September in the fall of the preschool year and the collection of each subsequent wave of data. Thus, by its coding, it accounts for the different spacing of assessments, by wave, across children. A value of 0 indicates the beginning of the preschool year.
- *EXTERNALIZING\_PROP75* is a time-invariant measure of preschool classroom-level peer externalizing behaviors and was constructed in the

following manner. In September of the preschool year, parents used the *Behavior Problems Index* (BPI; Zill, 1990) externalizing problem-behaviors scale (Cronbach's alpha reliability = 0.92) to report on individual child behaviors. The 18 items in this subscale each seek responses on a 3-point scale (0 = not true, 2 = very/often true). Sample items address how true it is that the child is high strung, cheats or lies, or argues. Importantly, by using a parent-rating of these behaviors before the children's behaviors were able to be influenced by peers, I can characterize the children's contribution to the social ecology of the classroom absent teacher influences. Because this instrument is meant to capture the number as well as the severity of externalizing behaviors observed by the reporter, I summed ratings on the individual items to create a subscale score with a potential sample range of 0-36 ( $M = 5.77$ ,  $SD = 4.79$ ). Then, I created a classroom-level composite which recorded the proportion of students in each classroom whose parent-rating of externalizing behavior was equal to, or above, the sample 75<sup>th</sup> percentile ( $M = 0.39$ ,  $SD = 0.14$ ).

I operationalized the preschool classroom-level of peer externalizing behaviors in this way because it described the number of children with high levels of externalizing behaviors in the room. I regard it as a better index of exposure than the classroom mean-level of externalizing behaviors (which is typically employed, e.g., Thomas, Bierman, & Powers, 2011) because the latter statistic is more sensitive to the presence of a small number of individuals with extreme values. If a child is in a classroom with a high proportion of peers with high-levels of externalizing behaviors, the probability they will

interact with such a peer is higher. The mean is less sensitive in this regard because two classrooms may have the same mean level of peer-externalizing behavior but contain different proportions of children whose individual-ratings are high.

Therefore, *EXTERNALIZING\_PROP75* represents the baseline externalizing behaviors present in the classroom, in the aggregate, at the beginning of the preschool year before children were immersed in the social context of the classroom. In Figure 1, I present the proportion of students whose parental ratings of externalizing behaviors were above the sample 75<sup>th</sup> percentile in each of the 17 study classrooms, at the beginning of preschool. I have plotted the proportion of students (vertical axis) versus the classroom ID (horizontal axis). Notice that, in the classroom with the lowest classroom-level of externalizing behaviors, only 13% of parents rated their children as having externalizing behaviors at or above the sample 75<sup>th</sup> percentile. This is in contrast to the classroom with the highest classroom-level of externalizing behaviors in which 64% of children were rated by their parents as having externalizing behaviors at or above the sample mean.

***Moderator.***

- *POSITIVE* is a time-invariant classroom-level measure that was gathered in each classroom in September of the preschool year, via a rating process conducted by an external observer using the *Classroom-Assessment Scoring System* (CLASS; Pianta & Hamre, 2009). This measure was designed to describe the quality of the preschool classroom on several dimensions, by rating child-teacher interactions. *POSITIVE* indicates the quality of teacher responsiveness to children's needs and the extent to which teachers provided a secure base within the classroom. I constructed *POSITIVE* ( $\alpha = 0.77$ ) by

averaging the raters' responses to four items from the CLASS observation protocol that reflect a teacher's awareness of children, responsiveness to children, ability to comfort children, and manner of addressing problems (Pianta & Hamre, 2009). This is consistent with how the instrument designers and researchers using the CSRP CLASS data have constructed this composite in other studies (Raver, et al., 2008). Each item has a range of 1-7 with 7 indicating the highest rating possible. The final composite therefore had a possible range of 1-7 ( $M = 5.06$ ,  $SD = 1.04$ ).

**Covariates.** In selected statistical models, I also included a short set of critical child and teacher covariates in order to increase the precision of my estimation and the statistical power of my analyses. These covariates included: dichotomous indicators of individual children's sex and race/ethnicity, a dummy variable to indicate whether each teacher has a BA/BS degree, class size, and an indicator of the economic risk a child's family faced. In Table 1, I present summary statistics for all the covariates I examined in this study. In the equations presented below, I represent this vector of covariates with this symbol: **Z**.

### **Data Analysis**

In order to address my research questions and account for the longitudinal nature of my data, I fit 2-level multilevel models for change in which time was nested within children. I fit these models in a person-period data set in which each child contributes a row for each time that s/he was rated on his or her social competence. Therefore, all children in the dataset have between one to three rows of data. This design allowed me to account for the lack of independence of the child-level responses across measurement

instances within children (Singer & Willett, 2003). Please note that, in my analyses, I do not account explicitly for the nesting of children in their preschool classrooms because during the last stage of the study period children were no longer nested in their original preschool classrooms, but were dispersed widely throughout the elementary education system.

*Research Question 1: What developmental trajectory does a child's social competence follow from age 4 through age 5? In particular, does a linear trajectory provide an adequate summary of the development over time, and if so what are the typical elevations and rates of change of such trajectories?*

To address this question, I fit the following unconditional multilevel model for change, expressing the growth of social competence as a function of time, for child  $i$  at time  $j$ , as follows:

*Level 1 Model:*

$$SOCIAL\_COMPETENCE_{ij} = \pi_{0i} + \pi_{1i}TIME_{ij} + \varepsilon_{ij}$$

*Level 2 Model:*

$$\pi_{0i} = \gamma_{00} + \zeta_{0i}$$

$$\pi_{1i} = \gamma_{10} + \zeta_{1i}$$

where I assume that

$$\varepsilon_{ij} \sim N(0, \sigma_{\varepsilon}^2) \text{ and } \begin{bmatrix} \zeta_{0i} \\ \zeta_{1i} \end{bmatrix} \sim N \left( \begin{bmatrix} 0 \\ 0 \end{bmatrix}, \begin{bmatrix} \sigma_0^2 & \sigma_{01} \\ \sigma_{10} & \sigma_1^2 \end{bmatrix} \right)$$

In the hypothesized level-1 model, individual growth parameter  $\pi_{0i}$  represents the  $i$ th child's initial true social-competence level (intercept), and  $\pi_{1i}$  represents the linear rate of true change (slope) in the child's trajectory. The level-2 parameter  $\gamma_{00}$  represents the

population average of the level-1 intercepts and the level-2 parameter  $\gamma_{10}$  represents the population average of the level-1 slopes. I hypothesized that—overall—estimates of population averages  $\gamma_{00}$  and  $\gamma_{10}$  would be positive and statistically significant, indicating that children's social competence was non-zero at age 4 (the beginning of the study) and increased over time.

Because the social competence of children was measured a maximum of three times in the study period, I was limited to specifying an individual growth model with only two parameters, most typically a linear trajectory. I did test the relationship between social competence and time specified as a quadratic function. While I cannot determine if the shape of the true population trajectory has a shape other than a linear shape, I can determine whether the linear specification of time adequately explains within-person variation over time. I do this by comparing the level-1 residual variance,  $\sigma_{\varepsilon}^2$ , from the unconditional growth model shown above to the level-1 residual variance of the unconditional means model which is shown below. As you can see, the unconditional means model examines the manner in which the total variation in the outcome, social competence, was partitioned within each person and across people without the consideration of the role of time. Therefore, the degree to which the inclusion of time reduces the level-1 residual variance (which represents the portion of the outcome that exists within each individual) is an indication of the degree to which linear time explains within person variation in social competence. Therefore, I address my first research question by examining the reduction of the level-1 residual variation from the unconditional means to the unconditional growth models and then by examining  $\gamma_{00}$  and  $\gamma_{10}$ .

*Level 1 Model:*

$$SOCIAL\_COMPETENCE_{ij} = \pi_{0i} + \varepsilon_{ij}$$

*Level 2 Model:*

$$\pi_{0i} = \gamma_{00} + \zeta_{0i}$$

where I assume that

$$\varepsilon_{ij} \sim N(0, \sigma_{\varepsilon}^2) \text{ and } \zeta_{0i} \sim N(0, \sigma_0^2)$$

*Research Question 2:* *Do children who, at age 4, attended preschool classrooms characterized by higher aggregate levels of classroom-level peer externalizing behaviors display trajectories of social competence development (from age 4 to age 5) with lower elevations and rates of change than children who attended preschool classrooms with lower levels of aggregate peer externalizing behaviors?*

I addressed this research question by extending the multilevel model for change fitted above to include the time-invariant indicator of preschool peer externalizing behaviors at level-2.

*Level 1 Model:*

$$SOCIAL\_COMPETENCE_{ij} = \pi_{0i} + \pi_{1i}TIME_{ij} + \varepsilon_{ij}$$

*Level 2 Model:*

$$\pi_{0i} = \gamma_{00} + \gamma_{01}EXTERNALIZING\_PROP75_{ij} + \zeta_{0i}$$

$$\pi_{1i} = \gamma_{10} + \gamma_{11}EXTERNALIZING\_PROP75_{ij} + \zeta_{1i}$$

under the same residual assumptions made above.

My second research question was addressed by estimating level-2 parameters  $\gamma_{01}$  and  $\gamma_{11}$ . A statistically significant and negative estimate for  $\gamma_{01}$  indicates that children who had experienced higher classroom-levels of peer externalizing behaviors in

preschool also displayed developmental trajectories of social competence with lower elevation, on average. A statistically significant and negative estimate for  $\gamma_{11}$  indicates that children who participated in classrooms with higher classroom-levels of peer externalizing behaviors had lower rates of growth in their developmental trajectories of social competence, on average.

*Research Question 3: Does the relational climate of the preschool classroom moderate the relationship between the initial classroom-level peer externalizing behaviors in preschool and child trajectories of social competence from age 4 through age 5?*

I addressed my third research question by estimating parameters  $\gamma_{03}$  and  $\gamma_{13}$  in the following multilevel model for change. Please note that  $\mathbf{Z}$  is a vector of covariates which I defined in the earlier Measures section.

*Level 1 Model:*

$$SOCIAL\_COMPETENCE_{ij} = \pi_{0i} + \pi_{1i}TIME_{ij} + \varepsilon_{ij}$$

*Level 2 Model:*

$$\begin{aligned} \pi_{0i} = & \gamma_{00} + \gamma_{01}EXTERNALIZING\_PROP75_{ij} + \gamma_{02}POSITIVE_{ij} \\ & + \gamma_{03}EXTERNALIZING\_PROP75 \times POSITIVE_{ij} + \gamma_{04}\mathbf{Z}_{ij} \\ & + \zeta_{0i} \end{aligned}$$

$$\begin{aligned} \pi_{1i} = & \gamma_{10} + \gamma_{11}EXTERNALIZING\_PROP75_{ij} + \gamma_{12}POSITIVE_{ij} \\ & + \gamma_{13}EXTERNALIZING\_PROP75 \times POSITIVE_{ij} + \gamma_{14}\mathbf{Z}_{ij} \\ & + \zeta_{1i} \end{aligned}$$

under similar residual assumptions as described in the models above.



While not of primary interest, statistically significant, positive estimates of population parameters  $\gamma_{02}$  and  $\gamma_{12}$  would indicate main effects of preschool classroom relational quality on developmental trajectories of social competence for children in classrooms in which none of the children were reported by their parents as having externalizing behaviors above the sample 75<sup>th</sup> percentile. This would indicate that, on average, the growth trajectories of social competence would have a higher elevation (indicated by a positive, statistically significant estimate of  $\gamma_{02}$ ) and more rapid growth (indicated by a positive, statistically significant estimate of  $\gamma_{12}$ ) in classrooms with higher ratings of relational quality, independent of the classroom-level of externalizing behaviors.

Instead, my third research question is addressed by estimating parameters  $\gamma_{03}$  and  $\gamma_{13}$ . Parameter  $\gamma_{03}$  describes the difference in elevation in the developmental trajectory of social competence due to the two-way interaction of classroom-level peer externalizing behaviors and classroom relational quality. A statistically significant estimate for  $\gamma_{03}$  will indicate that, classroom-level peer externalizing behaviors has a differential relationship with the elevation of children's developmental trajectories of social competence depending upon the relational quality in the preschool classroom. Parameter  $\gamma_{12}$  describes how the rate of change in children's developmental trajectories of social competence is shaped by the three-way interaction among time, classroom-level peer externalizing behaviors, and preschool classroom relational quality. A statistically significant estimate for  $\gamma_{12}$  will indicate that, on average, classroom relational quality alters the manner in which classroom-level peer externalizing behaviors influence the rate of change in social competence over time.

## Results

### **RQ1: Social Competence Increased Over Time.**

In Table 2, I list regression coefficients, approximate  $p$ -values, standard errors and model fit information for the unconditional means and unconditional growth models fit to investigate my first research question. As I indicated above, I fit an unconditional means model to examine the manner in which the total variation in the outcome, social competence, was partitioned within, and among, children (Model M1). In this model, I estimated the intraclass correlation coefficient (ICC) in order to quantify the proportion of the total variance in social competence that exists between people. In the unconditional means model, 36% of the total variation in social competence resides between people leaving 64% of the variance within individual children. Because the estimated variance components in this model are all statistically significant, I concluded that further exploration was warranted of the within-child and between-children characteristics that might explain some of this variation.

In order to explore whether, and if so how much, of the variation within children can be attributed to time, I fit the unconditional growth model (M2). The results of this model fit are also contained in Table 2. When the unconditional growth model was fit, the level-1 residual, which represents the portion of the variation in social competence within each child was reduced by 40% (from 64.12 to 38.23). This indicates that 40% of the within-child variation in social competence is associated systematically with linear time.

In the population, the average intercept of the social competence growth trajectory is 24.84 ( $p < 0.001$ ). On average, children experienced growth in social competence from

the beginning of preschool (Head Start) to the middle of kindergarten such that for every month from the time of the baseline in September of the children's prekindergarten year 0.32 pts of growth in social competence ( $p < 0.001$ ). The estimated value of the ICC in this model indicates that 59% of the total variance in social competence exists between people and the rest resides within individuals.

**RQ2: Children in preschool classrooms in which a high proportion of children received high ratings of externalizing behaviors had developmental trajectories of social competence that had lower elevations compared to children in preschool classrooms with a lower proportion of externalizing children.**

In Table 3, I present the regression coefficients, approximate  $p$ -values, standard errors and model fit information for the two multilevel models for change that I fitted to investigate my second research question. In it, I explored the main, unconditional relationship between the classroom-level of externalizing behaviors in preschool and a child's development of social competence from preschool to kindergarten. In the table, I present the results of fitting two models. The first model (M3) examines the relationship between the classroom-level of externalizing behaviors and the elevation of the developmental trajectories of social competence. The second model (M4) examines the relationship between the classroom-level of externalizing behaviors and the elevation and rate of change of the developmental trajectories of social competence.

Inspection of the results from M3 reveal that, on average, there is a negative and statistically significant relationship ( $\beta = -7.78, p = 0.014$ ) between the classroom-level of externalizing behaviors and the elevation of social competence developmental trajectories. The inclusion of this level-2 predictor explained 3% of the variance in

between person variance in initial status. Then, as you can see in M4, I did not find a statistically significant relationship between the classroom-level of externalizing behaviors and the trajectories' rate of growth ( $\beta = 0.13, p = 0.72$ ). Furthermore, the amount of total outcome variance that exists among children in their rate of change was not reduced from M3 to M4. Thus, I preferred Model M3 over Model M4, in my interpretations of the analyses.

In Figure 2, I present fitted developmental trajectories of social competence for three prototypical children using estimates obtained in fitting M3. I have plotted the social competence of children (vertical axis) versus the number of months elapsed since the children's entry into preschool (horizontal axis). In this figure, I show that children's trajectories have a higher elevation when in classrooms with lower classroom-levels of externalizing behaviors. Specifically, if a child is in a classroom in which 28% of the children received parent ratings of externalizing behaviors (Child A) that were equal to or higher than the sample 75<sup>th</sup> percentile this child experienced a developmental trajectory of social competence that was 2.26 points ( $p = 0.02; ES = 0.25$  SD) higher than a child (Child C) in a classroom in which 57% of the children received parent ratings of externalizing behaviors that were equal to or higher than the sample 75<sup>th</sup> percentile. Child B is shown to illustrate the developmental trajectory of a prototypical child in a classroom in which 36% of the children had high levels of externalizing behaviors. Importantly, 36% represents the sample average classroom-level of high externalizing behaviors.

**RQ3: Classroom emotional and relational quality moderates the relationship between classroom composition of externalizing behaviors and the development of social competence.**

In Table 4, in Model M5, I present regression coefficients, standard errors, and model fit information for the multilevel models for change that I fitted to explore whether and how preschool classroom emotional quality (operationalized as the positive climate subscale of the CLASS observation scale) moderated the relationship between preschool classroom-level of externalizing behavior and children's subsequent developmental trajectories of social competence during elementary school. In M5, I explored whether the emotional and relational quality of the classroom, as measured by the CLASS, moderated the relationship between the preschool classroom-level of externalizing behaviors and the elevation of children's subsequent developmental trajectories of social competence. In M6, to improve precision and power, I included a small set of covariates. Importantly, I did not explore whether the preschool classroom emotional and relational climate moderated the relationship between the preschool classroom-level of externalizing behavior and the rate of change in the trajectories of social competence because this relationship was found to be zero in earlier Model M4 (Table 3). In examining the results of fitting M6, I found that the emotional and relational climate of the preschool classroom did indeed moderate the relationship between the preschool classroom-level of externalizing behavior and the elevation of children's subsequent developmental trajectories of social competence ( $\beta = 22.28, p < 0.001$ ). By including a measure of the preschool classrooms' emotional and relational climate, I was able to reduce the between-person variance in initial status by 23% when compared to the

unconditional growth model. When I added the short set of covariates listed in M6, the between-person variance in initial status was reduced by 59%.

While I am satisfied with the results of fitting M5 and M6, the estimates are not simple to understand. In order to unpack the final results of fitting Model M6, I present Figure 3. In this figure, I have plotted the fitted social competence of children (on the vertical axis) versus the number of months elapsed since the children's entry into preschool (on the horizontal axis). In Panel 1, I depict the social-competence developmental trajectories of two prototypical children in preschool classroom in which 28% of the children had externalizing behaviors rated above the sample 75<sup>th</sup> percentile. While the children experienced equivalent preschool classroom-level of externalizing behaviors, the emotional quality of the preschool classroom they attended differed. Child A attended a preschool classroom with classroom quality that was one standard deviation lower than the average level of classroom quality across classrooms and had a developmental trajectory of social competence that was 1.79 points lower ( $ES = 0.20$  SD) than Child B who attended a preschool classroom with emotional quality that was one standard deviation higher than the average classroom emotional quality in this sample. Panel 2 is similar to Panel 1 in that the prototypical children shown are in preschool classroom with equal classroom-levels of externalizing behaviors. In Panel 2, however, 57% of the children have externalizing behaviors above the sample 75<sup>th</sup> percentile. Child C attended a preschool classroom with classroom quality that was one standard deviation lower than the average level of classroom quality and had a subsequent developmental trajectory of social competence that was 12.70 points lower ( $ES = 1.42$  SD) than Child D

who attended a preschool classroom with emotional quality that was one standard deviation higher than the average classroom emotional quality in this sample.

### **Discussion**

In my study, I explored the relationship between the subsequent development of social competence in early childhood and the social context a child encounters in his or her earliest schooling experience. I found that children's short-term development of social-competence skills was related to the classroom-level of externalizing behaviors. Children in preschool classrooms with a higher proportion of externalizing peers had subsequent developmental trajectories of social competence with lower elevations than children in classrooms with a lower proportion of externalizing peers. In this study, I chose to operationalize preschool classroom-level externalizing behaviors by calculating the proportion of children whose parent-ratings of externalizing behaviors were above the sample mean in that classroom. In doing this, I opted to operationalize the preschool classroom social context in such a way as to focus on the relationship of being exposed to the most extreme levels of externalizing behaviors (Yudron, Jones, & Raver, 2014). While this operationalization focuses preferentially on the presence of children with higher than normal externalizing behaviors, my review of the literature supported this action by suggesting that these children would be most likely to disrupt peer interactions (Kellam et al., 1998).

As in other studies that examine child outcomes in respect to classroom-levels of externalizing behaviors (see, for example, Kellam, et al., 1998; Molano, Jones, Brown, & Aber, 2013; Thomas, Bierman & Powers, 2011), these disruptive and often physically or relationally aggressive behaviors may curtail the opportunities that children have to learn

and practice social skills in a positive, supportive context. Importantly, being deprived of these opportunities may not only limit a child's opportunity to develop social competence but also increase a child's probability of experiencing negative peer relations such as exclusion or rejection (Bierman, 2004).

Of particular importance, my findings also suggest that teachers may offset the impact of high preschool classroom-levels of externalizing behaviors by establishing positive relational and emotional classroom climates. As I demonstrated in Figure 3, when two children who are in preschool classrooms with the same higher-than-average classroom-level of externalizing behaviors but different levels of emotional and relational classroom quality, the child in the higher quality preschool classroom has a much higher elevation of subsequent social-competence development than the child in the lower quality preschool classroom. The magnitude of this difference (12.70 points,  $ES = 1.42$  SD) is far larger than the difference between two children who are in preschool classrooms with the same lower-than-average classroom-levels of externalizing behaviors but different levels of classroom quality. Preschool classrooms with high quality emotional and relational climates may act by transforming the externalizing behaviors of one child into a learning opportunity for the entire classroom as the teacher models appropriate responses to such behaviors and helps the child with the problem behaviors learn alternative social-problem solving skills. Recent evidence suggests that teachers may also shape peer interactions in the preschool and early elementary school classroom directly and, through these actions, also increase the number and quality of positive peer interactions in which children might learn and practice social competence (Farmer, Lines, & Hamm, 2011; Bierman, 2011). It is my hope that future research will begin to unpack



the specific strategies that teachers can deploy to maintain classroom climates in which problem behaviors are treated as learning opportunities rather than distractions.

While the current study represents an important first step toward understanding how children's development of social competence is related to their experiences of the preschool social context, this study does not provide evidence that differences in social contexts across classrooms actually caused the differences I observe in the subsequent developmental trajectories of social competence from age 4 to age 5. Of primary concern, children in the sample who participated in the current study were not randomized to preschool classrooms with differing levels of peer-externalizing behavior and it is likely that there are unobserved processes that guided the assignment of children to classrooms. These unobserved processes may be responsible for the variation observed in both preschool peer externalizing behavior and the subsequent developmental trajectories of social competence.

It is important to note that I used parent-ratings of child externalizing behaviors to characterize initial preschool classroom composition of externalizing behaviors. I did this because my outcome of interest, social competence, was derived from teacher ratings and it is likely that teacher ratings of children's problem behaviors and social skills would be correlated with one another given the shared reporter and shared context in which the measurement occurred. In fact, in the analytic sample examined in this study, there is a moderate, statistically significant correlation between teacher ratings of externalizing behaviors and social competence ( $r = 0.52$ ;  $p < 0.001$ ). Therefore, using parent ratings of externalizing behavior obtained at the beginning of the preschool year helped me avoid

this potential confound, by providing a different perspective on child behavior that also represents behaviors that children enter preschool with rather than develop in preschool.

More important for the properties of my estimation, although classroom quality and child externalizing behaviors were measured four times in the study period, I have chosen deliberately to not include the later classroom quality ratings when modeling the developmental trajectories of social competence over early childhood. I made this decision in order to avoid any potential endogeneity inherent in the peer externalizing behaviors and classroom relational quality measures that were to be treated potentially as predictor and moderator in my statistical models. This potential endogeneity is a concern because social competence is likely developing in tandem with the child's and the peers' externalizing behaviors, and the classroom relational quality, and their values may be affected reciprocally, thereby violating critical assumptions on the independence of predictors and residuals in my multilevel models. Failure to deal with this endogeneity could have led to bias in my parameter estimates.

*Table 1.*

Sample statistics -- including the means, standard deviations, minima and maxima -- of selected variables in the *Chicago School-Readiness Project* (n=279).

Variables	Mean	SD	Minimum	Maximum
<i>Child characteristics</i>				
Male student	0.42	0.49	0	1
Age of Child in Months at beginning of Head Start	48.93	7.42	25.83	61.63
Caucasian student	0.05	0.23	0	1
African American student	0.64	0.48	0	1
Hispanic student	0.27	0.44	0	1
<i>Adult characteristics</i>				
Head Start teacher with BA/BS	0.60	0.49	0	1
<i>Classroom characteristics</i>				
Proportion of all children in each Head Start classroom with parent ratings of externalizing behaviors higher than sample 75 <sup>th</sup> percentile	0.39	0.15	0.13	0.64
Head Start class size	19.14	5.10	13	34
CLASS-Positive Climate Rating	5.63	0.84	4	6.60

Table 2.

Regression coefficients, approximate  $p$ -values and standard errors for fitted multilevel regression models summarizing trajectories of child social competence from entry into preschool through Kindergarten. ( $n=297$  children, followed across three data-collection waves).

	M1 $\beta$ (se)	M2 $\beta$ (se)
<i>Fixed Effects</i>		
Intercept	27.59*** (0.48)	24.84*** (0.60)
Time		0.32*** (0.05)
<i>Random Effects (Variance Components)</i>		
Level-1 (within person)	64.12*** (4.50)	38.23*** (3.68)
Level-2 (between person)		
In initial status	36.43*** (5.76)	53.92*** (8.84)
In rate of change		0.28*** (0.06)
Covariance		-1.73 (0.62)
ICC	0.36	0.59
<i>Model Fit Statistics</i>		
L1: pseudo- $R^2$		0.40
-2LL	-5048.57	-4965.25
AIC	5054.57	4977.25
BIC	5068.71	5004.45

\*\*\*  $p < 0.001$ ; \*\*  $p < 0.01$ ; \*  $p < 0.05$

Table 3.

Regression coefficients, approximate  $p$ -values and standard errors for fitted multilevel regression models summarizing trajectories of child social competence from entry into preschool through Kindergarten. ( $n=297$  children, followed across three data-collection waves).

	M3 $\beta$ (se)	M4 $\beta$ (se)
<i>Fixed Effects</i>		
Intercept	27.80*** (1.34)	28.14*** (1.64)
Classroom-level externalizing behaviors	-7.78* (3.17)	-8.70* (4.07)
Time	0.33*** (0.05)	0.28* (0.14)
Time $\times$ Classroom-level externalizing behaviors		0.13 (0.35)
<i>Random Effects (Variance Components)</i>		
Level-1 (within person)	38.31*** (3.69)	38.31*** (3.69)
Level-2 (between person)		
In initial status	52.24*** (8.73)	52.18*** (8.73)
In rate of change	0.28*** (0.06)	0.28*** (0.06)
Covariance	-1.73 (0.62)	-1.73 (0.62)
ICC	0.58	0.58
<i>Model Fit Statistics</i>		
L1: pseudo- $R^2$	0.00	0.00
L2: pseudo- $R^2$ (initial status)	0.03	0.03
L2: pseudo- $R^2$ (rate of change)	0.00	0.00
-2LL	-5048.57	-4965.25
AIC	5054.57	4977.25
BIC	5068.71	5004.45

\*\*\*  $p < 0.001$ ; \*\*  $p < 0.01$ ; \*  $p < 0.05$

Note: Classroom-level externalizing behaviors is operationalized as the proportion of students in each preschool (Head Start) classroom which were rated by parents as having externalizing behaviors at or above the sample 75<sup>th</sup> percentile.

Table 4.

Regression coefficients, approximate  $p$ -values and standard errors for fitted multilevel regression models summarizing trajectories of child social competence from entry into preschool through Kindergarten. ( $n=297$  children, followed across three data-collection waves).

	M5 $\beta$ (se)	M6 $\beta$ (se)
<i>Fixed Effects</i>		
Intercept	57.38*** (12.30)	39.80*** (12.26)
Classroom-level externalizing behaviors	-136.49*** (3.17)	-147.85*** (33.09)
Positive classroom climate	-4.51* (2.08)	-5.20* (2.04)
Externalizing $\times$ Positive <sup><math>\phi</math></sup>	20.56*** (5.53)	22.38*** (5.48)
Child Age (in months)		0.35*** (0.06)
Child was male		-2.88*** (0.80)
Child was white		-0.73 (1.80)
Economic risk of child's family		0.01 (0.36)
Class size		0.31*** (0.08)
Teacher had a BA/BS		0.42 (0.89)
Time	0.33*** (0.05)	0.34*** (0.05)
<i>Random Effects (Variance Components)</i>		
Level-1 (within person)	38.33*** (3.70)	38.31*** (3.70)
Level-2 (between person)		
In initial status	41.08*** (7.92)	22.11*** (6.70)
In rate of change	0.28*** (0.06)	0.28*** (0.06)
Covariance	-1.54 (0.60)	-0.78 (0.55)
ICC	0.52	0.37
<i>Model Fit Statistics</i>		
L1: pseudo-R <sup>2</sup>	0.00	0.00
L2: pseudo-R <sup>2</sup> (initial status)	0.23	0.59
L2: pseudo-R <sup>2</sup> (rate of change)	0.00	0.00

-2LL	-4918.56	-4870.58
AIC	4936.57	4896.59
BIC	4977.36	4964.57

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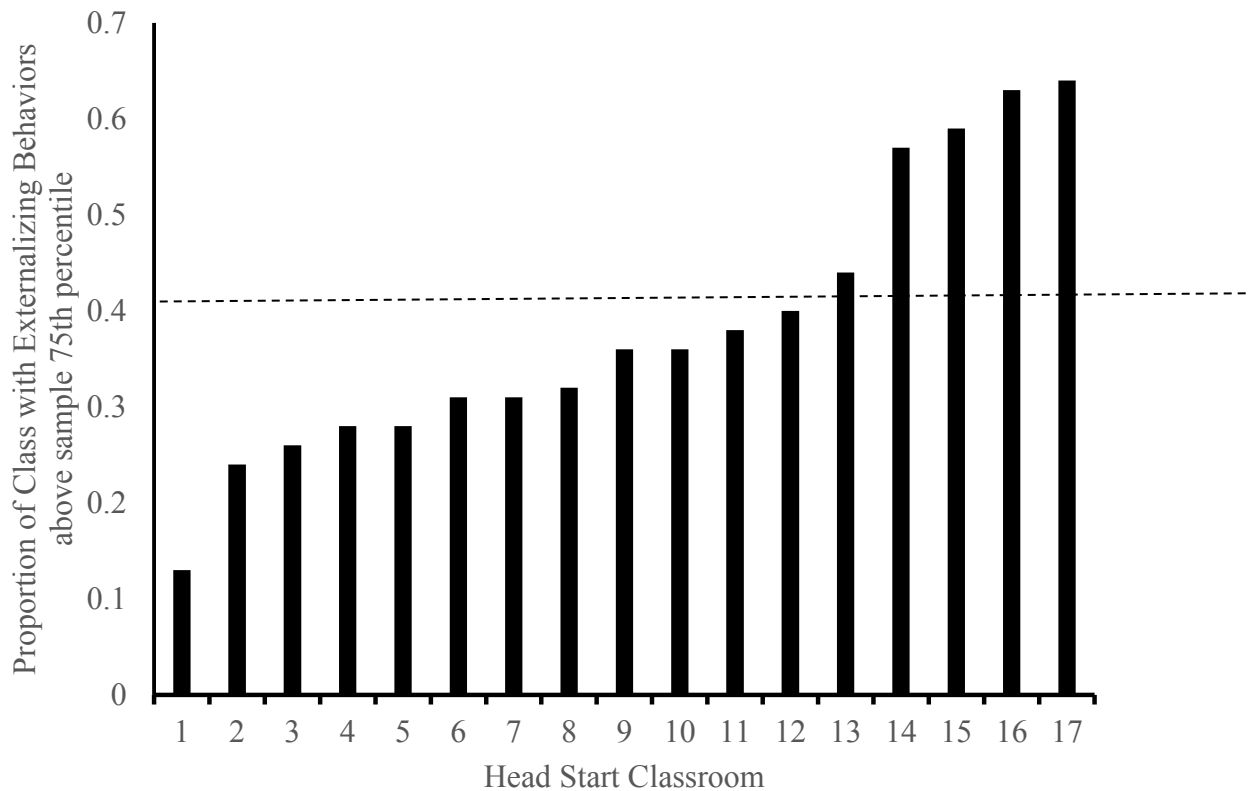
\*\*\*  $p < 0.001$ ; \*\*  $p < 0.01$ ; \*  $p < 0.05$

Note: Classroom-level externalizing behaviors is operationalized as the proportion of students in each preschool (Head Start) classroom which were rated by parents as having externalizing behaviors at or above the sample 75<sup>th</sup> percentile.

<sup>φ</sup> This refers to the interaction between the classroom-level externalizing behaviors and the classroom relational climate.

Figure 1.

Sample proportion of children in each HS classroom for whom parent-ratings of externalizing behaviors were above the sample 75<sup>th</sup> percentile. ( $n_{children} = 297$ ;  $n_{classrooms} = 17$ ). The dashed line represents the sample mean proportion of classroom composition of externalizing behaviors ( $M = 0.39$ )





*Figure 2.*  
Fitted individual growth trajectories of social competence for three prototypical children. These trajectories illustrate the unconditional main effect of the proportion of students whose parent ratings of externalizing behaviors are above the sample 75th percentile on the development of social competence from preschool through kindergarten. Child A is in a classroom in which 28% of the children received rating of externalizing behaviors above the sample 75<sup>th</sup> percentile. Child B is in a class in which 36% of the children received these high parent ratings and child C is in a class in which 57% of the children received these high ratings.

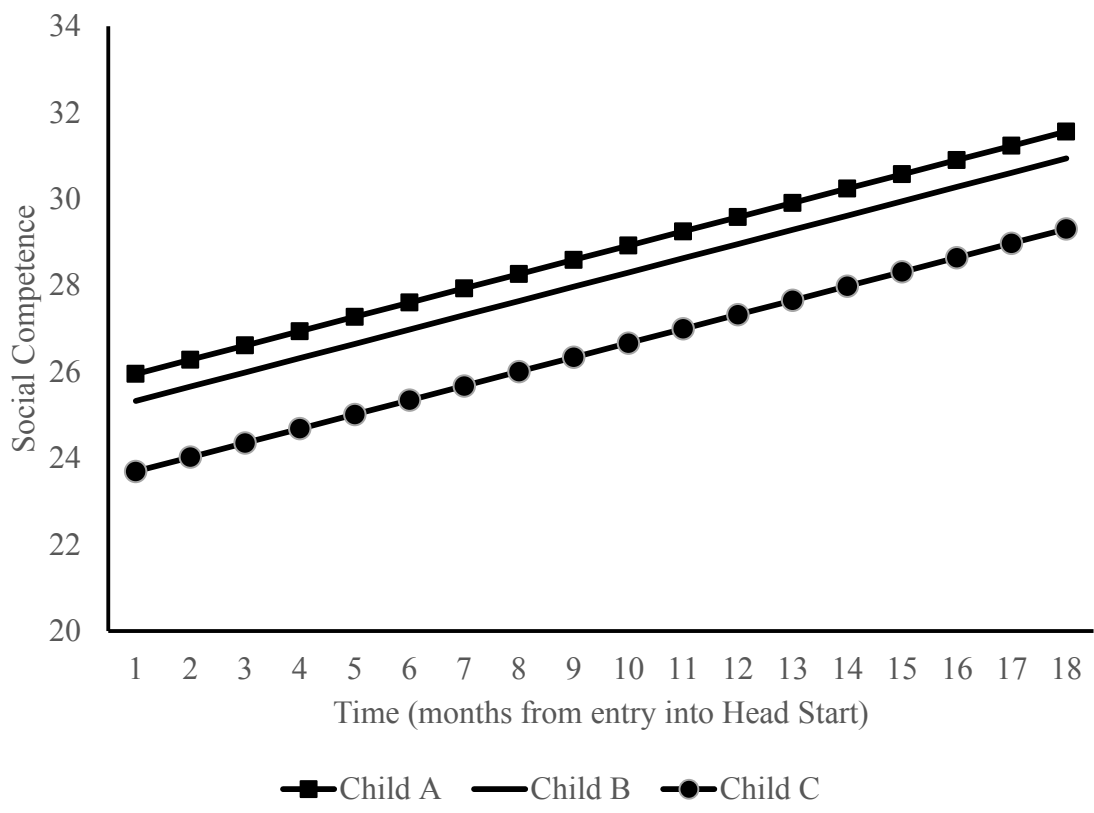
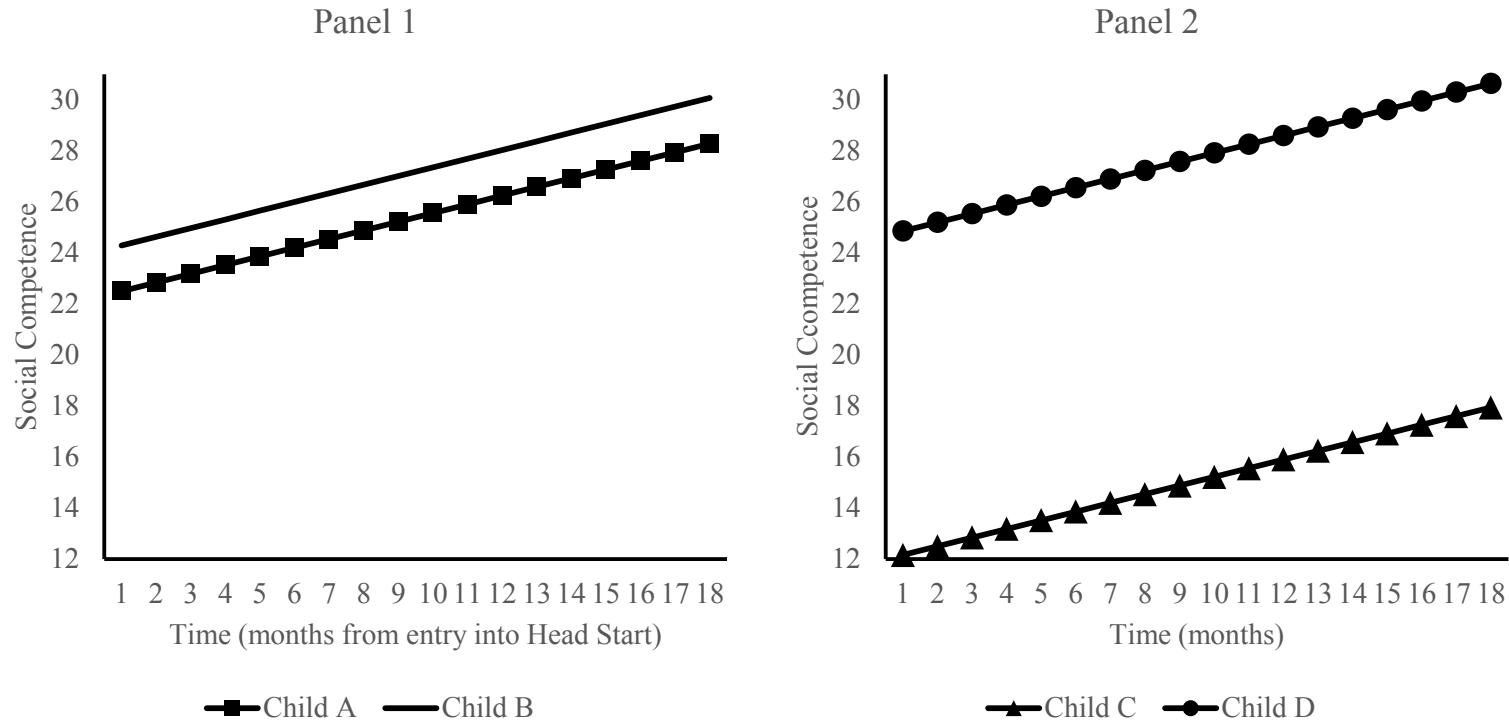


Figure 3.

Fitted trajectories comparing the relationships between classroom composition of externalizing behaviors and classroom climate. Panel 1 shows developmental trajectories of two prototypical children each in a classroom with the same classroom composition of externalizing behaviors. 28% of the children in the classrooms attended by children in Panel 1 had externalizing behaviors above the sample 75<sup>th</sup> percentile. Child A is in a classroom with lower than average positive classroom climate. Child B is in a classroom with higher than average positive classroom climate. Panel 2 shows developmental trajectories for two prototypical children each in a classroom with the same classroom composition of externalizing behaviors. 57% of the children in the classrooms attended by children in Panel 2 had externalizing behaviors above the sample 75<sup>th</sup> percentile. Child C is in a classroom with lower than average positive classroom climate. Child D is in a classroom with higher than average positive classroom climate.



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**Vita**

1993-1998	Purdue University West Lafayette, IN	B.S. May 1998
1998-2001	Teacher Columbus North High School Columbus, IN	
2001-2003	Teacher Akins High School Austin, TX	
2003-2007	Science Editor Holt, Rinehart and Winston Austin, TX	
2007-2008	University of Texas Austin, TX	M.A. May 2008
2007-2008	Research Assistant Population Research Center University of Texas Austin, TX	
2008	Legislative Aide Texas House of Representatives Austin, TX	

2008-2015	Doctor of Education Candidate, Harvard Graduate School of Education Cambridge, MA	
2009-2015	Research Assistant Harvard University Cambridge, MA	
2009-2015	Teaching Fellow Harvard Graduate School of Education Cambridge, MA	
2012	Harvard Graduate School of Education Prevention Science and Practice Cambridge, MA	Ed.M. May 2012
2013	Instructor in Education Harvard Graduate School of Education Cambridge, MA	
2013-2015	K1DS Evaluation Director Boston Public Schools Boston, MA	