

School Readiness in an Early Childhood Population

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Boston College
Lynch School of Education

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Counseling Psychology Doctoral Program

SCHOOL READINESS IN AN EARLY CHILDHOOD
POPULATION

Dissertation
By

SARAH BACKE

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2015

School Readiness in an Early Childhood Population

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School readiness at kindergarten is an important predictor of children's future academic success (Duncan et al., 2007). While early pre-academic and behavioral skills are important for all students, there is considerable inequality in students' levels of readiness at the start of school (Coley, 2002; Lee & Burkam, 2002; Razza, Martin & Brooks-Gunn, 2010; Ryan, Fauth, & Brooks-Gunn, 2006; Welsh, Nix, Blair, Bierman & Nelson, 2010), and research has pointed to a range of out-of-school and poverty-related factors that contribute to these inequalities (Coley, 2002; Dearing, 2008; Foster, 2002; Hill, 2001; Razza et al., 2010; Ryan et al., 2006). This study utilizes relational developmental systems theory (Lerner, 2006; 2011) to examine the individual and contextual factors that co-act dynamically to shape and predict student outcomes. Specifically, this study extends the body of research on early child development by examining the factors that predict school readiness skills within a sample of 521 young children preparing to enter the first grade from urban early education programs. Multilevel regression models indicate that student characteristics, classroom characteristics, and peer contexts each predict students' school readiness scores, and that the interactions among these variables make unique contributions to the prediction of school readiness scores as well. Implications for theory, policy, and practice are discussed along with recommendations for future research.

TABLE OF CONTENTS

Chapter 1: Introduction	1
Relational Developmental Systems Theory	2
School Readiness	3
Inequalities in School Readiness	3
City Connects.....	5
Overview of the Study	6
Rationale for the Study	7
 Chapter 2: Literature Review.....	 9
Relational Developmental Systems Theory	9
Poverty and Early Child Development	14
Socioeconomic Inequalities in School Readiness.....	22
Prevention and Intervention.....	25
City Connects.....	27
Developmental Contexts of Early Childhood Education.....	33
The Current Study.....	36
 Chapter 3: Research Design and Methods	 39
Research Design.....	39
Sample.....	40
Measures	40
Procedure	43
Analysis.....	45
 Chapter 4: Results.....	 47
Preliminary Analysis.....	48
Primary Analysis.....	55
Ad Hoc Analysis.....	72
Results by Hypothesis.....	79
 Chapter 5: Discussion.....	 82
Review and Discussion of Findings.....	82
Limitations	96
Implications of Research.....	99
Summary & Conclusions	104
 References.....	 106

Tables

Table 1. <i>Student demographics</i>	49
Table 2. <i>Student demographics by City Connects status</i>	50
Table 3. <i>Classroom characteristics</i>	51
Table 4. <i>Classroom characteristics by City Connects status</i>	51
Table 5. <i>Student behavior scores at end of kindergarten</i>	52
Table 6. <i>School readiness scores at start of preschool and end of kindergarten</i>	52
Table 7. <i>Student behavior and school readiness scores by City Connects status</i>	53
Table 8. <i>Correlations among student characteristics and school readiness</i>	54
Table 9. <i>Correlations among classroom characteristics and school readiness</i> ..	55
Table 10. <i>Aim 1 – Unconditional model</i>	56
Table 11. <i>Aim 1 – Unconditional model variance</i>	56
Table 12. <i>Aim 1 – Level 1 model</i>	58
Table 13. <i>Aim 1 – Level 1 model variance</i>	58
Table 14. <i>Aim 2 – Unconditional model</i>	60
Table 15. <i>Aim 2 – Unconditional model variance</i>	60
Table 16. <i>Aim 2 – Level 1 model</i>	62
Table 17. <i>Aim 2 – Level 1 model variance</i>	62
Table 18. <i>Aim 3 – Multilevel model</i>	63
Table 19. <i>Aim 3 – Multilevel model with interaction terms</i>	64
Table 20. <i>Aim 3 – Multilevel model with interaction terms variance</i>	65
Table 21. <i>Aim 4 – Unconditional model variance</i>	67
Table 22. <i>Aim 4 – Level 1 model</i>	68
Table 23. <i>Aim 4 – Level 1 model variance</i>	69
Table 24. <i>Aim 4 – Multilevel model</i>	70
Table 25. <i>Aim 4 – Multilevel model with interaction terms</i>	71
Table 26. <i>Aim 4 – Multilevel model with interaction terms variance</i>	72
Table 27. <i>Ad Hoc Analysis I – Unconditional model</i>	73
Table 28. <i>Ad Hoc Analysis I – Unconditional model variance</i>	73
Table 29. <i>Ad Hoc Analysis I – Level 1 model</i>	74
Table 30. <i>Ad Hoc Analysis I – Level 1 model variance</i>	74
Table 31. <i>Ad Hoc Analysis II – Unconditional model</i>	75
Table 32. <i>Ad Hoc Analysis II – Unconditional model variance</i>	75
Table 33. <i>Ad Hoc Analysis II – Level 1 model</i>	76
Table 34. <i>Ad Hoc Analysis II – Level 1 model variance</i>	77
Table 35. <i>Ad Hoc Analysis II – Multilevel model</i>	78
Table 36. <i>Ad Hoc Analysis II – Multilevel model variance</i>	78

Chapter 1: Introduction

School readiness at kindergarten is an important predictor of children's future academic success (Duncan et al., 2007). While early pre-academic and behavioral skills are important for all students, there is considerable inequality in students' levels of readiness at the start of school (Coley, 2002; Lee & Burkam, 2002; Razza, Martin & Brooks-Gunn, 2010; Ryan, Fauth, & Brooks-Gunn, 2006; Welsh, Nix, Blair, Bierman & Nelson, 2010). Researchers have pointed to a range of factors that contribute to these inequalities, many of which are related to out-of-school factors such as parental education, access to resources, and poverty (Coley, 2002; Dearing, 2008; Foster, 2002; Hill, 2001; Razza et al., 2010; Ryan et al., 2006).

Relational developmental systems theory (Lerner, 2006; 2011) affirms that risk and protective factors co-act dynamically with one another to shape student outcomes; there is no single risk or promotive factor that can predict school readiness. For psychologists and educators seeking to promote school readiness, then, it becomes necessary to engage multiple contexts in children's lives. It is not enough to promote a single-faceted intervention strategy (e.g., encouraging parents to read to their children or requiring advanced certifications of early educators; Lerner & Overton, 2008). Instead, interventionists must engage in systems of student support that are more comprehensive. Optimized student support is that which considers the full range of student needs and strengths in order to support young children's learning and thriving (Adelman & Taylor, 2011; City Connects, 2010).

This study aims to extend the body of research on early child development by examining the factors that promote school readiness skills within a sample of young

children preparing to enter the first grade from urban early education programs. School readiness skills in this study are operationalized in terms of early literacy and math skills, in accordance with state guidelines for early childhood education (Bracken, 2007). This study examines the relationship between school readiness skills and select school characteristics (i.e., poverty density), classroom characteristics (i.e., class size), peer characteristics (i.e., peer school readiness and behavior scores), and individual characteristics (i.e., age, sex, years of early education, and individual student behavior scores). In addition, a unique model of optimized student support, an intervention known as City Connects (City Connects, 2010; 2012; 2014; Walsh et al., 2000), has also been examined in terms of its impact on students' school readiness scores. Multilevel regression models are used to determine whether individual characteristics, contextual factors, and/or the dynamic interactions among these variables, are predictive of school readiness skills. Finally, potential implications for practice and theory will be discussed.

Relational Developmental Systems Theory

Relational developmental systems theory offers a framework for understanding and addressing the complex constellation of factors that contributes to children's development. Specifically, relational developmental systems theory highlights the importance of dynamic and interacting contexts (or variables) as a way of better understanding children's developmental trajectories (e.g., Lerner, 2006; 2011; Masten & Cicchetti, 2010). When applied to the domains of school readiness and academic thriving, relational developmental systems theory underscores the importance of taking a multifaceted intervention strategy (i.e., addressing academic skills along with nonacademic barriers) in order to optimize student development. Such a multifaceted

intervention strategy is understood to interact dynamically with the multitude (and multiple levels) of characteristics that make each child unique – these dynamic transactions yield systems of reciprocal causality that in turn shape development (Lerner & Overton, 2008; Overton & Lerner, 2012). In understanding school readiness development, it is important to consider both the characteristics of the individual child and the formative nature of his/her developmental contexts.

School Readiness

This study utilizes a relational developmental systems framework to examine the conditions that predict school readiness skills in a sample of young children in early education programs. School readiness skills have been defined within the field of early education as the intellectual, attentional, social, and behavioral skills necessary for successful school entry (Duncan et al., 2007). School readiness at kindergarten is an important predictor of children's future academic success. In a recent review of the literature, Duncan and colleagues (2007) linked early academic, attention, and socio-emotional skills to later academic achievement in reading and math, with effects persisting into middle school. In a distinct body of research, Coley and colleagues at the Educational Testing Service (2002) have documented inequalities in school readiness that are linked to socioeconomic status (SES), with children in lower SES groups underperforming relative to their peers.

Inequalities in School Readiness

Researchers have proposed multiple theories to explain why students who come from lower SES groups tend to start school behind their peers in early academic skills. Primarily, these theories focus on parental investment, parental stress, and environmental

exposures (Ryan et al., 2006). More specifically, researchers interested in parental investments have noted that parents with limited financial resources are less able to invest time, money, and energy into their children's development (Foster, 2002). As a result, children living in poverty have less access to a range of resources, from quality health care to reading materials (Karoely, Kilburn, & Cannon, 2005).

In another approach to explaining the connection between poverty and child development, researchers that study parental stress point to the link between poverty, parental stress, and parenting. According to these studies, parents living in challenging economic circumstances show lower levels of positive parenting practices, and their children in turn show lower levels of school readiness (Hill, 2001). High levels of parent stress have also been linked to parental mental health problems, which in turn predict less warm and more punitive parenting styles (Dearing, 2008).

Finally, child development in the context of poverty has been linked to higher levels of exposure to chaotic and unhealthy environments. Children living in poverty are more likely to be exposed to poor quality housing, lead poisoning, and other physical dangers (Evans, 2004; Evans, Gonella, Marcynyszyn, Gentile & Salpekar, 2005). This exposure is in turn linked to health problems that disrupt children's ability to learn and thrive in school (Berliner, 2009).

While researchers and policymakers have pointed to a range of factors to explain inequalities in school readiness, out-of-school and nonacademic factors are clearly at play. In fact, researchers have consistently documented the impact of these out-of-school and/or nonacademic factors on academic achievement and student thriving (Barton & Coley, 2009; Berliner, 2009). It is necessary, therefore, for psychologists and educators

seeking to promote school readiness to address not only academic skills, but nonacademic barriers to learning as well.

City Connects

Given the complexities of the relationship between poverty and early childhood outcomes, relational developmental systems theory offers a useful framework for intervention. In order to optimize student development, a relational developmental systems approach suggests that it is necessary to attend not only to individual risk factors, but to the interactions among individuals and contexts as well. The real-world application of developmental theory is a crucial contribution to basic science from a relational developmental systems perspective. By studying the application of changes in children's contexts, developmental scientists are able to observe and appreciate the dynamic, relational, multicausal nature of development (Lerner & Overton, 2008). When applied to the domains of school readiness and academic thriving, relational developmental systems theory underscores the importance of taking a multifaceted intervention strategy (i.e., one that addresses academic skills along with nonacademic barriers) in order to leverage student and contextual strengths to promote learning and thriving.

The intervention examined in this study, City Connects, is a school-based student support system that is rooted in relational developmental systems theory. City Connects is designed to alleviate nonacademic barriers to student achievement and thriving across multiple domains of development by leveraging community resources to both promote student strengths and address student needs (Walsh, Madaus et al., 2014). At the core of the intervention is a School Site Coordinator who collaborates with classroom teachers to

assess the strengths and needs of each student in the classroom and then connects each child to a uniquely tailored set of support and enrichment services. Consistent with the current literature on what factors impact school readiness, the intervention connects students with supports and enrichment opportunities across the domains of family, health, academics, and social/emotional development. In addition to supporting the intra-individual aspects of child development, these supports and opportunities can shape the contexts that support school readiness by alleviating family stressors (e.g., connecting families to housing assistance), supporting positive and consistent parenting practices (e.g., by connecting parents to workshops or support groups), and connecting students to resources to which they otherwise would not have access (City Connects, 2009; Walsh, Madaus et al., 2014). Previous studies with an elementary school population have linked involvement with City Connects to improvements in student health, achievement, and thriving (City Connects, 2010; 2012; 2014; Walsh, Madaus et al., 2014).

Overview of the Study

The purpose of this study is to examine some of the factors that impact the school readiness skills of young children who are preparing to enter first grade. Specifically, it will examine the relationship between school readiness and student characteristics, classroom characteristics, and school contexts. Stated another way, this study aims to address the following questions:

1. Within the dissertation sample, what student characteristics (i.e., age, race, gender) predict school readiness at the time of entry into preschool?

2. After controlling for initial school readiness performance, do student characteristics (i.e., age, race, gender, years of early education) and behavior predict school readiness performance at the close of kindergarten?
3. After controlling for initial school readiness performance and student characteristics, do school/classroom characteristics (i.e., class size, City Connects status, poverty density) predict school readiness at the close of kindergarten?
4. After controlling for initial school readiness performance, student characteristics, and classroom characteristics, does peer context in the classroom (i.e., peer knowledge and behavior) predict school readiness at the close of kindergarten?

Rationale for the Study

The importance of school readiness is well-established within the literature, but gaps remain in identifying and evaluating best practices in promoting the development of these skills. This study adds to the intervention literature in early child development by contributing to the field's current level of understanding about the factors that may promote school readiness development.

Specifically, this study examines the conditions that predict school readiness skills for children enrolled in urban early education programs. The potential impact of a preventive intervention, City Connects, on the development of school readiness skills in an urban preschool population is explored. This intervention is unique in that it works systemically to address a range of risk factors that may threaten the development of school readiness skills, while also promoting the strengths of students and their families. Such an approach is consistent with relational developmental systems theory, and previous research on City Connects with an elementary school population has

demonstrated positive impacts on students' academic achievement and thriving (City Connects, 2010; 2012; 2014). This study builds upon that body of research and extends it to a new target population, early childhood students.

Chapter 2: Literature Review

Relational developmental systems theory provides a framework for understanding the dynamic transactional nature of child development, particularly in the context of internal and external factors that shape child outcomes (Lerner, 2006; 2011; Lerner & Overton, 2008; Overton & Lerner, 2012). This chapter will use this theoretical perspective to understand documented inequalities in school readiness (Coley et al., 2002), and in particular the impact of poverty on early childhood development (Dearing, 2008). Following this review of the literature, the chapter will introduce City Connects (City Connects, 2010; 2012; 2014; Walsh, Madaus et al., 2014), a systemic intervention that is designed to address the out-of-school factors that serve as barriers to student learning and thriving (Berliner, 2009). Finally, the study's research questions and hypotheses will be described.

Relational Developmental Systems Theory

The totality of children's social, emotional, physical, and academic development occurs in context. Relational developmental systems theory is a theoretical framework that both makes this assertion and builds upon it, articulating the nuances of development within and across individuals and contexts (Lerner, 2006; 2011; Lerner & Overton, 2008; Overton & Lerner, 2012). Specifically, relational developmental systems theory is a more recent version of developmental contextualism which posited that (a) development occurs at multiple levels of organization, (b) transactions between the individual and his/her contexts shape development, (c) development occurs across the lifespan, and (d) development is shaped by risk and promotive factors (Lerner, 2011; Walsh, Galassi,

Murphy, & Park-Taylor, 2002). These basic principles of development serve as the conceptual frame for this study; each will be described in more detail below.

Development occurs at multiple levels of organization

According to relational developmental systems theory, development occurs simultaneously across multiple levels within a given individual and across multiple contexts (Lerner, 2006; 2011; Lerner & Overton, 2008; Walsh, DePaul & Park-Taylor, 2009).

Within the individual, the three major levels of development are the biological, psychological, and social/sociocultural (Lerner & Castellino, 2002; Walsh et al., 2009; Walsh, Galassi, Murphy & Park, 2002). Biological development encompasses outwardly visible changes, such as changes in height and weight, as well as internal changes such as neurological development. Psychological development includes the child's changing patterns of thoughts, feelings, and behavior (e.g., the regulation and expression of affect, executive functioning). Social development reflects the changing ways in which the child engages with the people around him/her (e.g., through communication, sharing, making requests). While each of these domains is somewhat distinct, they are nonetheless intricately connected to one another and are mutually dependent. While many theories of development reflect a multidimensional understanding of child development (i.e., one that recognizes the distinctions among the biological, psychological, and social aspects of development), relational developmental systems theory is unique in that it emphasizes the relationships among these domains as primary (Lerner & Castellino, 2002; Overton, 2011; Overton & Lerner, 2012).

In addition to recognizing the complexities of multiple distinct but interdependent domains of development within the individual, relational developmental systems theory positions development in the context(s) in which it is occurring. Bronfenbrenner's (1994) ecological systems theory has articulated multiple interacting systems, or contexts, in which children develop. Ranging from the microsystem of the family or classroom environment to the macrosystems of culture and political context, there are a multitude of interacting contexts in which early development occurs. More recent iterations of this theory have further embedded larger ecological systems within (changing) time (Lerner, Lynch, & Boyd, 2008; Lerner & Overton, 2008).

Individual – Context Transactions

Developmental systems theory integrates all levels of organization, from the genetic to the sociohistorical, into a single dynamic system (Lerner & Overton, 2008; Overton & Lerner, 2012). More specifically, Lerner asserts that all levels of the ecology of human development “are fused in a fully coacting, mutually influential, and therefore dynamic system” (Lerner, 2006, p. 10). Stated another way, child development occurs in a dynamic and transactional system in which a child's individual characteristics shape and are shaped by multiple dynamic contexts (Lerner, 2011; Sameroff, 2000).

Fundamentally, these relationships are multidirectional, such that mutual influence exists across levels of developmental systems. While distinctions have been made between the individual (with multiple levels of development) and his/her (multiple) contexts in the section above, it is important to note that the relational developmental systems perspective locates the *relationships* among systems as absolutely primary – the individual vs. environment binary is rejected in favor of a systems-based approach that

affirms the multiple transactional *relationships* among the intraindividual and environmental contexts that shape development (Overton & Lerner, 2012).

Developmental Plasticity over the Lifespan

The hallmark, then, of relational developmental systems theory is plasticity, or the ever-present potential for change (Overton & Lerner, 2012). In the context of a dynamic developmental system, both the individual and his/her contexts are understood to have a degree of relative malleability across the lifespan; individuals and contexts consistently have the capacity for change and development (Lerner, 2004; 2006; 2011). While the potential for change is there, its nature is limited by previous development and current contextual factors (Lerner, 1996). Young children have relatively greater plasticity than older adults, because their developmental trajectories are shaped by fewer prior developmental experiences. Likewise, contexts can undergo changes that are constrained by both previous change and other interacting contexts, including those presented by the child. Ultimately, it is the relationships among intra-individual and contextual levels within a developmental system that shape changes in the child and/or that child's context (Lerner, 1996; 2006; 2011). As a result of the relationships within and among individuals and their contexts, and the relative plasticity of both, the possible developmental pathways that lay before a single child are many (Masten & Cicchetti, 2010). The term multifinality is used to capture the multitude of outcomes that can arise from a single starting point, while the complementary term equifinality asserts that a single outcome can be reached through myriad pathways (Cicchetti & Rogosch, 1996; Cicchetti & Sroufe, 2000). For each moment in a child's development then, there are transactions occurring among the multiple domains of development and the multiple contexts of that

child's life that serve to either promote positive developmental outcomes or put the child at risk of more negative developmental outcomes. From one point in time a child can go many places, and he/she can likewise follow a range of pathways to end up at a single developmental outcome. Each developmental pathway is shaped by complex positive and negative feedback loops that are in turn the result of transactions among environmental and intraindividual contexts (Overton & Lerner, 2012). For interventionists, then, the task becomes the successful leveraging of individual—context transactions to promote positive developmental outcomes and optimize change mechanisms across the lifespan (Lerner & Overton, 2008).

Risk and Resilience

With its emphasis on transactions and complex individual—context interactions, relational developmental systems theory offers a unique lens for understanding the vast range of developmental trajectories that lay before a single child. As a metatheory, relational developmental systems theory not only explains how development happens, but how it can be shaped (Lerner & Overton, 2008). If individuals and contexts are each relatively plastic and mutually influential, then it should be possible to leverage the strengths and assets of each to promote positive developmental outcomes (Lerner, 2006; Lerner & Overton, 2008).

In the context of lifespan development, those factors that are associated with negative life outcomes are considered risk factors, while those that are associated with more positive outcomes are considered protective or promotive factors (Cicchetti, 2006; Rutter & Sroufe, 2000). Early theorists believed that children's developmental outcomes could be understood simply as a function of the risk and promotive factors in their lives

(Appleyard, Egeland, vanDulmen & Sroufe, 2005; Rutter, 1979). If the sum of a child's risk factors was too great, that child was understood to be on a poor trajectory that could only be offset by a comparable quantity of protective or promotive factors (Rutter, 1979). More contemporary developmental-contextual perspectives highlight the dynamic and transactional nature of child development, such that risk and promotive factors, within the child and his/her contexts, interact with one another to shape child development (thus moving beyond a simple cumulative model; Jensen, Hoagwood, & Zitner, 2006; Overton & Lerner, 2012). Relational developmental systems theory proposes that child development is often nonadditive and nonlinear. Embracing the complexity of relational dynamic systems, it emphasizes the multidirectional causal relationships inherent in the "spontaneously active (dynamic), changing (developing), relational, holistic (integrated) system" that characterizes development (Overton & Lerner, 2012, p. 376). Within these dynamic transactional contexts then, individual and contextual strengths can be leveraged to promote positive developmental outcomes even in the face of individual and contextual risks (Lerner & Overton, 2008; Masten, 2007). Children who overcome hardship to achieve positive developmental outcomes are characterized as resilient (Masten & Coatsworth, 1998; Masten, 2001; 2007).

Poverty and Early Child Development

One of the most pervasive and detrimental contexts that shapes children's development is poverty. As of 2010, 22% of children in the United States, and 25% of children under age 5, were living poverty (US Census Bureau, 2010). The impacts of poverty on children, and on young children in particular, are well established. A review of the literature indicates that, on average, children growing up in poverty have

diminished cognitive and language capacities, poorer health, and more emotional and behavioral problems than their peers who are not living in poverty (Dearing, 2008). The impacts of poverty on the multiple domains of early child development will be discussed in more detail below.

Impacts on cognitive development

One of the strongest and most pervasive impacts of poverty on child development is in the domain of cognitive functioning. Whether it is measured in terms of intelligence, verbal skills, reasoning, scholastic achievement, or school readiness, children who are living in poverty consistently underperform relative to their peers (Barajas, Philipsen, & Brooks-Gunn, 2007; Bradley & Corwyn, 2002; Dickerson & Popli, 2012; Duncan & Brooks-Gunn, 1997; Najman et al., 2009; Ryan et al., 2006; Schoon, Jones, Cheng & Maughan, 2012). The implications of these early deficits are significant, as on average these children are more likely to underperform academically, to be held back, and eventually to drop out of school (Barajas et al., 2007).

When one examines the relationship between poverty and cognitive ability more closely, it appears that differences in functioning first emerge around age two, when objective measures begin to tap into vocabulary and reasoning skills (Barajas et al. 2007; Smith, Brooks-Gunn & Klebanov, 1997). The differences in cognitive functioning by SES are manifest across measures, including the Bayley IQ test (National Institute of Child Health and Human Development Early Child Care Research Network, 2005; Smith et al., 1997), Peabody Picture Vocabulary Test (Smith et al., 1997), various intelligence measures (Stanford-Binet – Smith et al., 1997; WPPSI – Kainz, Willoughby, Vernon-Feagans, Burchinal & The Family Life Project Investigators, 2012), achievement

indicators (WRAT Najman et al., 2009; Smith et al., 1997), and rates of learning disability diagnosis (Brooks-Gunn & Duncan, 1997). While differences in cognitive functioning emerge early in development for children living in poverty, they persist or even grow by the time children enter school at age five (Barajas et al., 2007; Smith et al., 1997).

Although there are a host of possible confounds in this work, family income has consistently been documented as a significant predictor of children's intelligence, even when other family characteristics are taken into account. Some of the factors that have proven less impactful than poverty, or that operate as a distinct mechanism from poverty, include family instability (Schoon et al., 2012), maternal education (Brooks-Gunn, Duncan, & Maritato, 1997; Smith et al., 1997), household structure (Smith et al., 1997), family educational expectations (Lee & Burkam, 2002), access to high-quality child care (Lee & Burkam, 2002), and home reading environments (Lee & Burkam, 2002). Furthermore, poverty has been demonstrated to interact with associated risk factors – such as being in a single-parent household, living in highly crowded environments, having a depressed caregiver, and experiencing multiple life stressors – to predict greater problems with cognitive and behavioral self-regulation (Roy & Raver, 2014).

While the impact of poverty cannot be explained away by some of its correlates, research on the relationship between poverty and cognitive functioning has been further strengthened by the body of research examining the importance of the depth and duration of poverty in shaping cognitive outcomes (Barajas et al., 2007; Dearing, 2008; Najman et al., 2009; NICHD, 2005; Smith et al., 1997). On average, children living in deep poverty have lower IQ scores than near-poor children, and children who are persistently

poor show gaps in cognitive development that increase as children get older and continue to live in conditions of poverty (Barajas et al. 2007; Smith et al., 1997). Children who are exposed to poverty more frequently likewise have poorer cognitive outcomes (Najman et al., 2009). Some have argued that this income effect is due to the types of home learning environments that families are able to provide (Duncan & Brooks-Gunn, 1997; Najman et al., 2009); the possible mechanisms through which poverty impacts early child development will be discussed in more detail later in this chapter.

Impacts on language development

Within the context of poverty's impact on children's cognitive development, it is important to highlight the specific impact of poverty on children's early language. Research consistently demonstrates that children in poverty, on average, have lower verbal abilities than their peers (Hackman & Farah, 2008; Ryan et al., 2006; Smith et al., 1997; Vernon-Feagans, Garrett-Peters, Willoughby, Mills-Koonce, & The Family Life Project Key Investigators, 2012). In a nationally representative sample of young children, Smith and colleagues found that income effects were particularly significant in terms of children's early literacy skills, as compared to math (Smith et al., 1997). More recent research has confirmed this finding, revealing that while poor children often catch up to their peers in terms of pre-literacy skills like letter recognition, gaps remain in more complex skills like reading words in context (Barajas et al., 2008). Neuroimaging studies have likewise confirmed that SES is significantly related to cognitive performance, particularly in the domains of language and executive functioning (Hackman & Farah, 2008).

Impacts on health

The impact of poverty on young children's health is well-documented and occurs through a variety of mechanisms. Children living in poverty are more likely to be born prematurely or at low birth weight, which is a known risk factor for a host of detrimental child outcomes (Berliner, 2009; Brooks-Gunn & Duncan, 1997; Korenman & Miller, 1997). Postnatally, children living in poverty are more likely to experience food insecurity (Berliner, 2009), poor nutrition (Korenman & Miller, 1997), chronic health problems (Carroll, 2013), or to have stunted growth due to malnutrition (Brooks-Gunn & Duncan, 1997). Along with their families, they generally have less access to quality health care and/or insurance (Berliner, 2009; Brooks-Gunn et al., 1997) and are exposed to greater levels of environmental pollutants such as lead (Berliner, 2009; Brooks-Gunn & Duncan, 1997). Poverty's impact on health can also serve as a mechanism for poverty's impact on children's cognitive development, such that poor health is associated with poor cognitive and learning outcomes (Basch, 2011; Crosnoe, 2006; Grantham-McGregor & Ani, 2001; Jackson, Vann, Kotch, Pahlel & Lee, 2011). Given these many accumulating risk factors, children living in poverty are less likely than their peers to enter school ready to learn and thrive.

Impacts on social-emotional development

Of final note with regard to the impact of poverty on early child development is the domain of children's social and emotional growth. Poverty has consistently been demonstrated to be associated with both internalizing and externalizing problems in children (Barajas et al., 2007; Brooks-Gunn et al., 1997; McLeod & Nonnemaker, 2000; Pachter, Auinger, Palmer & Weitzman, 2006; Roy & Raver, 2014; Ryan et al., 2006;

Slopen, Fitzmaurice, Williams & Gilman, 2012; Yoshikawa, Aber, & Beardslee, 2012), such that children ages 4 to 11 living in poverty are three times as likely as their peers to carry a psychiatric diagnosis (Lipman & Offord, 1997). For families living in poverty, income-to-needs ratios are significantly correlated with maternal reports of behaviors such as aggression, tantrums, anxiety, and moodiness (Brooks-Gunn et al., 1997; McLeod & Nonnemaker, 2000). While poverty's impact on children's cognitive development has been shown to function through direct and indirect causal mechanisms, the relationship between poverty and children's social and emotional outcomes is more often mediated by other associated factors. Such mediating factors include maternal mental health, maternal education, family structure/size, neighborhood context (e.g., overcrowded residential spaces, low levels of adult employment), and parenting practices (NICHD, 2005; McLeod & Nonnemaker, 2000; Pachter et al., 2006; Roy & Raver, 2014).

Mechanisms of Poverty's Impact

Researchers have proposed multiple theories to explain why students who come from lower SES groups tend to exhibit the range of cognitive, language, health, and social-emotional outcomes described above. Primarily, these theories focus on (a) family investment, (b) family stress, and (c) exposure to stressful or chaotic home and neighborhood contexts (Dearing, 2008; Ryan et al. 2006; Walsh & Backe, 2013; Yoshikawa et al., 2012).

Family Investments

Children and families living in poverty experience economic conditions that make it difficult/impossible to access resources that promote healthy development. Poverty constrains the investment of money, time, and energy (Foster, 2002). Specifically,

children in poverty have limited access to resources such as health care, high quality child care, and reading materials (Berliner, 2009; Karoly et al., 2005), and are likewise less likely to have age appropriate toys and computers in the home (Bradley, Corwyn, McAdoo, & Garcia Coll, 2001). In contrast, research shows that families who have access to greater financial resources are able to make investments in their children's development that set them well ahead of their peers in terms of early cognitive and social-emotional development (Murnane & Duncan, 2011). While family investments and resources may impact child development across a host of domains, research has shown that they are most strongly predictive of children's cognitive performance (Ryan et al., 2006)

Family Stress and Parenting

While poverty certainly impacts children's development by limiting access to resources, it also intensifies levels of caregiver stress, which in turn shapes parenting behavior (Dearing, 2008; Yoshikawa et al., 2012). Researchers that focus on parenting stress and practices demonstrate that parenting style (including such variables as maternal warmth and patience) is predictive of a range of child developmental outcomes, including physical health and development; mental, emotional, and behavioral health; and cognitive development and learning (Yoshikawa et al., 2012). In studies explicitly focusing on school readiness, parenting practices are particularly predictive for low-income families, such that parents living in challenging economic circumstances show lower levels of positive parenting practices, and their children in turn show lower levels of school readiness (Hill, 2001). High levels of parental stress can also be related to parental mental health problems, which in turn predict less warm and more punitive parenting

(Dearing, 2008). Overall, family stress seems to be particularly relevant for children's social-emotional development (Razza et al., 2010; Ryan et al., 2006).

Environmental Stress / Environmental Exposure

Finally, child development in the context of poverty has been linked to higher levels of exposure to chaotic and unhealthy environments (Vernon-Feagans et al., 2012). Children and families living in poverty often experience housing arrangements that are crowded and of relatively poor quality, and research suggests that children living in poverty experience less structure and predictability in their lives (Evans et al., 2005). Furthermore, children living in poverty are more likely than their peers to be exposed to dangerous physical environments. On average, children living in poverty are exposed to greater violence in the home, higher noise levels across contexts, and a range of environmental toxins such as lead and other carcinogens (Evans, 2004). Factors related to children's physical environments consistently predict academic achievement (Woolley et al., 2008), and are more predictive of cognitive than behavioral outcomes (Razza et al., 2010).

Through these pathways and others, poverty has definite impacts on children's cognitive and social-emotional development. In the context of education, poverty is associated with inequalities in school readiness (Coley et al., 2002), academic achievement (Sirin, 2005), high school graduation rates (Brooks-Gunn & Duncan, 1997), and postsecondary outcomes such as college entry and graduation (Bailey & Dynarski, 2011). While the mechanisms of poverty's impact on academic achievement and thriving likely vary to some degree according to the individual developmental systems of each

child, it is clear that nonacademic factors, such as those associated with poverty, are impacting academic achievement (Barton & Coley, 2009; Berliner, 2009).

Socioeconomic Inequalities in School Readiness

In the many ways that poverty manages to impact early child development, its implications are clearly seen upon children's entry into schools (Coley, 2002; Duncan et al., 2007; Lee & Burkam, 2002; Razza et al., 2010; Reardon, 2011; Ryan et al., 2006; Welsh et al., 2010). Inequalities in school readiness by socioeconomic status have been consistently documented by research; a review of this literature follows.

In their study of the Kindergarten cohort of the nationally representative Early Childhood Longitudinal Study (ECLS-K), Lee and Burkam (2002) found that indicators of achievement in reading (e.g., phonemic awareness, emergent literacy, language development) and math (e.g., properties of numbers, math operations, and problem solving) at the beginning of kindergarten were associated with students' socioeconomic status, such that higher SES was correlated with higher reading and math achievement. Specifically, low-SES children scored .47 standard deviations below their peers in the middle quintile of SES, and .55 standard deviations below this group in math. The relationship between SES and achievement persisted across all SES levels, with high-SES children outscoring middle-SES children by .70 standard deviations in reading and .69 standard deviations in math (Lee & Burkam, 2002).

Looking more closely at the individual components of reading and math achievement assessed in the ECLS-K study, Coley (2002) demonstrated that inequalities in school readiness were evident across indicators. In the domain of reading, Coley identified strong, direct relationships between SES and literacy skills such as letter

recognition, understanding the beginning sounds of words, and understanding the ending sounds of words. Differences in performance by SES were smaller in the skill areas of recognizing common words by sight and reading words in context, as children across all SES groups were unlikely to demonstrate these skills at the start of kindergarten (Coley, 2002).

Similar findings were evidenced in the domain of math. Coley (2002) documented a strong linear relationship between SES and the identification of numbers and shapes, the understanding of relative size, the understanding of ordinal sequence, and skills in mathematical operations. Gaps among SES groups were smaller in those skills at which few children had reached proficiency, although the trend for low-SES children to perform more poorly was consistent across mathematic indicators (Coley, 2002).

While early literacy and math skills have consistently been accepted as indicators of school readiness, other authors have looked to more domain-general skills, such as working memory and attention, as indicators of preparedness for formal education. Welsh and colleagues (2010) examined the relationship between children's domain-specific (i.e., literacy, numeracy) and domain-general (i.e., working memory, attention) skills in pre-kindergarten and their reading and math achievement in kindergarten. Consistent with expectations, the authors found that early literacy skills in pre-kindergarten were significant predictors of kindergarten reading achievement, and that early number skills in pre-kindergarten predicted kindergarten math achievement; early domain-specific skills were indeed significant predictors of later performance in that domain. Moving beyond this demonstrated growth within specific domains, the authors also found that early domain-general skills, such as working memory and attention, were

significant predictors of kindergarten achievement in math and reading. These domain-general executive functioning skills significantly predicted growth in domain-specific (i.e., reading and math) skills over the pre-kindergarten year, and made unique contributions to kindergarten achievement in reading and math. The authors argue that early development of executive functioning skills serves as a foundation for later academic learning and success (Welsh et al., 2010).

The relationship between executive functioning skills and school readiness has been replicated in other studies. Razza and colleagues (2010) demonstrated that children's ability to sustain focused attention is associated with receptive vocabulary in poor and near-poor children, and that a lack of impulsivity was likewise associated with receptive vocabulary, although only for children living in poverty (Razza et al., 2010). Razza and colleagues also examined young children's externalizing behaviors, and found that lack of impulsivity was associated with fewer behavioral problems for poor children.

Given the complex cluster of skills that seems to underlie school readiness, some researchers have argued for a broader conceptualization of the construct (Duncan et al., 2007; Ryan et al., 2006). Ryan and colleagues have described school readiness as both a child's existing skills and his/her capacity to acquire new skills and knowledge across multiple domains. This holistic understanding of school readiness includes cognitive skills, social skills, and physical health (Ryan et al. 2006).

However school readiness is operationalized, it is clear that children living in poverty are beginning their formal educations behind their peers in important ways. Inequalities in school readiness have significant implications for children's future academic success. In a recent review of the literature, Duncan and colleagues (Duncan et

al., 2007) linked early academic, attention, and socio-emotional skills to later academic achievement in reading and math, with effects persisting into middle school.

Prevention and Intervention

Given the implications of the documented inequalities in school readiness along socioeconomic lines, researchers, interventionists, and policymakers have generated a range of proposals for addressing the problem. Two of the best-known examples will be described in detail below.

Head Start

One of the most widely recognized early childhood interventions for children and families living in poverty is Head Start. The Head Start program was developed in the mid-1960s as part of The War on Poverty. It was designed to help break the cycle of economic disadvantage by providing young children and their families with access to a comprehensive program of services (US Department of Health and Human Services, n.d.). Specifically, children in Head Start participated in preschool programming to promote their cognitive, social and emotional development, and their families were granted access to a range of health, nutrition, and social services (USDHHS, n.d.). Implementation of Head Start continues to this day, and now includes programming for families and children from birth to age five.

The research on the impact of Head Start has been mixed (Barnett & Hustedt, 2005). Short-term (i.e., from preschool to third grade) studies have found improvements in cognitive development, health outcomes, and social development for children participating in the intervention (Barnett & Hustedt, 2005). Immediate improvements in children's language and literacy development, health, and social-emotional development

(per parental report) were likewise confirmed in the most recent longitudinal study of Head Start's effects (Puma et al., 2012). However, this same study found that by third grade, very few of these initial improvements remained (Puma et al., 2012). Detractors of the intervention have used these studies to argue against its ongoing federal funding.

The Carolina Abecedarian Project

The Carolina Abecedarian Project was an experimental early education intervention conducted by the University of North Carolina in the late 1970s. Like Head Start, it was designed to improve the educational outcomes of young children living in poverty. Students in the intervention received high-quality individualized educational programming that was designed to promote social, emotional, and cognitive development. At its start, the Carolina Abecedarian Project study recruited more than 100 low-income children who were randomly assigned to participate in either the Abecedarian intervention or control conditions from birth until age five. These same children were then randomly assigned to a second three year intervention that began at age five (such that half of the control children and half of the intervention children were enrolled in the second intervention and the remainder of the children served as the control; Barnett & Hustedt, 2005).

Studies of the Abecedarian Project have repeatedly demonstrated its positive short and long-term impacts. In the short term, children enrolled in the five-year early education program outscored their control peers on indicators of cognitive development and academic achievement (Campbell, Pungello, Miller-Johnson, Burchinal, & Ramey, 2001). Long-term effects persisted into adulthood, with participating children exhibiting stronger IQ scores, academic skills, education levels, and levels of skilled employment at

age 21; effects were greatest for those who had participated in the five year preschool program (Barnett & Hustedt, 2005). While the Abecedarian Project represented a significant investment of resources, cost-benefit analyses indicate that the returns far outweighed the costs (Barnett & Hustedt, 2005). Although the Abecedarian Project has informed the design of many later early education programs, the intervention programming initially studied is no longer available to families.

City Connects

The intervention examined in this study, City Connects, is a school-based intervention rooted in relational developmental systems theory. It is designed to alleviate nonacademic barriers to student achievement and thriving across multiple domains of development. Consistent with relational developmental systems theory, City Connects acts on multiple levels of the individual child (academic, social/emotional, health, family) as well as his/her contexts (classroom, school, home, community) in order to effect change. While addressing needs, the City Connects intervention simultaneously leverages the promotive factors in the lives of children (be they biological, psychological, social, or contextual assets) in order to optimize developmental outcomes.

Theoretical Grounding

Relational developmental systems theory offers a framework for better understanding and addressing the complex constellation of factors that contributes to the development (or lack thereof) of school readiness skills. Specifically, relational developmental systems theory highlights the importance of dynamic and interacting contexts as a way of better understanding developmental trajectories (Lerner, 2011; Masten & Cicchetti, 2010). When applied to the domains of school readiness and

academic thriving, relational developmental systems theory underscores the importance of taking a multifaceted intervention strategy (i.e., addressing academic skills along with nonacademic barriers) in order to optimize student development. The connections between the City Connects model and relational developmental systems theory will be highlighted in the description of the model below.

Description of the Model

City Connects is a school-based intervention that is designed to transform a core function of schooling – student support. The intervention was originally designed for the elementary school population, and it emerged from a school-university partnership that was formed to help existing schools address the impacts of poverty on students in the classroom (Walsh & Backe, 2013; Walsh, Madaus et al., 2014). Rooted in relational developmental systems theory, City Connects seeks to offset the out-of-school factors that impact learning (Berliner, 2009) by leveraging existing school and community resources.

At the core of the City Connects intervention is a School Site Coordinator who collaborates with classroom teachers to assess the strengths and needs of each and every student in the school building. This assessment process, known as the Whole Class Review, is designed to elicit the unique pattern of strengths and needs that each child exhibits across the domains of academics, social/emotional development, health, and family. This emphasis on strengths and needs across multiple developmental levels is consistent with relational developmental systems theory (Walsh et al., 2009).

Once a unique profile has been generated for each student, the Site Coordinator works to secure school- and community-based services and enrichment opportunities that

are tailored to each student's strengths and needs. In this way, the Site Coordinator leverages the strengths of the community, school, and child to promote positive developmental trajectories. The types of services and enrichments leveraged depend on the needs and strengths of the child and family (Walsh, Madaus et al., 2014). For example, a student who is struggling to make peer connections and expresses an interest in dance may be connected with a summer or afterschool enrichment opportunity with the Boston Ballet that allows him/her to explore an area of interest, build confidence, and generate new peer connections. A child struggling in math whose primary caregiver works two jobs may be connected with an afterschool program that provides academic tutoring to the child and addresses the childcare needs of the family. While the examples of tailored intervention are many, they consistently provide opportunities to address student needs and promote student strengths. Furthermore, these supports and opportunities can extend to the family as well, where they may offset the impacts of poverty by alleviating family stressors (e.g., connecting families to housing assistance), supporting consistent parenting practices (e.g., through workshops or support groups), and connecting students to resources to which they otherwise would not have access.

Evaluation Outcomes

Evaluation of the City Connects intervention has consistently demonstrated its positive impact on students' achievement and thriving. A review of evaluation findings to date is summarized below.

Report Card Grades. Students in City Connects demonstrate improvements in report card grades in math and English at greater rates than their peers in comparison schools. Specifically, once students have entered a City Connects school, they show

significantly greater improvement over time than their peers who had never been in a City Connects school. In propensity-matching studies where students have been statistically matched to peers at comparison schools based on key characteristics, City Connects students consistently outperform their matched peers in math and reading report card grades at Grades 3, 4, and 5, and outperform comparison peer in Grade 4 writing report card scores as well (City Connects, 2010; Walsh, Madaus et al., 2014). More recent evaluation findings have extended this finding to demonstrate that City Connects students continue to receive better grades in math and English even after they have left City Connects and moved into middle school (City Connects, 2012; Walsh, Madaus et al., 2014). Effects on report card reading and writing scores are greatest for students who are classified as English Language Learners, a particularly at-risk group with regard to this performance indicator (City Connects, 2010).

Standardized Test Scores. While report card grades are an important indicator of academic achievement, the No Child Left Behind Act of 2001 has made student performance on standardized tests a vital indicator of academic achievement. On the Stanford Achievement Test (SAT-9), students in City Connects outperformed comparison students in both reading and math (City Connects, 2014). On the state-mandated Massachusetts Comprehensive Assessment System (MCAS), differences in performance between City Connects and comparison students do not emerge until middle school, when longitudinal analyses demonstrate that City Connects students do significantly better than their comparison peers on standardized tests of reading and math in Grades 6, 7, and 8 (City Connects, 2010; Walsh, Madaus et al., 2014). A recent study of student enrolled in City Connects between 1999 and 2009 indicated that City Connects students

did better on third grade standardized math scores as well (Walsh, Madaus et al., 2014). Notably, the impact of City Connects on standardized test scores has consistently been demonstrated for English Language Learners (ELL), a population of students who are at risk for academic underperformance. While ELL students generally start out well below their peers with regard to standardized test scores on the English Language Arts MCAS in Grade 3, those who have been enrolled in City Connects elementary schools approach statewide levels of proficiency by Grade 8 (a degree of improvement that is significantly greater than that of their ELL peers in comparison schools; City Connects, 2014).

Indicators of Thriving. There are many different indicators of student thriving in elementary school and beyond. For elementary school students, teachers provide grades in classroom behavior, work habits, and effort. A comparison of City Connects students and their peers in comparison schools indicates that City Connects students significantly outperform their peers in all three domains in Grades 3 and 5 (and outperform their peers in effort in Grade 4). After propensity score weights and controls for student characteristics have been applied, City Connects student across all grades receive significantly higher effort scores than their peers who are not enrolled in intervention schools (City Connects, 2010).

Beyond report card grades, student thriving has been conceptualized in terms of retention, attendance, and graduation; City Connects students show improvements on all three of these indicators as well. Specifically, students are less likely to be retained in grade both during elementary school and on through Grade 9 (City Connects, 2010). Additionally, although City Connects students start out with higher rates of chronic absenteeism (absent 10% or more of school year) than their peers at Grade 1, the trend

reverses and they demonstrate significantly lower levels of this behavior than their comparison peers in Grades 6-12 (except in Grade 10, where the trend remains but significance is not achieved; City Connects, 2012). Finally, the high school dropout rate is lower for students who have been in City Connects than for those who have not (City Connects, 2012; 2014; Walsh, Lee-St. John, Raczek, Foley, & Madaus, 2014). City Connects students are also more likely than comparison peers to attend prestigious exam schools in Boston, with their probability of attendance increasing with each additional year of City Connects in elementary school (City Connects, 2014).

Dosage. While the positive impact of City Connects has been consistently documented at both the school and individual level, additional analyses have been conducted to examine the differential impact of years of exposure (i.e., dosage) on student outcomes. Broadly speaking, results indicate that the longer a student has been enrolled in a City Connects school, the better his or her associated outcomes, particularly in middle school (Walsh, Madaus et al., 2014). More specifically, greater exposure to City Connects is associated with stronger math and writing report card grades in fourth grade, stronger ELA scores in fifth grade, and stronger MCAS and GPA scores in middle school (Walsh, Madaus et al., 2014)

This profile of evaluation findings suggests that City Connects not only has immediate impacts on students' achievement and thriving in elementary school, but that the intervention shapes children's developmental trajectories such that they are more likely to achieve and thrive long after they have left the intervention. The relationship between greater exposure to the City Connects intervention and a range of associated

positive outcomes further affirms that continued exposure to the intervention shapes children's developmental trajectories over time (Walsh, Madaus et al., 2014).

Early Childhood Adaptation

Given the demonstrated impact of City Connects on student outcomes, in 2009-10 the City Connects team expanded the intervention to include the early childhood population. To develop and implement this Early Childhood Adaptation, City Connects partnered with a series of private (Catholic) schools in urban areas with high levels of poverty and student diversity. Each of these schools had existing preschool and kindergarten programs. Preliminary analyses indicated that within the first two years of implementation, young children in the City Connects schools made improvements in pre-literacy skills at a greater rate than their comparison peers (Backe, n.d.). Looking longitudinally, we see that while City Connects students typically started preschool behind their comparison peers, they quickly caught up and eventually outperformed peers who were not exposed to the intervention (City Connects in Catholic Schools, 2012). The present study builds upon this body of work by examining the conditions that promote and predict school readiness skills as children prepare to enter first grade.

Developmental Contexts of Early Childhood Education

For children in preschool and early education programs across the country, the early childhood classroom is an important context for ongoing child development. This study explores the impact of multiple characteristics of schools and classrooms, including class size, poverty density, and peer knowledge and behavior. The literature on each of these contextual factors will be described in detail below.

Class Size

For children living in poverty, access to high quality child care and early education is associated with gains in a range of school readiness skills, including those in math and reading (Magnuson, Meyers, Ruhm, & Waldfogel, 2004). While there are many different factors that contribute to the quality of early childhood educational experiences, one that has attracted significant policy attention is class size.

The literature on class size and early childhood education draws primarily from the data collected as part of either the Tennessee Student-Teacher Achievement Ratio (STAR) study or the Wisconsin Student Achievement Guarantee in Education (SAGE) study (Reynolds, Magnuson, & Ou, 2010). In the STAR study, children were randomly assigned to small classes (13-17 students), regular classes (22-26 students), or regular classes with a teacher's aide for Grades K through 4 (Finn, Gerber, Achilles & Boyd-Zaharias, 2001). Student achievement on standardized tests was assessed annually through high school. In the SAGE study, the state of Wisconsin lowered the class sizes for a large number of low-income children and assessed changes in achievement in math and reading (Reynolds et al., 2010). In both the STAR and SAGE studies, smaller class size was associated with higher achievement in math and reading (Finn et al., 2001; Reynolds et al., 2010).

The possible mechanisms of the impact of class size on achievement are multiple. Some suggest that smaller teacher:student ratios are associated with warmer, more stimulating interactions between teachers and students, while others note the greater risks to physical health associated with larger classes (e.g., greater risk of injury due to

lessened supervision) (Barnett, Schulman, & Shore, 2004). Whatever the mechanism, smaller classes seem to promote student gains in early academic skills.

Poverty Density

Poverty has consistently emerged as a significant predictor of school readiness and academic achievement at the individual level (e.g., Coley, 2002). In the broader context of schools, school-level rates of poverty have been associated with student-level academic achievement as well. In a study of adolescents, Caldas and Bankston (1997) found that the socioeconomic status of peers in school was a significant and independent predictor of individual student achievement. This effect was only “slightly less” than that of the student’s own socioeconomic status (Caldas & Bankston, 1997, p. 269).

Peer Behavior and Relationships

The peer group within the classroom represents another important context for child development. In terms of children’s socioemotional development, research has demonstrated a “peer contagion” effect, such that individual students tend to drift toward the behavioral norms of their fellow students in a group setting (Boxer, Guerra, Huesmann, & Morales, 2005; Dishion & Tipsord, 2011; Thomas, Bierman, & Powers, 2011). In a study of over 4,000 children in 214 classrooms, Thomas and colleagues found that classroom-level aggregate aggression scores were significant and independent predictors of changes in the aggressive behavior of individual students (Thomas et al., 2011). Similar findings have emerged across child and adolescent populations (Boxer et al., 2005; Dishion & Tipsord, 2011).

The Current Study

The purpose of this study is to examine the conditions that support school readiness skills in a sample of young children in urban preschool and kindergarten settings. Specifically, the relationship between school readiness and school characteristics, classroom characteristics, peer characteristics, student behavior, and the City Connects intervention will each be tested. Should a relationship between school, classroom, or peer characteristics and school readiness emerge, the potential moderating impact of City Connects will be examined. Specifically, the dissertation aims to address the following questions:

1. Within the dissertation sample, what student characteristics (i.e., age, race, gender) predict school readiness at the time of entry into preschool?
2. After controlling for initial school readiness performance, do student characteristics (i.e., age, race, gender, years of early education) and behavior predict school readiness performance at the close of kindergarten?
3. After controlling for initial school readiness performance and student characteristics, do school/classroom characteristics (i.e., class size, City Connects status, poverty density) predict school readiness at the close of kindergarten?
4. After controlling for initial school readiness performance, student characteristics, and classroom characteristics, does peer context in the classroom (i.e., peer knowledge and behavior) predict school readiness at the close of kindergarten?

Hypothesis 1. Student characteristics (i.e., gender, age, and race) will be significant predictors of school readiness scores at time of entry into preschool and at the close of kindergarten.

Consistent with existing literature, it is expected that student, gender, age, and race will each be significant predictors of school readiness scores, both at the time of entry into preschool and at the close of kindergarten. Specifically, it is expected that females will demonstrate higher scores than males on this measure, that white students will have higher scores than students of color, and that older students will demonstrate stronger performance than their younger peers. These relationships are expected to be consistent at the start of preschool and at the close of kindergarten.

Hypothesis 2. Student behavior scores will significantly predict school readiness scores.

Given the research linking children's executive functioning, impulsivity, and academic skills, it is hypothesized that student behavior will indeed predict school readiness scores such that greater behavior problems will be associated with lower levels of school readiness.

Hypothesis 3. School and classroom characteristics (i.e., class size, poverty density, and City Connects status) will be significant predictors of school readiness scores.

Consistent with the literature on class size, school-level poverty, and the City Connects intervention, it is hypothesized that all of these factors will be significant predictors of student level school readiness scores. Specifically, smaller class size is expected to be associated with greater school readiness scores, while higher school poverty levels are expected to be associated with lower school readiness scores. The City

Connects intervention is expected to be associated with higher school readiness scores at the close of kindergarten, after controlling for initial school readiness scores.

Hypothesis 4. The peer context of the classroom is expected to significantly predict individual students' school readiness scores. Specifically, higher levels of behavioral intensity in the classroom are expected to predict lower school readiness scores. Higher levels of peer knowledge (i.e., peer school readiness skills) are expected to predict stronger individual school readiness skills.

Chapter 3: Research Design and Methods

This study examines some of the factors that impact the school readiness skills of young children preparing to enter first grade (i.e., at the close of kindergarten). Specifically, it examines the relationship between school readiness, student demographics, and school/classroom characteristics. To explore these questions, a quasi-experimental research design has been employed. The research design, relevant variables, and school readiness measures are explained in detail below.

Research Design

The current study utilizes a quasi-experimental design to explore the conditions that promote school readiness in a sample of children preparing to enter the first grade (i.e., at the end of kindergarten). Participants in the study have been assigned to naturally occurring groups (i.e., early childhood classrooms in schools) prior to the study. Additionally, the City Connects intervention was implemented in a select number of these pre-existing groups (i.e., schools). Due to the nature of schools in communities, random assignment of participants to groups was not possible. While lack of random assignment makes a true experimental design impossible, the manipulation of the independent variable (i.e., City Connects) makes quasi-experimental methods appropriate (Heppner, Wampold & Kivlighan, 2008).

Within this quasi-experimental design, the following questions will be explored:

1. Within the dissertation sample, what student characteristics (i.e., age, race, gender) predict school readiness at the time of entry into preschool?

2. After controlling for initial school readiness performance, do student characteristics (i.e., age, race, gender, years of early education) and behavior predict school readiness performance at the close of kindergarten?
3. After controlling for initial school readiness performance and student characteristics, do school/classroom characteristics (i.e., class size, City Connects status, poverty density) predict school readiness at the close of kindergarten?
4. After controlling for initial school readiness performance, student characteristics, and classroom characteristics, does peer context in the classroom (i.e., peer knowledge and behavior) predict school readiness at the close of kindergarten?

Sample

This study is based on archival data from the evaluation of City Connects in Catholic Schools. Approximately 500 students, ages 4 through 7, are included in the sample, which is racially and socioeconomically diverse. Students in the sample attended early education programming between the years of 2009 and 2013. All of the early education classrooms were housed within existing private (Catholic) schools and were located in urban areas with high levels of poverty and student diversity.

Measures

The operational definition of each of the variables under consideration is stated below. In the case of school readiness and student behavior, the measure to be used and its supporting research is reviewed.

School Readiness

School readiness was assessed with the Bracken School Readiness Assessment, Third Edition (BSRA-3). The Bracken is a well-established school readiness measure

that includes five core skill areas: colors, letters, numbers/counting, sizes/comparison, and shapes (Bracken, 2007). These skill areas were developed following a review of both educational research and state standards for early childhood education, and they tap key pre-academic skills in literacy and math (Bracken, 2007). In studies of the original Bracken School Readiness Assessment, the measure was shown to predict early childhood academic success (Panter & Bracken, 2000).

Bracken school readiness scores can be reported either as raw scores (i.e., percent correct on the full measure) or as standardized scores. While standardized scores are generally preferable to raw scores, the differences between the current study sample and the normative sample are important. The normative sample has fewer students living in poverty and considerably less racial diversity than the study sample. Consequently, comparisons between the normative and study sample are inappropriate. Instead, raw scores indicating percent correct will be used as the primary outcome variable. To ensure that this percentage represents each of the five subject areas equally, percent correct will be calculated as the average of percent correct exhibited on each of the five subscales. Possible Bracken scores in this study therefore range from 0-100, with higher scores indicating higher levels of school readiness (i.e., better performance).

Student Behavior

Student behavior was assessed with the Sutter-Eyberg Student Behavior Inventory, Revised Edition, which is a teacher-report measure (SESBI-R; Eyberg & Pincus, 1999). This inventory asks two questions about 38 different disruptive behaviors: their intensity/frequency (from a score of 1, or never, to a score of 7, or frequently) and whether or not teachers consider this behavior a problem in their classrooms (yes or no).

Sample disruptive behaviors include having temper tantrums, teasing other students, acting bossy, having difficulty staying on task, and interrupting peers or teachers. The “intensity” scores have a possible range of 38-266, with higher scores indicating higher (i.e., more frequent) levels of the disruptive behaviors. The “problem” scores can range from 0-38, with high scores indicating a greater number of disruptive behaviors being identified as problems.

In the case of both the “intensity” and “problem” scores, it is possible that teachers across classrooms may utilize the measure differently (e.g., by making more or less use of the full scale). To offset any bias associated with teacher response patterns (as opposed to true variance in student behavior), individual student behavior scores are group centered by classroom in regression models. The decision of which behavioral scores to include in the model (i.e., frequency/intensity of behaviors, number of problematic behaviors, or both) is made at the time of analysis and is based on the quality of each variable (i.e., level of missing data, variance exhibited).

Student Characteristics

Student demographic information was included in all analytic models. Specifically, student age, race, and gender were each included. All student demographic information for students in City Connects schools was drawn from the City Connects Student Support Information System (SSIS). This database includes data drawn from school records that is confirmed and/or amended by School Site Coordinators. All student demographic information for students in comparison schools was drawn from school records.

School and Classroom Characteristics

School and classroom characteristics were operationalized in a manner that is consistent with the reporting standards of schools and the school district. Students' school and classroom memberships were indicated as categorical variables.

At the classroom level, class size was drawn from school records and SSIS. At the school level, poverty density was drawn from the records of the school district. Poverty density is defined as the proportion of students in each school that qualify for free or reduced lunch. The use of lunch subsidies as a proxy for poverty status is well-established in psychological and educational research.

A classroom average of children's school readiness and behavior scores was calculated as an indicator of the academic and behavioral context of the classroom.

City Connects

While the City Connects intervention is implemented systemically at the school level, it is also tailored to the unique profile of strengths and needs exhibited by each student. Participation in City Connects was designated with a dummy variable at the classroom level.

Procedure

This study made use of archival data that is part of the larger evaluation of City Connects. Specifically, a sample of approximately 500 students from City Connects and comparison schools was included; data was drawn from four academic years.

The early childhood evaluation of City Connects was vetted and approved by the Boston College Institutional Review Board. Active parent consent was required for student participation in the study, and student participants had the option of withdrawing

their participation at any time and for any reason. Consistent with ethical standards of research, student data was de-identified prior to storage and analysis. Numeric student IDs were used to track student data over time.

From 2010 to 2013, the Bracken School Readiness Assessment (BSRA-3) was individually administered to 1130 students in early education classrooms across 27 schools. Bracken administrators read aloud a series of questions to which student participants responded either verbally or by pointing to the correct answer; all items employed a multiple choice format.

Over the same period of time, the Sutter-Eyberg Student Behavior Inventories (SESBI-R) were completed by classroom teachers for each student. These inventories were collected and de-identified to protect student confidentiality. Student data across measures was linked according to student IDs.

A new data file was created for this study that included school, classroom and student characteristics across all four academic years of the study. Aggregate variables (e.g., classroom average school readiness scores) were created as needed. Students were selected for inclusion in this study if they a) had at least two years of early education and b) had school readiness data available for their first and last year of early education.

Data for this study were drawn from across multiple sources of archival data. In some cases, aspects of students' demographic information were missing. Although all students had gender data available, 13 students were missing age variables and 26 students were missing race. For missing age data, age was imputed based on classroom average. For missing race data, no imputations were made; these students were excluded from analysis as needed.

Analysis

Preliminary Analysis

In the first stage of analysis, descriptive statistics are provided for each of the predictor and outcome variables being examined. The nature of these initial descriptive statistics is provided in more detail below.

Sample Demographics. The sample is described in detail, including number of students and demographic characteristics of the sample (age, race, gender).

Descriptive Statistics. Descriptive statistics (mean, range, standard deviation) are provided for all predictor variables – student demographic characteristics, years of early education, student behavior, initial levels of individual school readiness, school-wide poverty density, and class size. Descriptive statistics (mean, range, standard deviation) are presented for the outcome variable, individual school readiness scores, as well. Descriptive statistics are presented both for the sample both as a whole and according to City Connects status (i.e., broken down by City Connects schools and comparison schools); significant differences between the City Connects and comparison school samples are identified as they emerge.

Correlations. To explore the relationships among variables, correlations have been calculated. Statistically significant relationships are identified and discussed.

Primary Analysis

Following the preliminary analysis, a series of regression models were built to examine the research questions.

Multilevel Regression. To explore the stated research questions, a series of multilevel regression models were constructed. A regression is a form of statistical analysis wherein

the variance in one variable (the outcome) is explained as a function of the variance of another variable (the predictor) (Ludlow, 2003). Multilevel modeling is a specific type of regression modeling that addresses the statistical challenges associated with nesting (e.g., of students within schools or classrooms). Multilevel modeling accomplishes this task by breaking its models down by level and using both level one and level two factors to predict outcomes, including use of level two variables to predict level one coefficients (O'Dwyer, 2012).

Chapter 4: Results

The results of this study are presented in detail below. A discussion of links to the literature and implications for practice can be found in Chapter 5.

Sample Characteristics

Data used in this study were drawn from across four academic years of data that were collected as part of the larger evaluation of City Connects in Catholic schools. Data are longitudinal in nature in that students were administered the Bracken School Readiness Assessment annually for each year that they were a) enrolled in a City Connects or comparison school and b) consented to participate. In order to be included in the study, students had to meet two inclusion criteria. First, they had to have completed a Bracken School Readiness Assessment in their last year of early education (i.e., kindergarten – K2). Second, they had to have completed a Bracken School Readiness Assessment in their first year of enrollment in a City Connects or comparison school. The first inclusion criterion was put in place to ensure that all students had the designated outcome variable. The second inclusion criterion was put in place due to the importance of children's early experiences in shaping their readiness for school. Since it is beyond the scope of this study to capture all of the pre-entry (meaning prior to entry into early education) variables that may be predictive of a student's later school readiness scores, initial school readiness scores are crucial as a means of controlling for pre-entry experiences. Therefore only students for whom start year and outcome year data was available were included in this study.

Preliminary Analysis

This study is based on a sample of 521 students from 89 classrooms across 24 schools (16 City Connects schools, 8 comparison schools) and four academic years. The demographics of the sample are presented below, along with descriptive statistics for the outcome variable and all predictor variables.

Descriptive Statistics – Student Characteristics

After inclusion criteria were applied, 521 students were eligible for inclusion in the study. The characteristics of the students in this sample are represented in Table 1. The sample included slightly more females (52%) than males (48%). Children ranged in age from 4.25 years to 7.15 years at the close of kindergarten. Students had experienced either two or three years of early childhood education (i.e., preschool and kindergarten). More specifically, 82% of children had participated in one year of preschool and one year of kindergarten, and 18% of children had participated in two years of preschool and one year of kindergarten.

Table 1.

Student demographics

	N	%
Total Pop	521	
Gender		
Male	249	48%
Female	272	52%
Race		
Asian	43	8%
Black	101	19%
Hisp/Latino	76	15%
Multi/Other	37	7%
White	264	51%
Age		
4:0 – 4:11	4	0.8%
5:0 – 5:11	235	45%
6:0 – 6:11	280	54%
7:0 – 7:11	2	0.4%
Years of Early Education		
2 years	428	82%
3 years	93	18%

When we compare students in City Connects schools with those in comparison schools, some demographic differences emerge (see Table 2). When means are statistically compared across groups, we see that there are no significant differences in gender, $\chi^2(1, N = 521) = 0.101, p = .750$, or years of early education, $\chi^2(1, N = 521) = 0.67, p = .414$, across City Connects and comparison classrooms. There is a statistically significant difference with regard to race and City Connects status, such that there are more students of color in City Connects schools than in comparison schools, $\chi^2(1, N = 521) = 25.401, p < 0.001$. The difference in age between City Connects students and

Comparison students is also statistically significant, $t(519)=2.61$, $p=0.009$, with City Connects students being slightly older ($M_{diff}=0.01$ years) than comparison students at close of kindergarten; note that this difference is statistically significant but not clinically significant.

Table 2.

Student demographics by City Connects status

	City Connects		Comparison	
	N	%	N	%
Total Pop			141	
Gender				
Male	180	47%	69	49%
Female	200	53%	72	51%
Race				
Asian	27	7%	16	11%
Black	88	23%	13	9%
Hisp/Latino	66	17%	10	7%
Multi/Other	32	8%	5	3.5%
White	167	44%	97	69%
Age				
4:0 – 4:11	3	1%	1	1%
5:0 – 5:11	185	49%	50	36%
6:0 – 6:11	191	50%	89	63%
7:0 – 7:11	1	<1%	1	1%
Years of Early Education				
2 years	309	81%	119	84%
3 years	71	19%	22	16%

Descriptive Statistics – School and Classroom Characteristics

Participants in this study were drawn from 89 classrooms across 24 schools and four academic years (see Table 3). Seventy-four percent of classrooms were from City

Connects schools. Class size ranged from 11 to 40 students, with an average class size of 21 (SD=4.76). Poverty density ranged from 0.0 to 0.75, with an average of 0.29 (SD=0.25).

Table 3.

Classroom characteristics

	N	Min	Max	M	SD
Class Size	89	11	40	20.85	4.76
Poverty Density	89	.00	.75	.29	.25

When we compare classrooms from City Connects and comparison schools, we see some differences emerge (see Table 4). Specifically, City Connects classrooms had significantly higher rates of poverty overall than did classrooms in comparison schools, $t(52.8) = -3.25, p = 0.002$, with a mean difference of 0.16. Class size did not differ significantly according to City Connects status, $t(27.9) = 1.71, p = 0.099$.

Table 4.

Classroom characteristics by City Connects status

	N	Min	Max	M	SD
City Connects Classrooms (N=66)					
Class Size	66	12	29	20.23	3.90
Poverty Density	66	.00	.75	.33	.26
Comparison Classrooms (N=23)					
Class Size	23	11	40	22.65	6.41
Poverty Density	23	.00	.52	.17	.19

Descriptive Statistics – Student Knowledge and Behavior

Student behavior was assessed with the Sutter-Eyberg Student Behavior Inventory (SESBI-R). Student scores on the SESBI-R are presented in Table 5. Eyberg behavioral intensity scores ranged from 38 to 251 (M=77.43, SD=42.21) and behavioral problem

scores ranged from 0 to 37 ($M=2.56$, $SD=6.53$); in both cases, higher scores indicate greater behavior problems (i.e., worse behavior). Due to higher rates of missing data with the Eyberg Problem scores, and the more limited variability in scores, this data source was excluded from subsequent analysis. The Eyberg Intensity Score served as the behavioral indicator for the study.

Table 5.

Student behavior scores at end of kindergarten

	N	Min	Max	M	SD
Eyberg Intensity	521	38	251	77.43	42.21
Eyberg Problem	505	0	37	2.56	6.53

Students' levels of school readiness in their first year of preschool and their last year of kindergarten were assessed with the Bracken School Readiness Assessment (BSRA-3). At year of entry, students had an average school readiness score of 76.35 ($SD=14.56$). At the close of kindergarten, students had an average composite Bracken school readiness score of 91.20 ($SD=5.59$). Bracken school readiness scores at the start of preschool and close of kindergarten are presented in Table 6; note that higher scores indicate greater levels of school readiness.

Table 6.

School readiness scores at start of preschool and end of kindergarten

	N	Min	Max	M	SD
Bracken (Start of Preschool)	521	24.55	100	76.35	14.56
Bracken (End of Kindergarten)	521	62.59	100	91.20	5.59

Students' levels of initial school readiness (i.e., Bracken score at entry into preschool), outcome levels of school readiness (i.e., Bracken score at close of kindergarten), and

behavior scores at close of kindergarten (i.e., Eyberg intensity scores) are presented by City Connects status (see Table 7). Specifically, City Connects students show statistically significantly lower levels of school readiness at the start of preschool, $t(299)=2.57, p=0.011$ ($M_{diff} = 3.37$). These statistically significant differences persist at the close of kindergarten, though the mean difference is smaller, $t(297)= 3.57, p<0.001$ ($M_{diff} = 1.80$). There are no statistically significant differences between City Connects and comparison students with regard to behavioral problems at close of kindergarten, $t(519)=0.003, p=0.997$; in other words, teacher ratings of student behaviors are consistent across City Connects and comparison schools.

Table 7.

Student behavior and school readiness scores by City Connects status

	City Connects		Comparison	
	M	SD	M	SD
Bracken (Start of Preschool)	75.44	15.15	78.81	12.59
Bracken (End of K)	90.71	5.78	92.51	4.84
Eyberg Intensity (End of K)	77.43	41.56	77.44	44.06

Correlations

To explore the relationships among variables, correlations were calculated and are presented in Table 8. Gender was significantly correlated with Bracken school readiness score at start ($r = -0.110, p<0.05$) and Eyberg behavioral intensity score at finish ($r=0.217, p<0.01$), such that being male was associated with lower Bracken school readiness scores at start and higher behavioral intensity scores (i.e., more disruptive behavior) at finish. Gender was not significantly correlated with school readiness scores at the close of kindergarten. Age was positively correlated with Bracken scores at start ($r=0.190, p<0.01$) and finish ($r=0.239, p<0.01$), such that older children received higher

school readiness scores on the Bracken at both time points. Number of years of early education was negatively correlated with Bracken scores at start, such that children with lower Bracken scores at the start were associated with spending more years in preschool ($r = -0.446, p < 0.01$). Years of early education was not significantly correlated with school readiness scores at the end of kindergarten.

Significant relationships emerged between school readiness and behavioral indicators as well. Higher levels of behavioral intensity at close of kindergarten were correlated with lower Bracken scores at start ($r = -0.211, p < 0.01$) and finish ($r = -0.164$) of kindergarten. Bracken scores at start were positively correlated with Bracken scores at finish ($r = 0.513, p < 0.01$), such that children who scored higher on the Bracken School Readiness Assessment at the beginning of preschool tended to score higher at the close of kindergarten as well.

Table 8.

Correlations among student characteristics and school readiness

	Is Male	Is White	Age	Has 3 rd Year EE	Bracken (Start)	Bx Int. (Finish)	Bracken (Finish)
Is Male	1	-0.009	-0.013	0.026	-.110*	.217**	-0.058
Is White	-0.009	1	.126**	-0.061	.290**	-0.083	.275**
Age	-0.013	.126**	1	0.048	.190**	0.031	.239**
Has 3 rd Year EE	0.026	-0.061	0.048	1	-.446**	0.057	0.063
Bracken (Start)	-.110*	.290**	.190**	-.446**	1	-.211**	.513**
Bx Int. (Finish)	.217**	-0.083	0.031	0.057	-.211**	1	-.164**
Bracken (Finish)	-0.058	.275**	.239**	0.063	.513**	-.164**	1

* Correlation is significant at the 0.05 level (2-tailed).

** Correlation is significant at the 0.01 level (2-tailed).

Correlations were also calculated between classroom level variables and the outcome variable (see Table 9). Bracken scores were significantly negatively correlated with City

Connects status, such that being in City Connects was associated with lower Bracken scores at start ($r = -.103, p < 0.05$) and finish ($r = -.143, p < 0.01$). Bracken scores were also significantly negatively correlated with poverty density, such that higher levels of poverty at the school level were associated with lower Bracken scores at start ($r = -0.223, p < 0.01$) and finish ($r = -0.299, p < 0.01$). Being in City Connects was correlated with higher levels of school-level poverty ($r = 0.308, p < 0.01$) and smaller class size ($r = -0.269, p < 0.01$).

Table 9.

Correlations among classroom characteristics and school readiness

	Is CCCS	Class Size	Poverty Density	Bracken (Start)	Bracken (Finish)
Is CCCS	1	-.269**	.308**	-.103*	-.143**
Class Size	-.269**	1	0.053	-.008	0.002
Poverty Density	.308**	0.053	1	-.223**	-.299**
Bracken (Start)	-.103*	-.008	-.223**	1	.513**
Bracken (Finish)	-.143**	0.002	-.299**	.513**	1

* Correlation is significant at the 0.05 level (2-tailed)

** Correlation is significant at the 0.01 level (2-tailed).

Primary Analysis

Following the preliminary analysis, a series of multilevel regression models were built to examine the research questions. A regression is a form of statistical analysis wherein the variance in one variable (the outcome) is explained as a function of the variance of another variable (the predictor) (Ludlow, 2003). Multilevel regression modeling is a specific type of regression modeling that addresses the statistical challenges associated with nesting (e.g., of students within schools or classrooms). Multilevel modeling accomplishes this task by breaking its models down by level and using both level one and level two factors to predict outcomes, including use of level two variables to predict level one coefficients (O'Dwyer, 2012).

Aim 1: Within the dissertation sample, what student characteristics predict school readiness at the time of entry into preschool?

While decades of research have established multiple predictors of school readiness skills at the time of entry into preschool, it is important to examine the relationships that exist within the dissertation sample before proceeding to later study questions.

Unconditional Model

The unconditional model represents the expected value of Y (i.e., school readiness score at start of preschool) without consideration of any level one (student) or level two (classroom) variables. Within our sample, the intercept, or the expected value of school readiness score at start of preschool, is 75.96 (see Table 10). The final estimation of variable components indicates that there is significant variance available to be explained (see Table 11). The variance associated with between-classroom effects is 43.36 and the variance associated with between-student effects is 171.62 (see Table 11).

Table 10.

Aim 1 – Unconditional model

Fixed Effect	Coefficient	Standard error	t-ratio	Approx. d.f.	p-value
For INTRCPT1, β_0 INTRCPT2, γ_{00}	75.96	0.93	81.74	88	<0.001

Table 11.

Aim 1 – Unconditional model variance

Random Effect	Standard Deviation	Variance Component	d.f.	χ^2	p-value
INTRCPT1, u_0 level-1, r	6.58 13.10	43.36 171.62	88	214.88	<0.001

Based on these estimates of the variance components, it is possible to establish the presence of a statistical nesting effect within the sample. Within this study, students are nested logically within classrooms. To confirm that this nesting also exists statistically, an unconditional intraclass coefficient (ICC) was calculated; the ICC in this model is 0.20. In other words, 20% of the variance in school readiness performance in this sample lies between classrooms. This is a significant proportion of the overall variance, and suggests that multilevel modeling would be a useful way to predict school readiness.

$$ICC = \frac{43.36}{43.36 + 171.62} = 0.20$$

Level One Model

To establish the predictive power of student characteristics in estimating student school readiness at the start of preschool, a level one model was established. Student gender, race, and age at start of preschool were all entered into the model. The associated coefficients are presented in Table 12.

The intercept in this model, or the predicted school readiness score without consideration of any level one predictors, is 74.40. All three of the level one predictors emerged as significant. Specifically, the coefficient associated with the relationship between gender and school readiness was -2.84 ($p=0.006$), such that male students are expected to score 2.84 points lower on the school readiness assessment than their female peers after holding race and age constant. White students in this model are expected to score 6.35 points higher than students of color, after holding gender and student age constant ($p<0.001$). Older students are expected to score an additional 11.20 points per year of age on the school readiness assessment after controlling for gender and race ($p<0.001$)

Table 12.

Aim 1 – Level 1 model

Fixed Effect	Coefficient	Standard error	t-ratio	Approx. d.f.	p-value
For INTRCPT1, β_0					
INTRCPT2, γ_{00}	74.40	1.20	62.22	88	<0.001
For IS_MALE slope, β_1					
INTRCPT2, γ_{10}	-2.84	1.03	-2.76	429	0.006
For IS_WHITE slope, β_2					
INTRCPT2, γ_{20}	6.35	1.37	4.65	429	<0.001
For SY_AGE slope, β_3					
INTRCPT2, γ_{30}	11.20	1.52	7.38	429	<0.001

Multilevel models allow the researcher to explore whether the variance in school readiness is differentially predicted by student level variables across groups. In other words, it is possible to explore whether the relationships between gender and school readiness, race and school readiness, and age and school readiness vary according to classroom. Within the sample, the relationship between all level one predictors and school readiness score varied across classrooms. The final estimation of variance component is presented in Table 13. Note that the addition of these level one variables to the model accounts for 34% of the variance among students in levels of school readiness at the start of preschool.

Table 13.

Aim 1 – Level 1 model variance

Random Effect	Standard Deviation	Variance Component	d.f.	χ^2	p-value
INTRCPT1, u_0	7.04	49.59	41	72.03	0.002
IS_MALE slope, u_1	2.45	6.02	41	66.63	0.007
IS_WHITE slope, u_2	6.34	40.23	41	75.54	0.001
SY_AGE slope, u_3	7.32	53.54	41	66.29	0.008
level-1, r	10.68	114.10			

The results of this analysis indicate that, consistent with expectations, gender, race, and age are all significant predictors of school readiness at the start of preschool in this sample.

Given that the expected relationships were established among student characteristics and school readiness, it is now possible to address subsequent research questions. In all subsequent models, school readiness score at start of preschool was entered as a covariate in order to control for variability in skill level at the start of preschool. Student characteristics also continue to be included in subsequent models in order to explore whether they continue to predict school readiness at the close of kindergarten even after controlling for initial school readiness performance.

Aim 2: After controlling for initial school readiness performance, do student characteristics predict school readiness performance at the end of kindergarten?

Having established the relationships among student characteristics and school readiness at the start of preschool, it is now possible to examine the relationships among student characteristics and school readiness performance at the close of kindergarten, after controlling for initial school readiness performance.

Unconditional Model

The unconditional model represents the expected value of Y (i.e., school readiness score at end of kindergarten) without consideration of any level one (student) or level two (classroom) variables. Within our sample, the intercept, or the expected value of school readiness score at the end of kindergarten, is 91.11 (see Table 14).

Table 14.

Aim 2 – Unconditional model

Fixed Effect	Coefficient	Standard error	t-ratio	Approx. d.f.	p-value
For INTRCPT1, β_0 INTRCPT2, γ_{00}	91.11	0.32	285.04	88	<0.001

The final estimation of variable components indicates that there is significant variance in school readiness performance that is available to be explained. The variance associated with between-classroom effects is 3.91 and the variance associated with between-student effects is 27.56 (see Table 15).

Table 15.

Aim 2 – Unconditional model variance

Random Effect	Standard Deviation	Variance Component	d.f.	χ^2	p-value
INTRCPT1, u_0 level-1, r	1.98 5.25	3.91 27.56	88	167.39	<0.001

Based on these estimates of the variance components, it is possible to once again establish the presence of a statistical nesting effect within the sample. Within this study, students are nested logically within classrooms. To confirm that this nesting also exists statistically, an unconditional ICC was calculated. The intraclass coefficient is 0.12. In other words, 12% of the variance in school readiness performance lies between classrooms. This is a significant proportion of the overall variance, and suggests that multilevel modeling would be a useful way to predict school readiness outcomes.

$$ICC = \frac{3.91}{3.91 + 27.56} = 0.12$$

Level One Model

To establish the predictive power of student characteristics in estimating student school readiness at the close of kindergarten (after the controlling for initial school readiness performance), a level one model was established. Student gender, race, age, years of early education, and behavioral intensity at close of kindergarten were all entered into the model. An examination of variance in slopes indicated that the relationships between age and school readiness and initial school readiness and end date school readiness varied by classroom membership; slopes for these relationships were therefore allowed to vary randomly. The coefficients associated with each relationship are presented in Table 16.

In the established level one model, gender was not significantly associated with school readiness at the close of kindergarten after accounting for student readiness at the start of preschool ($p>0.05$). In contrast, race remained a significant predictor of school readiness, even after controlling for initial school readiness performance; white students in this model were expected to score 1.23 additional points on the school readiness measure after controlling for all other predictors ($p=0.001$). Age also significantly predicted school readiness at close of kindergarten, such that for every year older than average a student was, s/he was expected to score 1.21 points higher on the school readiness measure after controlling for all other predictors ($p=0.045$). Years of early education also emerged as a significant predictor of school readiness at close of kindergarten, such that students who had a third year of early education were expected to score an additional 4.38 points on the school readiness assessment over their peers who had only two years of early education ($p<0.001$). Beyond student demographics, student

behaviors were also a significant predictor of school readiness knowledge at the close of kindergarten. For every additional 10 points that a child scored on the behavioral intensity measure (indicating greater behavior problems), s/he was expected to score 0.2 points lower on the Bracken School Readiness Assessment ($p < 0.01$) when holding all other variables constant. Note that this model explained 72% of the variance between classrooms and 41% of the variance between students (see Table 17).

Table 16.

Aim 2 – Level 1 model

Fixed Effect	Coefficient	Standard error	<i>t</i> -ratio	Approx. <i>d.f.</i>	<i>p</i> -value
For INTRCPT1, β_0					
INTRCPT2, γ_{00}	89.69	0.35	257.17	88	<0.001
For IS_MALE slope, β_1					
INTRCPT2, γ_{10}	0.16	0.39	0.41	250	0.680
For IS_WHITE slope, β_2					
INTRCPT2, γ_{20}	1.23	0.37	3.27	250	0.001
For AGE_OY slope, β_3					
INTRCPT2, γ_{30}	1.21	0.59	2.03	88	0.045
For HAS_3RDY slope, β_4					
INTRCPT2, γ_{40}	4.38	0.72	6.06	250	<0.001
For BRACKENS slope, β_5					
INTRCPT2, γ_{50}	0.24	0.02	12.31	88	<0.001
For EYBERG_I slope, β_6					
INTRCPT2, γ_{60}	-0.02	0.01	-3.42	250	<0.001

Table 17.

Aim 2 – Level 1 model variance

Random Effect	Standard Deviation	Variance Component	<i>d.f.</i>	χ^2	<i>p</i> -value
INTRCPT1, u_0	1.04	1.07	76	120.39	0.001
AGE_OY slope, u_3	2.85	8.14	76	113.31	0.004
BRACKENS slope, u_5	0.08	0.01	76	105.23	0.015
level-1, r	4.00	16.03			

Aim 3: After controlling for initial school readiness performance and student characteristics, do school/classroom characteristics (i.e., class size, City Connects status, poverty density) predict school readiness at the close of kindergarten?

Having established the relationship between student characteristics and school readiness at the end of kindergarten, even after controlling for school readiness skills at the start of preschool, it is then possible to examine whether school/classroom characteristics predict school readiness at the close of kindergarten. Building upon the level one model established above, class size, City Connects status, and poverty density were added to the model as possible predictors of school readiness scores (see Table 18). Of these predictors, only poverty density emerged as a significant predictor ($p=0.034$). Specifically, for every 10% increase in school-level poverty, individual students within that school were expected to score 0.22 points lower on the Bracken school readiness assessment at the close of kindergarten.

Table 18.

Aim 3 – Multilevel model

Fixed Effect	Coefficient	Standard error	<i>t</i> -ratio	Approx <i>d.f.</i>	<i>p</i> -value
For INTRCPT1, β_0					
INTRCPT2, γ_{00}	89.93	0.34	265.30	87	<0.001
POVERTY, γ_{01}	-2.29	1.06	-2.16	87	0.034
For IS_MALE slope, β_1					
INTRCPT2, γ_{10}	0.17	0.40	0.43	250	0.667
For IS_WHITE slope, β_2					
INTRCPT2, γ_{20}	0.72	0.43	1.67	250	0.097
For AGE_OY slope, β_3					
INTRCPT2, γ_{30}	1.17	0.59	2.00	88	0.049
For HAS_3RDY slope, β_4					
INTRCPT2, γ_{40}	4.28	0.72	5.98	250	<0.001
For BRACKENS slope, β_5					
INTRCPT2, γ_{50}	0.23	0.02	11.82	88	<0.001
For EYBERG_I slope, β_6					
INTRCPT2, γ_{60}	-0.02	0.01	-3.46	250	<0.001

To further explore the relationships among variables, level two predictors were added to the model to predict the relationship between level one predictors and school readiness scores (see Table 19). Within the model, the intercept, or the expected value of the school readiness score at close of kindergarten, was 89.91. For each additional 10% of students in a school living below the poverty line, students within that school were expected to score 0.34 points lower on the assessment than their peers ($p=0.008$). After controlling for all other predictors, male students were expected to score 0.93 points higher than female students on the assessment. Poverty density and City Connects status each emerged as significant predictors of the relationship between gender and school readiness at the close of kindergarten. The interaction between poverty density and gender was significant in predicting school readiness, such that male students in schools with 10% greater poverty density than average are expected to score 0.30 points higher on the assessment ($p=0.041$). The interaction between City Connects status and gender was also significant in predicting school readiness score, such that male students in City Connects schools were expected to score 1.04 points lower on the school readiness assessment than their male comparison peers ($p=0.043$). No other interactions between level one and level two variables emerged as significant within the model.

Table 19.

Aim 3 – Multilevel model with interaction terms

Fixed Effect	Coefficient	Standard error	t-ratio	Approx. d.f.	p-value
For INTRCPT1, β_0					
INTRCPT2, γ_{00}	89.91	0.33	273.67	87	<0.001
POVERTY, γ_{01}	-3.39	1.25	-2.70	87	0.008
For IS_MALE slope, β_1					
INTRCPT2, γ_{10}	0.93	0.39	2.38	248	0.018
POVERTY, γ_{11}	2.98	1.45	2.05	248	0.041

IS_CCCS, γ_{12}	-1.04	0.51	-2.03	248	0.043
For IS_WHITE slope, β_2					
INTRCPT2, γ_{20}	0.72	0.43	1.68	248	0.095
For AGE_OY slope, β_3					
INTRCPT2, γ_{30}	1.17	0.57	2.04	88	0.045
For HAS_3RDY slope, β_4					
INTRCPT2, γ_{40}	4.31	0.72	5.95	248	<0.001
For BRACKENS slope, β_5					
INTRCPT2, γ_{50}	0.23	0.02	11.72	88	<0.001
For EYBERG_I slope, β_6					
INTRCPT2, γ_{60}	-0.02	0.01	-3.44	248	<0.001

Based on the multilevel model described above, 76% of the variance among classrooms and 41% of the variance among students has been accounted for (see Table 20).

Table 20.

Aim 3 – Multilevel model with interaction terms variance

Random Effect	Standard Deviation	Variance Component	<i>d.f.</i>	χ^2	<i>p</i> -value
INTRCPT1, u_0	0.97	0.94	75	113.61	0.003
AGE_OY slope, u_3	2.55	6.51	76	105.81	0.013
BRACKENS slope, u_5	0.08	0.01	76	105.70	0.014
level-1, r	4.00	15.97			

Based on this analysis, poverty density emerged as a significant predictor of school readiness, both as an independent predictor and through an interaction with gender. Boys were less vulnerable than girls to the negative relationship between poverty density and school readiness in this sample. City Connects status did not emerge as a significant independent predictor of school readiness in this study after controlling for initial levels of school readiness. For boys in the sample, however, being in City Connects was associated with lower school readiness scores at the close of kindergarten. Class size did not significantly contribute to the multilevel model in predicting school readiness score, either as an independent predictor or in interaction with student characteristics.

Aim 4: After controlling for initial school readiness performance, student characteristics, and school/classroom characteristics, does peer context in the classroom (i.e., peer knowledge and behavior) predict school readiness skills at the close of kindergarten?

The final research aim of this study sought to examine the impact of peer context (i.e., peer knowledge and behavior) in predicting student-level school readiness skills at the close of kindergarten. In order to address this question, a subsample of participating classrooms was selected based on the proportion of students for whom behavioral and school readiness measures were available. Specifically, classrooms (and students within classrooms) were chosen for inclusion only if Eyberg behavioral intensity and Bracken school readiness data was available for at least 25% of classroom students. This ensured that classroom level composite scores were reasonably representative of the classroom setting. Based on this new inclusion criterion, the subsample included 497 students from 86 classrooms.

Unconditional Model

The unconditional model represents the expected value of Y (i.e., school readiness score at end of kindergarten) without consideration of any level one (student) or level two (classroom) variables. It was necessary to re-establish an unconditional model at this time due to the revision in sample. Within the new sample, the intercept, or the expected value of school readiness score at close of kindergarten, is 91.21. The final estimation of variable components indicates that there is significant variance available to be explained (see Table 21). The variance associated with between-classroom effects is 3.46 and the variance associated with between-student effects is 27.46 (see Table 21).

Table 21.

Aim 4 – Unconditional model variance

Random Effect	Standard Deviation	Variance Component	<i>d.f.</i>	χ^2	<i>p</i> -value
INTRCPT1, u_0	1.86	3.46	85	150.46	<0.001
level-1, r	5.24	27.46			

Based on these estimates of the variance components, it is possible to establish the presence of a statistical nesting effect within the sample. Within this study, students are nested logically within classrooms. To confirm that this nesting also exists statistically, an unconditional intraclass coefficient (ICC) was calculated; the ICC in this model is 0.11. In other words, 11% of the variance in school readiness performance lies between classrooms. This is a significant proportion of the overall variance, and suggests that multilevel modeling would be a useful way to predict school readiness outcomes.

$$ICC = \frac{3.46}{3.46 + 27.46} = 0.11$$

Level One Model

To establish the degree to which student characteristics predict school readiness at the close of kindergarten within this sample, a level one model was established. Student gender, race, age, years of early education, initial school readiness score, and behavioral intensity score were all entered into the model. The associated coefficients are presented in Table 22.

The intercept in this model, or the predicted school readiness score without consideration of any level one predictors, is 89.69. Four of the six predictors entered into the model emerged as significant. Specifically, for every 10 additional points a student scored above average on the initial school readiness assessment, he or she was expected

to score 2 additional points on the final school readiness assessment ($p<0.001$). The coefficient associated with race and school readiness was 1.15 ($p=0.002$), such that white students are expected to score 1.15 points higher than students of color on the school readiness assessment. Years of early education predicted school readiness performance, such that students with a third year of early education were expected to score an additional 4.6 points on the school readiness assessment than peers with only two years of early education ($p<0.001$). Student behavior also emerged as a significant predictor of school readiness at close of kindergarten, such that for every 10 points more than average a student scored on the behavioral intensity measure (indicating worse behaviors), he or she was expected to score 0.2 points less on the school readiness assessment ($p=0.004$). Student gender and age were not significant predictors of school readiness in this model.

Table 22.

Aim 4 – Level 1 model

Fixed Effect	Coefficient	Standard error	t-ratio	Approx. d.f.	p-value
For INTRCPT1, β_0					
INTRCPT2, γ_{00}	89.69	0.36	249.27	85	<0.001
For IS_MALE slope, β_1					
INTRCPT2, γ_{10}	0.30	0.41	0.74	405	0.460
For IS_WHITE slope, β_2					
INTRCPT2, γ_{20}	1.15	0.38	3.04	405	0.002
For AGE_OY slope, β_3					
INTRCPT2, γ_{30}	1.16	0.61	1.89	405	0.060
For HAS_3RDY slope, β_4					
INTRCPT2, γ_{40}	4.60	0.73	6.31	405	<0.001
For BRACKENS slope, β_5					
INTRCPT2, γ_{50}	0.23	0.02	10.78	405	<0.001
For EYBERG_I slope, β_6					
INTRCPT2, γ_{60}	-0.02	0.01	-2.88	405	0.004

Variance estimates indicate that this model accounts for 66% of level two variance and 33% of level one variance (see Table 23).

Table 23.

Aim 4 – Level 1 model variance

Random Effect	Standard Deviation	Variance Component	<i>d.f.</i>	χ^2	<i>p</i> -value
INTRCPT1, u_0	1.09	1.18	85	119.61	0.008
level-1, r	4.24	17.95			

Further examination indicated that the relationship between school readiness and age and school readiness and initial school readiness score varied by classroom. As such, slopes for these relationships were allowed to vary randomly by group membership.

Level Two Model

Having established the relationship between student characteristics and school readiness at the end of kindergarten within this new sample, even after controlling for school readiness skills at the start of preschool, it is then possible to examine whether classroom and/or peer contexts predict school readiness at the close of kindergarten. Building upon the level one model established above, class size, City Connects status, poverty density, and classroom aggregates of behavior and school readiness scores were added to the model as possible predictors of school readiness. Of these predictors, only peer Bracken (i.e., school readiness) scores emerged as a significant predictor ($p < 0.001$; see Table 24). In contrast to previous models, poverty density did not emerge as a significant predictor of school readiness scores.

Table 24.

Aim 4 – Multilevel model

Fixed Effect	Coefficient	Standard error	t-ratio	Approx. d.f.	p-value
For INTRCPT1, β_0					
INTRCPT2, γ_{00}	90.03	0.34	263.73	84	<0.001
BRACKEN, γ_{01}	0.52	0.08	6.68	84	<0.001
For IS_MALE slope, β_1					
INTRCPT2, γ_{10}	0.23	0.38	0.61	235	0.542
For IS_WHITE slope, β_2					
INTRCPT2, γ_{20}	0.59	0.40	1.47	235	0.143
For AGE_OY slope, β_3					
INTRCPT2, γ_{30}	1.03	0.61	1.69	85	0.095
For HAS_3RDY slope, β_4					
INTRCPT2, γ_{40}	3.76	0.57	6.54	235	<0.001
For BRACKENS slope, β_5					
INTRCPT2, γ_{50}	0.20	0.02	10.67	85	<0.001
For EYBERG_I slope, β_6					
INTRCPT2, γ_{60}	-0.02	0.01	-3.62	235	<0.001

To further explore the relationships among variables, level two predictors were added to the model to predict the relationship between level one predictors and school readiness scores (see Table 25). As established in previous models, the relationships between school readiness and age and school readiness and initial school readiness score varied by classroom. In order to explore these relationships more fully, level two predictors were entered into the model in order to attempt to predict the relationships between level one predictors and school readiness outcome scores. Within the model, the intercept, or the expected value of the school readiness score at close of kindergarten, was 89.98. For each additional one point in classroom average on the Bracken (above grand mean of all classrooms), individual students within those classrooms were expected to score 0.51 points higher on their own school readiness assessment. Consistent with previous models, student characteristics such as race, initial Bracken score, and behavioral intensity score all emerged as significant level one predictors of school

readiness scores at the close of kindergarten. The relationship between student age and school readiness score, after controlling for all other student characteristics, approached significance ($p=0.054$). Unique to this model, an interaction effect emerged between years of early education and City Connects status. For students who had a third year of early education, school readiness scores at close of preschool were expected to be 1.7 points higher than their peers with two years of early education ($p=0.207$). Within that group, students who had been in City Connects schools for their early education experience were expected to score an additional 2.63 points on the school readiness assessment at close of kindergarten than their peers in comparison schools. This interaction effect closely approached statistical significance ($p=0.057$). Such an interaction suggests that enrollment in a City Connects school enhanced the promotive effect of being enrolled in early education for a longer period of time.

Table 25.

Aim 4 – Multilevel model with interaction terms

Fixed Effect	Coefficient	Standard error	t-ratio	Approx. d.f.	p-value
For INTRCPT1, β_0					
INTRCPT2, γ_{00}	89.98	0.30	302.88	84	<0.001
BRACKEN, γ_{01}	0.51	0.07	6.87	84	<0.001
For IS_MALE slope, β_1					
INTRCPT2, γ_{10}	0.26	0.40	0.64	234	0.520
For IS_WHITE slope, β_2					
INTRCPT2, γ_{20}	0.66	0.33	1.99	234	0.048
For AGE_OY slope, β_3					
INTRCPT2, γ_{30}	1.10	0.56	1.95	85	0.054
For HAS_3RDY slope, β_4					
INTRCPT2, γ_{40}	1.70	1.34	1.27	234	0.207
IS_CCCS, γ_{41}	2.63	1.38	1.91	234	0.057
For BRACKENS slope, β_5					
INTRCPT2, γ_{50}	0.20	0.02	9.97	85	<0.001
For EYBERG_I slope, β_6					
INTRCPT2, γ_{60}	-0.02	0.01	-3.85	234	<0.001

Based on this analysis, peer knowledge emerged as a significant predictor of school readiness. City Connects status emerged as a significant predictor of school readiness in interaction with extended time in early education, such that students in City Connects schools with three years of early education demonstrated stronger school readiness skills than students with three years of early education in non-City Connects schools. Within this model, class size, poverty density, and peer behavior were not predictive of school readiness scores at the close of kindergarten.

Variance estimates indicate that this model successfully explained 99% of between-classroom variance and 43% of between-student variance (see Table 26).

Table 26.

Aim 4 – Multilevel model with interaction terms variance

Random Effect	Standard Deviation	Variance Component	<i>d.f.</i>	χ^2	<i>p</i> -value
INTRCPT1, u_0	0.14	0.02	73	79.99	0.269
AGE_OY slope, u_3	2.60	6.75	74	111.26	0.004
BRACKENS slope, u_5	0.08	0.01	74	103.96	0.012
level-1, r	3.94	15.53			

Ad Hoc Analysis

Given the importance of student behavior in predicting school readiness, an ad hoc analysis was conducted to determine which factors predict behavior scores, both as students enter preschool, and again as they finish kindergarten.

Predicting student behavioral intensity at time of entry into preschool

Student behaviors in early childhood have been associated with a range of variables, including basic demographic characteristics such as age, race, and gender. An initial ad

hoc analysis was conducted to determine which student characteristics predicted student behavior scores in their first year of formal early education.

Unconditional Model

The unconditional model represents the expected value of Y (i.e., student behavioral intensity at start of preschool) without consideration of any level one (student) or level two (classroom) variables. Within our sample, the intercept, or the expected value of school readiness score at start of preschool, is 72.19 (see Table 27). The final estimation of variable components indicates that there is significant variance available to be explained (see Table 28). The variance associated with between-classroom effects is 368.80 and the variance associated with between-student effects is 1012.66 (see Table 28).

Table 27.

Ad Hoc Analysis I – Unconditional model

Fixed Effect	Coefficient	Standard error	t-ratio	Approx. d.f.	p-value
For INTRCPT1, β_0					
INTRCPT2, γ_{00}	72.19	2.64	27.30	82	<0.001

Table 28.

Ad Hoc Analysis I – Unconditional model variance

Random Effect	Standard Deviation	Variance Component	d.f.	χ^2	p-value
INTRCPT1, u_0	19.20	368.80	82	247.86	<0.001
level-1, r	31.82	1012.66			

Level One Model

When student characteristics were entered into the model, only gender emerged as a significant predictor of disruptive behavior (see Table 29). Specifically, male students are predicted to score 15.82 points higher than their female peers on the behavioral measure (indicating higher frequency of disruptive behavior), after controlling for race and age. Neither student race nor age emerged as significant predictors of behavioral intensity scores at the time of entry into preschool. Note that this model accounts for only 4% of the between-student variance in initial student behavior scores (see Table 30).

Table 29.

Ad Hoc Analysis I – Level 1 model

Fixed Effect	Coefficient	Standard error	<i>t</i> -ratio	Approx. <i>d.f.</i>	<i>p</i> -value
For INTRCPT1, β_0					
INTRCPT2, γ_{00}	66.54	3.08	21.62	82	<0.001
For IS_MALE slope, β_1					
INTRCPT2, γ_{10}	15.82	2.90	5.45	386	<0.001
For IS_WHITE slope, β_2					
INTRCPT2, γ_{20}	-4.37	3.79	-1.15	386	0.249
For SY_AGE slope, β_3					
INTRCPT2, γ_{30}	-1.23	3.31	-0.37	386	0.711

Table 30.

Ad Hoc Analysis I – Level 1 model variance

Random Effect	Standard Deviation	Variance Component	<i>d.f.</i>	χ^2	<i>p</i> -value
INTRCPT1, u_0	17.70	313.36	82	229.52	<0.001
level-1, r	31.18	971.92			

Predicting student behavior at the end of kindergarten

Having examined the relationship between student characteristics and behavioral intensity scores in the first year of preschool, a series of models were constructed to predict students' behavioral intensity scores at the end of their kindergarten year.

Unconditional Model

To first establish the amount of variance available to be explained, an unconditional model was specified. Without any consideration of level one (student) or level two (classroom) predictors, the intercept of predicted student behavior scores was 81.55 (see Table 31). This unconditional model indicated significant variance both between students and between classrooms in predicting student behavior (see Table 32).

Table 31.

Ad Hoc Analysis II – Unconditional model

Fixed Effect	Coefficient	Standard error	t-ratio	Approx. d.f.	p-value
For INTRCPT1, β_0 INTRCPT2, γ_{00}	81.55	3.35	24.35	82	<0.001

Table 32.

Ad Hoc Analysis II – Unconditional model variance

Random Effect	Standard Deviation	Variance Component	d.f.	χ^2	p-value
INTRCPT1, u_0	25.62	656.57	82	304.62	<0.001
level-1, r	35.81	1282.19			

Level One Model

When student characteristics were added into the model, several statistically significant relationships emerged. Furthermore, the relationship between level one variables and

student behavior scores varied by classroom membership. Accordingly, the relationships between student behavior and age, student behavior and years of early education, and student behavior at start and finish were each allowed to vary. The coefficients associated with each student characteristic, and their levels of significance, are presented in Table 33. Note that boys are expected to score 8.73 points higher than their female peers on the disruptive behavior measure (indicating greater frequency of disruptive behaviors among boys; $p=0.008$). Students with an additional year of early education showed fewer behavior problems than their peers with only two years of exposure, scoring 9.33 points lower on the measure ($p=0.050$). Finally, initial student behavior scores emerged as a highly significant predictor of student behavior during the kindergarten year ($p<0.001$). Just as in previous models, students' race and age did not emerge as significant predictors of student behavior.

Table 33.

Ad Hoc Analysis II – Level 1 model

Fixed Effect	Coefficient	Standard error	<i>t</i> -ratio	Approx. <i>d.f.</i>	<i>p</i> -value
For INTRCPT1, β_0					
INTRCPT2, γ_{00}	78.10	4.36	17.92	82	<0.001
For IS_MALE slope, β_1					
INTRCPT2, γ_{10}	8.73	3.26	2.68	138	0.008
For IS_WHITE slope, β_2					
INTRCPT2, γ_{20}	2.17	4.36	0.50	138	0.620
For AGE_OY slope, β_3					
INTRCPT2, γ_{30}	-2.07	4.18	-0.50	82	0.621
For HAS_3RDY slope, β_4					
INTRCPT2, γ_{40}	-9.33	4.70	-1.99	82	0.050
For SYEYBERG slope, β_5					
INTRCPT2, γ_{50}	0.55	0.07	8.18	82	<0.001

The level one model specified accounted for 36% of between-student variance in behavior scores at close of kindergarten (see Table 34).

Table 34.

Ad Hoc Analysis II – Level 1 model variance

Random Effect	Standard Deviation	Variance Component	<i>d.f.</i>	χ^2	<i>p</i> -value
INTRCPT1, u_0	24.99	624.31	23	60.61	<0.001
AGE_OY slope, u_3	11.34	128.54	23	54.78	<0.001
HAS_3RDY slope, u_4	18.67	348.61	23	44.78	0.004
SYEYBERG slope, u_5	0.33	0.11	23	47.40	0.002
level-1, r	28.67	821.69			

Level Two Model

Having established the level one model, a multilevel model was then specified. School and classroom characteristics were entered into the model to predict students' behavioral intensity scores. No level two variables emerged as significant independent predictors of students' behavioral intensity scores. However, an interaction effect did emerge, such that students with higher levels of disruptive behavior at the start of preschool demonstrated increased behavioral problems when placed in larger classrooms. In general, for every 10 points above average that a student scored on the behavioral intensity measure at the start of preschool, s/he is expected to score an additional 5 points higher on the behavioral intensity measure at the end of kindergarten ($p < 0.001$). Furthermore, for every additional student above average class size, students with above-average disruptive behaviors at the start of preschool are expected to score an additional .04 points on the behavioral measure at the close of kindergarten ($p = 0.014$; see Table 35).

Table 35.

Ad Hoc Analysis II – Multilevel model

Fixed Effect	Coefficient	Standard error	t-ratio	Approx. d.f.	p-value
For INTRCPT1, β_0					
INTRCPT2, γ_{00}	78.07	4.27	18.28	82	<0.001
For IS_MALE slope, β_1					
INTRCPT2, γ_{10}	8.58	3.2	2.64	138	0.009
For IS_WHITE slope, β_2					
INTRCPT2, γ_{20}	1.36	4.23	0.32	138	0.748
For AGE_OY slope, β_3					
INTRCPT2, γ_{30}	-2.12	4.27	-0.50	82	0.621
For HAS_3RDY slope, β_4					
INTRCPT2, γ_{40}	-8.33	4.69	-1.78	82	0.080
For SYEYBERG slope, β_5					
INTRCPT2, γ_{50}	0.50	0.06	8.25	81	<0.001
CLASS_SI, γ_{51}	0.04	0.02	2.52	81	0.014

This final multilevel model indicates that students' initial levels of disruptive behavior, gender, and years of early education all predict student behavioral intensity at the end of kindergarten. For children with above-average behavioral intensity (i.e., more frequent disruptive behaviors) in the first year of preschool, larger class size in kindergarten further predicts elevated disruptive behavior scores in that same year. Students' race and age are not significant predictors of behavior scores, nor are school-wide levels of poverty or City Connects status. The multilevel model accounts for 35% of the variance between students in behavior scores (see Table 36).

Table 36.

Ad Hoc Analysis II – Multilevel model variance

Random Effect	Standard Deviation	Variance Component	d.f.	χ^2	p-value
INTRCPT1, u_0	24.57	603.69	23	59.36	<0.001
AGE_OY slope, u_3	12.30	151.19	23	54.50	<0.001
HAS_3RDY slope, u_4	19.32	373.34	23	44.55	0.005
SYEYBERG slope, u_5	0.26	0.07	22	39.50	0.012
level-1, r	28.84	831.77			

Results by Hypothesis

Hypothesis 1. Student characteristics (i.e., gender, age, and race) will be significant predictors of school readiness scores at time of entry into preschool.

The initial hypothesis that student characteristics such as gender, age, and race would predict school readiness was supported at the time of entry into preschool; all three student characteristics emerged as significant in predicting initial performance on the school readiness assessment.

The hypothesis that student gender, age, and race would continue to predict school readiness at the close of kindergarten was supported in part. After controlling for initial school readiness skills, only student race and age emerged as continued significant predictors of school readiness at the close of kindergarten. Student gender was no longer a significant predictor of school readiness at the close of kindergarten after controlling for initial levels of school readiness. The results are likely due in part to the structure of the model – having controlled for initial school readiness skills, these models have already controlled for the gender, race, and age differences at the start of preschool that continue to be present as students continue in early education.

Hypothesis 2. Student behavior scores will significantly predict school readiness scores.

Given the research linking children's executive functioning, impulsivity, and academic skills, it was hypothesized that student behavior would predict school readiness scores such that greater behavior problems would be associated with lower levels of school readiness. This hypothesis was supported within this study. Intensity of student behavior emerged as a statistically significant predictor of school readiness scores at the

close of kindergarten, such that for every ten points higher a student scored on the behavioral intensity measure (i.e., was rated as having more frequent disruptive behaviors), s/he was expected to score 0.2 points lower on the school readiness assessment.

Hypothesis 3. Classroom and school characteristics (i.e., class size, poverty density, and City Connects status) will be significant predictors of school readiness scores at the close of kindergarten.

The hypothesis that school and classroom characteristics (i.e., class size, poverty density, and City Connects status) would be significant predictors of school readiness scores was only partially supported in this study. Poverty density, or the proportion of students in a school who are eligible for lunch subsidies, was significantly related to school readiness, such that students in higher poverty schools were expected to receive lower scores on the school readiness assessment at the close of kindergarten. This is consistent with the existing body of research that has documented the gap in school readiness skills along socioeconomic lines. It should be noted, however, that the relationship between poverty density and school readiness scores interacted with gender such that boys experienced less of a detrimental effect associated with poverty than did their female peers. The relationship between class size and school readiness skills was not significant in this study, either as an independent predictor of school readiness score or in interaction with any level one variables.

The results regarding the relationship between school readiness and the City Connects intervention were mixed. In the model built to address Aim 3 (student and

classroom predictors only), City Connects emerged as a significant predictor of school readiness skills in interaction with student gender. Specifically, males in City Connects schools were expected to score 1 point lower on the assessment than their peers in comparison schools. In later models that accounted for peer knowledge and behavior, City Connects status, when in interaction with years of early education experience, emerged as a significant predictor of school readiness. In those models, students who had been enrolled in City Connects schools for three years of early education were expected to score nearly 3 points higher on the Bracken than their peers who had three years of early education in a comparison school; for children with only two years of early education, no such effect emerged.

Hypothesis 4. The peer context of the classroom is expected to significantly predict individual students' school readiness scores. Specifically, higher levels of behavioral intensity in the classroom are expected to predict lower school readiness scores. Higher levels of peer knowledge (i.e., peer school readiness skills) are expected to predict stronger individual school readiness skills.

The hypothesis that peer context (behavior and knowledge) would predict school readiness skills was supported in part. Peer levels of school readiness were significantly predictive of students' school readiness skills (Aim 4). In contrast, peer behavior scores were not significant predictors of school readiness scores.

Chapter 5: Discussion

School readiness skills are a crucial component of early child development, and they are important predictors of children's later academic success (Duncan et al., 2007). While school readiness skills are critical for all children, there are long-standing inequalities in students' levels of readiness at the start of school that predict differential achievement over time (Coley, 2002; Duncan et al., 2007; Lee & Burkam, 2002; Razza et al., 2010; Ryan et al. 2006; Welsh et al., 2010). In order to address these inequalities, psychologists, educators, and policy makers have sought to design interventions that leverage student, family, and community strengths in order to promote optimal development. This study contributes to that literature by examining City Connects, a systemic school-based intervention that is designed to address out of school barriers to learning in order to optimize student development. Consistent with a social justice and relational developmental systems approach (Lerner & Overton, 2008), this intervention works across intraindividual and extraindividual domains to promote child development and thriving. Furthermore, this study examines the unique contributions of student characteristics, school/classroom characteristics, and the interactions among these variables in order to more deeply understand the development of school readiness skills within our sample of students.

Review and Discussion of Findings

Relational developmental systems theory offers a framework for understanding and addressing the complex constellation of factors that contributes to children's development. Specifically, relational developmental systems theory highlights the importance of dynamic and interacting contexts (or variables) as a way of better

understanding children's developmental trajectories (e.g., Lerner, 2006; 2011; Masten & Cicchetti, 2010). When applied to the domains of school readiness and academic thriving, relational developmental systems theory underscores the importance of taking a multifaceted approach to both research and intervention in order to most fully understand and optimize student development. Consistent with this approach, the purpose of this study was to examine the conditions that support school readiness skills in a sample of young children in urban preschool and kindergarten settings. Specifically, this study modeled the relationships between student characteristics, classroom characteristics, peer contexts, and school readiness skills, including interactions among these variable groups.

Broadly speaking, this study supports a relational developmental systems perspective, and results indicated that student characteristics, classroom characteristics, peer context, and interactions among these variables each predicted school readiness skills at the end of kindergarten. Findings are reviewed and discussed in detail below according to variable category (i.e., student demographic characteristics, student behavior, school/classroom characteristics, peer context, and interactions among variables).

Student Demographic Characteristics and School Readiness

The first aim of this study was to examine the relationship between student characteristics and school readiness skills during students' first year of exposure to early education (i.e., their first year of preschool). The literature on student characteristics and school readiness consistently points to achievement gaps along the lines of gender, socioeconomic status, and race (Coley, 2002; Duncan et al., 2007; Lee & Burkam, 2002; Razza et al., 2010; Reardon, 2001; Ryan et al., 2006; Welsh et al., 2010). Specifically,

on school readiness measures of pre-academic skills in reading and math, boys typically perform at lower levels than girls, students living in poverty tend to underperform relative to their peers with greater socioeconomic resources, and students of color tend to underperform relative to their white peers (Coley, 2002). In the context of typical development, older students tend to perform more strongly on school readiness measures than their younger peers, a trend that is consistent with appropriate developmental gains and should not be considered a form of inequality (Bracken, 2007).

Consistent with the existing body of research (e.g., Coley, 2002; Duncan et al., 2007), this study documented the predicted relationships among available sociodemographic characteristics and student performance on school readiness measures at the start of early education. The first model in this study demonstrated that gender ($p < 0.01$), race ($p < 0.001$), and age ($p < 0.001$) each served as significant predictors of initial school readiness (i.e., school readiness scores during that child's first year of preschool). Furthermore, the relationships demonstrated in this model were meaningful in an applied sense as well, such that boys were expected to score 3 points lower on the school readiness assessment than girls, white students were expected to score 6 points higher on the school readiness assessment than their peers of color, and for each additional year of age, older students were expected to score an additional 11 points on the school readiness assessment at the close of kindergarten (all coefficients reflect holding all other variables constant). These relationships clearly demonstrate that, consistent with the previous literature (e.g., Coley, 2002; Duncan et al., 2007), students' sociodemographic characteristics are both statistically significant and practically meaningful predictors of school readiness.

While student characteristics are predictive of school readiness at the start of preschool, they remain significant predictors of performance throughout early childhood and into elementary school as well (Duncan et al., 2007). The second aim of this study, therefore, was to identify those student characteristics that predicted school readiness at the close of kindergarten, even after controlling for initial levels of school readiness upon entry into preschool. In doing so, this study identified those students that are at particular risk for persistent underperformance with regard to school readiness, and may further be at risk for associated adverse outcomes in later academic performance.

Across all student demographic predictors of school readiness, the strength of relationships between individual characteristics and skills at the end of kindergarten lessened or was eliminated once initial school readiness was taken into account. For example, while gender was a significant predictor of initial school readiness at the start of preschool, it did not significantly predict school readiness at the close of kindergarten after initial school readiness skills were taken into account. Student race and age remained significant predictors of school readiness at the close of kindergarten even after controlling for initial school readiness scores, but their associated coefficients were smaller. After controlling for initial school readiness, white students were expected to score one point higher than their peers of color on the school readiness measure at the close of kindergarten ($p=0.001$) and older students were expected to score an additional one point on the school readiness measure for every year above average they were ($p=0.045$); note that these coefficients are calculated holding all other predictors constant. The noted relationship between student age and school readiness score is consistent with appropriate developmental gains, and is to be expected given students' continued

exposure to pre-academic concepts at home and in preschool (Bracken, 2007). While the relationship between student race and school readiness is consistent with the literature on inequalities in school readiness (Coley, 2002), its persistence even after accounting for initial levels of school readiness is somewhat surprising. This persistent relationship may be explained, at least in part, by the significant correlation between race and poverty density in this sample, such that students of color were more likely than white students to be in high poverty schools ($r=-0.516, p<0.001$). Given the lack of availability of an individual-level indicator of student poverty, it is possible that the relationship between student race and school readiness may be functioning as a proxy for dual risk in this model. The persistence of this relationship may also be accounted for by some variable that was not captured in this study, such that students of color had unique early education experiences (either within or outside the classroom) and thus unique paths to school readiness development. Such possibilities could be explored in future research on issues of early child development.

Student Behavior and School Readiness

In addition to examining the relationship between students' demographic characteristics and school readiness development, the second aim of this study also sought to explore the relationship between student behavior and school readiness. While this study operationalized school readiness in terms of early literacy and math skills, in accordance with state guidelines for early childhood education (Bracken, 2007), other theorists have identified children's behavioral and executive functioning skills as a key component of the school readiness construct (Duncan et al., 2007; Ryann et al., 2006). Consequently, these nonacademic skills are important variables to consider when

examining developmental outcomes and early childhood education. Furthermore, behavioral and executive functioning skills have each consistently emerged as predictors of children's cognitive and school readiness development, and are thus important to consider even if simply to deepen our understanding of early math and literacy skill development (Fantuzzo, Bulotsky-Shearer, McDermott, McWayne, & Frye, 2007; Hair, Halle, Terry-Humen, Lavelle, & Calkins, 2006; Razza et al., 2010; Welsh et al., 2010).

The behavioral indicator used in this study reflects a range of externalizing behaviors (e.g., temper tantrums, aggression) and executive functioning indicators (e.g., distractibility, attention problems), and as such reflects the relationship between externalizing problems and school readiness as well as the relationship between executive functioning / self-regulatory skills and school readiness, both of which are well-established within the literature (Fantuzzo et al., 2007; Hair et al., 2006; Razza et al., 2010; Welsh et al., 2010). Consistent with the expectations of the earlier research (e.g., Razza et al., 2010; Ryan et al., 2006; Welsh et al., 2010), student behavior in this study emerged as a statistically significant predictor of school readiness. Specifically, students with higher teacher ratings of behavioral intensity at the time of testing (i.e., greater frequency of disruptive behaviors) had lower predicted scores on the school readiness assessment at the close of kindergarten. Note that the significance of this relationship existed even after controlling for initial school readiness skills and student demographic characteristics.

To further examine student behaviors in this study, ad hoc analyses were conducted to determine what student and/or classroom characteristics would be predictive of disruptive behaviors, both at the start of preschool and at the close of kindergarten. By

examining these factors, this study sought to both identify risk factors that may predict behavior problems as students enter preschool, and to identify risk or protective factors that would predict student behaviors years later, as students were preparing to enter first grade. The existing literature on school readiness development suggests that just as there are inequalities in school readiness as defined by pre-academic skills, there are also inequalities in behavioral indicators of school readiness (Razza et al., 2010; Ryan et al., 2006). Ad hoc analyses in this study indicated that behavioral intensity scores at the start of preschool were significantly predicted only by gender (and not by race or age). This is consistent with previous research with the Sutter-Eyberg Student Behavior Inventory measure, which has documented gender differences in the direction found in this study (Lumley, McNeil, Herschell & Bahl, 2002). Further ad hoc analyses demonstrated that gender differences in behavioral intensity scores persisted at the close of kindergarten, even after controlling for initial student behavior. Student race and age were not significant predictors of later student behavior after initial behavior scores were taken into account.

While expected relationships were demonstrated with regard to student characteristics predicting student behavior problems, ad hoc analyses revealed additional findings that are worthy of discussion. When an ad hoc model was specified to predict student behavior at the close of kindergarten, a significant relationship emerged between years of early education and disruptive behavior scores, such that children with three years of early education were expected to receive lower teacher ratings on the disruptive behavior measure (indicating fewer disruptive behaviors) than their peers who had been

enrolled in only two years of early education. Stated another way, students with greater exposure to formal early education had fewer disruptive behaviors than their classmates.

There are several potential explanations for the relationship between years of early education and student behaviors. First, it may be that longer enrollment in preschool and kindergarten settings simply yields greater exposure to behavioral expectations in school settings, and that this continued exposure supports students' abilities to comply with those expectations accordingly. Alternately, the literature on teacher-child relationships in elementary schools suggests that high quality teacher-child relationships can serve as a buffer against behavioral problems, both within the year of that relationship and beyond (O'Connor, Dearing, & Collins, 2011). It may be that students in this study with more years of documented early education experience in City Connects and/or comparison schools have benefitted from an additional year of promotive teacher-child relationships, and are demonstrating positive behavioral outcomes accordingly. Whatever the explanatory mechanism, the significantly lower levels of behavior problems in children with more years of early education is an important protective factor for this group, as childhood behavior problems have been linked to a range of short- and long-term problems, including increased likelihood of experiencing academic failure, greater risk of dropping out of school, and greater risk of adolescent delinquent behavior (Caughy, Nettles, & O'Campo, 2008).

School/Classroom Characteristics and School Readiness

The third aim of this study moved beyond student characteristics and behaviors to explore the relationship between school/classroom characteristics and school readiness. Contextual characteristics considered at this level included class size, poverty density,

and City Connects status. As noted previously, student poverty is often associated with lower levels of school readiness in early childhood (Coley, 2002). In this study, the demographic recordkeeping practices of sample schools necessitated that poverty be operationalized at the school level. Although this limited the study's ability to tightly examine the relationship between poverty and school readiness at the student level, the broader expected relationships were nonetheless demonstrated. After controlling for initial school readiness and individual student characteristics (i.e., age, gender, race, years of early education), poverty density emerged as the single independent classroom-level predictor of school readiness, such that students in higher poverty schools were expected to achieve lower school readiness scores than their peers in schools with lower levels of poverty ($p=0.008$).

While the relationship between poverty and school readiness is well established within the literature (Coley, 2002; Duncan et al., 2007; Lee & Burkam, 2002; Razza et al., 2010; Reardon, 2001; Ryan et al., 2006; Welsh et al., 2010), the existing body of research suggests that classroom size too is often predictive of school readiness skills. Specifically, hallmark studies such as STAR and SAGE have demonstrated significant relationships between student:teacher ratio and levels of achievement in reading and math, with smaller class sizes being associated with more favorable outcomes (Finn et al., 2001; Reynolds et al., 2010). In contrast to these findings, class size in this study did not emerge as a significant predictor of school readiness scores. While this null finding could accurately reflect the relationship between class size and achievement within the study sample, it is important to note that class sizes in this study ranged from 11 to 40 students, with limited reporting about the number(s) of teachers and/or teaching assistants

that supported each classroom. A more nuanced understanding of classroom structure and student:teacher ratios may have enhanced the capacity of the study to detect such a relationship.

The impact of City Connects on students' academic achievement in elementary school has been well documented across more than a decade of research, reflecting positive outcomes on both teacher-assigned indicators (i.e., grades) and standardized test scores (City Connects, 2010, 2012, 2014; Walsh et al., 2000; Walsh, Madaus et al., 2014). Based on the strength of these previously demonstrated relationships, it was predicted that the City Connects intervention would show similar effects in the early childhood population. In contrast to that hypothesis, however, City Connects status did not emerge as an independent predictor of students' school readiness skills at the close of kindergarten. Although this null finding was unexpected given the previous body of research, the school-age literature on City Connects may still offer some clues in interpreting the current findings. While students in City Connects elementary schools go on to outperform their comparison peers on a range of indicators, positive outcomes often take multiple years to emerge. More specifically, significant differences in report card grades tend to emerge around the end of grade two (City Connects, 2010), and significant differences in high stakes achievement tests often emerge even after students have left City Connects elementary schools and entered middle school (City Connects, 2014). The null findings that we see here with regard to City Connects not emerging as a significant independent predictor of school readiness within this limited time sample is therefore consistent with the existing literature on the intervention, and suggests that longitudinal study is indicated in order to more completely assess the impact of the intervention over

time. The interactive relationship between years of early education and City Connects status, which is described in more detail below, further suggests that more longitudinal study may indeed be warranted.

Peer Context (Knowledge and Behavior) and School Readiness

While classroom and school characteristics certainly reflect important aspects of the context of children's development in early education settings, ecological models of child development (e.g., Bronfenbrenner, 1994) and relational developmental systems theory (Lerner, 2006; 2011) each point to the importance of children's peer group as a critical context for ongoing development. The fourth research aim of this study, therefore, sought to examine the impact of peer context (i.e., peer knowledge and behavior) in predicting student-level school readiness skills at the close of kindergarten. While peer contagion effects have been demonstrated in terms of student behavior in school-age samples (Boxer et al., 2005; Dishion & Tipsord, 2011; Thomas et al., 2011), the literature on peer knowledge and behavior predicting school readiness has not yet been developed. Nonetheless, relational developmental systems theory suggests that the context of the peer group is an important one to consider when understanding the complexities of children's development. As such, models were constructed to examine whether peer knowledge and behavior in the classroom predicted school readiness.

Classroom-level aggregates of peer knowledge (school readiness scores) and peer behavior (behavioral intensity scores) were added to multilevel models that predicted school readiness. When these variables were included, peer knowledge emerged as a significant predictor of student-level school readiness scores ($p < 0.001$). In this way, the classroom context in the form of peer knowledge was demonstrated to be a significant

independent predictor of the individual performance of children within that class on the school readiness measure. This relationship between peer and individual performance is an interesting one, and could be the subject of future exploration in educational research. Note that the context of peer behaviors was not a significant predictor of student-level school readiness in this study (although student-level behavior ratings remained a significant predictor of that same child's school readiness scores).

The existing literature on children's socioemotional development offers some suggestions about why peer knowledge emerges as a statistically significant predictor of individual students' school readiness scores. With regard to children's behavior, research has demonstrated a "peer contagion" effect, such that individual students tend to drift toward the behavioral norms of their fellow students in a group setting (Boxer et al., 2005; Dishion & Tipsord, 2011; Thomas et al., 2011). It may be that a similar phenomenon exists with regard to academic skill development, such that students tend to norm towards one another over time. Alternately, aggregate peer school readiness scores may serve as a proxy for the level of instruction that early education teachers are providing in classrooms, and thus the amount of formal instruction that students are receiving in these areas.

Interactions between Student- and Classroom-Level Variables and School Readiness

Relational developmental systems theory affirms the importance of examining the multiple dynamic transacting contexts that shape child development, including those within the child (i.e., across domains of development), and those outside of the child (e.g., family, peer group, classroom, school). Furthermore, relational developmental

system theory is unique in that it places an emphasis on the transactions among these contexts as a primary focus of study and conceptual understanding (Lerner & Castellino, 2002; Overton, 2011; Overton & Lerner, 2012). To explore these relationships, interaction terms were entered within each multilevel model in the study. Several interaction effects emerged, and are discussed in detail below.

The first interaction effect emerged when examining the predictive power of school/classroom characteristics (i.e., class size, City Connects status, and poverty density) with regard to school readiness after controlling for initial school readiness and student characteristics (i.e., gender, race, age, years of early education, initial school readiness skills, and behavioral intensity scores). In this model, poverty density ($p<0.001$), gender ($p=0.018$), age ($p=0.045$), years of early education ($p<0.001$), initial school readiness score ($p<0.001$), and behavioral intensity score ($p<0.001$) each emerged as significant predictors of school readiness. Furthermore, interactions emerged with regard to gender. While higher levels of school-wide poverty density were associated with lower school readiness scores for both male and female students, the size of that effect was much greater for female students ($p=0.041$). While the underlying mechanism of poverty's differential impact on child development by gender is unknown, similar effects have been seen in other studies, such that poverty is differentially associated with adverse developmental and cognitive outcomes in girls, but not boys (e.g., Petterson & Albers, 2001).

A second interaction with gender emerged in this study, such that for boys, being in City Connects schools was associated with a one point decrease in school readiness score relative to male peers in comparison schools ($p=0.043$); there was no such effect for

female students. This interaction is particularly difficult to interpret given the significant correlation between City Connects status and school-level poverty density. Specifically, City Connects schools in this sample tended to have higher rates of student poverty, and poverty density in turn was a significant predictor of lower school readiness performance. Further research with poverty status operationalized at the student level may help to differentiate what in this study is a confounded interaction between gender, City Connects status, and poverty.

In analyses that included aggregate peer school readiness scores, a significant interaction emerged between individual student behavior scores and class size. Specifically, the multilevel model indicated that for students with higher levels of disruptive behavior at the start of preschool, being in a larger class size in kindergarten was associated with higher ratings of behavioral intensity (i.e., greater behavioral problems) at the close of kindergarten. This interaction is consistent with previous studies that suggest larger class sizes are often associated with greater behavior problems (Barnett et al., 2004; Finn et al., 2001; Finn, Panno, & Achilles, 2003).

A final interaction effect in this study emerged in Aim 4, which accounted for the greatest number of student and classroom level variables. In this model, peer knowledge ($p < 0.001$), student race ($p = 0.048$), student behavior ($p < 0.001$), and initial school readiness score ($p < 0.001$) each emerged as significant predictors of school readiness at the close of kindergarten. Furthermore, an interaction emerged with regard to years of early education and City Connects status ($p = 0.057$), such that for students who had three years of early education experience (as opposed to two years), students in City Connects schools were predicted to score an additional 2.6 points higher on the school readiness

assessment at the close of kindergarten than their peers in comparison schools. This is an exciting finding, as it suggests that with increased years spent in City Connects schools, there is a positive predicted impact on school readiness. Furthermore, the coefficient associated with this interaction is greater than those of any of the other predictors in the model. The significance of this interaction in the current sample is consistent with the literature on the impact of City Connects in the elementary school population, wherein a greater number of years in City Connects schools (i.e., higher dosage) is associated with more positive outcomes (Walsh, Madaus et al., 2014). While further longitudinal study is certainly indicated, this interaction offers preliminary evidence that the City Connects intervention makes a difference in early school readiness development.

Limitations

The current study offers unique insights into the relationship between student characteristics, school/classroom characteristics, and school readiness development. Consistent with its relational developmental systems framework, it affirms that school readiness skills are predicted by a mix of individual factors, contextual factors, and dynamic interactions among these variables. While these findings have important implications for theory, policy, practice, and research (as discussed later in this chapter), there are several areas in which future researchers could make improvements to the study design in order to examine these relationships more fully.

The City Connects intervention is a unique and promising school-based intervention with a strong evidence base in school-aged populations. The nature of the intervention is that it is implemented at the school level, which offers great strength in terms of ecological validity. However, this same strength also generates some threats to

internal validity. Since randomization of intervention status to students is not possible, the study design is quasi-experimental in nature, and consumers of research must bear in mind that it is possible that pre-existing differences between students, classrooms, or schools may explain different outcomes. This threat was addressed in this study by incorporating a host of individual and classroom level variables into the model, but it is always possible that characteristics not incorporated into the model may nonetheless be impacting relationships therein.

The use of existing classrooms and schools also shaped the nature of the variables that were utilized in this study. Student-level variables utilized for research were limited to those that were collected and consistently documented by participating schools. While student gender, race, age, behavior ratings, and school readiness scores were all available for inclusion in the study, it should be noted that there are other risk and protective factors that were not available but which may nonetheless be important predictors of initial school readiness performance. Most notably, this study does not include an individual-level indicator of poverty, and thus was not able to replicate previous findings regarding the relationship between poverty and school readiness development.

Additionally, there was no information available about children's experiences of day-care and/or early childhood education prior to entering participating schools. The lack of availability of these variables certainly limits the capacity of this study to fully examine the relationship between student characteristics/experiences and school readiness, and future research should seek opportunities to incorporate these highly relevant variables whenever possible.

In addition to having limited access to student-level information, this study was limited by its reliance on school reports of classroom characteristics. With regard to the variables used in this study, there were limitations to the way in which class size was reported, in that class size was reported independently of teacher staffing in the classroom. Furthermore, more nuanced indicators of classroom quality were not available. Given that the existing literature on classroom context tends to focus on student:teacher ratios and structured observations of classroom quality, this may have limited the ability of this study to effectively capture any existing relationships between classroom context and the development of students' school readiness skills.

Finally, this study drew data from a formative time in the City Connects intervention. The four academic years of data utilized represent the four initial years in which the City Connects intervention was implemented in early education in Catholic schools, and thus represents the first possible look at the impact of the intervention in this population. While this early look is exciting, it also represents a time in which the intervention was first established in these schools, and thus may also reflect some early growing edges in implementation. Changes in which particular schools were implementing the intervention during this time frame limited the sample size as well. Future research that incorporates additional academic years may not only increase sample size, but would also reflect the impact of the now more well-established intervention in these early education environments.

While the "real world" settings of this study yielded some threats to internal validity, it is important to locate these considerations within the broader agenda of developmental research. Lerner and Overton (2008) have explicitly argued that such

tradeoffs are not only acceptable, but are in fact central to meeting the social justice aims of the field. By studying the dynamic contextual processes that predict school readiness development, this study not only contributes to the academic literature on the topic, but has also enacted positive change in the lives of students, and serves as a foundation for continued developmental scholarship and intervention.

Implications of Research

Theoretical Considerations

This study built upon a relational developmental systems framework to examine the development of school readiness skills in a sample of children in urban early education programs. Specifically, it examined the relationship between individual characteristics and school readiness, school/classroom contexts and school readiness, and the interactions between individual and school/classroom characteristics in predicting school readiness. Results of the evaluation are consistent with many of the tenets of relational developmental systems theory, as outlined below.

Relational developmental systems theory posits that development occurs at multiple levels of organization within the individual (Lerner, 2006; 2011; Lerner & Overton, 2008; Walsh et al., 2009). Furthermore, intraindividual domains of development are held to be both distinct and interdependent. Consistent with this theoretical approach, this study examined multiple aspects of student development, including school readiness skills and classroom behaviors. Consistent with relational developmental systems theory, school readiness skills were a distinct aspect of children's development that was predicted by characteristics such as student age, race, gender, and behavior. The interconnectedness of the development of students' school readiness and

behavioral skills is consistent with transactional developmental theory, and affirms the importance of maintaining a dynamic multidimensional perspective when conceptualizing even the development of discrete skills such as letter or number identification.

The relational developmental systems approach moves beyond intraindividual considerations to locate child development in multiple ecological contexts individual (Lerner, 2006; 2011; Lerner & Overton, 2008). In this study, the primary context considered was that of the early childhood classroom, including such characteristics as class size, poverty density, City Connects status, and peer knowledge and behavior. When these contextual variables were entered into multilevel models as independent predictors of school readiness, both poverty density and peer knowledge emerged as significant.

Finally, a relational developmental systems approach places particular emphasis on transactions and complex individual—context interactions in understanding developmental trajectories (Lerner & Castellino, 2002; Overton, 2011; Overton & Lerner, 2012). Within this study, multilevel modeling and cross-level interaction terms were utilized to model the dynamic interactions between student characteristics and school/classroom characteristics. As a result, nuanced relationships were identified, and a new level of understanding was brought to bear in conceptualizing school readiness skill development within this population of urban early education students.

Implications for Policy and Practice

One of the primary aims of developmental research is to inform the policies and practices that have the potential to optimize child development and functioning. The

results of this study offer several opportunities for informing policy and practice, each of which is described in more detail below.

First and foremost, the current study affirms the importance of taking a multidimensional approach to understanding risk and promotive factors with regard to the development of school readiness skills. Consistent with previous research, inequalities in school readiness were documented in this study along the lines of both gender and race. While poverty indicators were not available at the level of individual students, poverty density at the school level was associated with differences in school readiness, such that students in higher-poverty schools were more likely to demonstrate lower school readiness scores. Taken together, these results confirm previously demonstrated inequalities in school readiness along the lines of gender, race, and socioeconomic status.

Such persistent and pervasive inequalities suggest that intervention is indicated at the level of policy in order to meet the needs of at-risk students and provide appropriate educational opportunities for our nation's children. A one-size-fits-all model of early education is unlikely to combat pre-existing inequalities in school readiness, which in turn are strongly predictive of later academic outcomes. Instead, more targeted approaches are necessary. For at-risk children such as boys, students of color, or those living in poverty, it is particularly important that educational policies exist to ensure access to early education experiences that will address vulnerabilities toward underperformance in the development of pre-academic skills. Furthermore, the characteristics of such programs should address the specific needs of the students within them. For example, results of this study suggest that smaller class sizes are particularly important for children with greater behavioral problems at the start of preschool. Broader

research on poverty and academic development confirms that in order to be effective, educational interventions must address the out-of-school barriers to learning that impede children's cognitive, behavioral, and academic performance (e.g., Adelman & Taylor, 2011).

One such intervention that seeks to address out-of school barriers to learning by leveraging student, family, and community strengths is City Connects. In studies examining the impact of City Connects on elementary school students, positive results have consistently been documented with regards to report card grades, performance on standardized tests, and student thriving indicators (City Connects, 2010; 2012; 2014). Positive impacts have been documented even after students leave the City Connects intervention, including a continuation of strong standardized test performance, lower rates of retention by grade, and lower rates of high school dropout (City Connects, 2010; 2012; 2014; Walsh, Lee-St. John et al., 2014). While this profile of results is very well established in the literature on City Connects when implemented at the elementary school level, this study represents one of the first looks at the impact of the intervention on the early childhood population and students' associated school readiness and behavioral skills. While City Connects did not emerge as an independent predictor of school readiness skills in this study, the interaction between City Connects and years of early education suggests that greater effects may be evident through continued longitudinal research. Within the current study, a positive City Connects effect is seen for students who have had three years of early education, suggesting that the longer students are in City Connects schools or comparison schools, the bigger the impact the City Connects

intervention has. Continued research is indicated in order to examine these relationships more fully.

Implications for Future Research

The dynamic transactional nature of the development of school readiness skills is well established in the literature, and has been well-represented in this study as well. Student characteristics have consistently emerged as significant predictors of school readiness, both in children's first year of preschool and as they prepare to enter first grade. School and classroom characteristics are important predictors as well, with school poverty density predicting school readiness independently and City Connects status interacting with student characteristics to predict school readiness scores. While this study offers several insights into the developmental pathways that shape and predict school readiness, the dynamic longitudinal relationships between student behavior, school readiness, student characteristics, and school/classroom contexts should continue to be the subject of future research in order to more closely understand this aspect of early child development.

Within the literature on City Connects, the relationship between the intervention and student academic performance is well-established. Although City Connects did not emerge as a significant independent predictor of school readiness in this study, the interaction between City Connects status and years of early education suggests that the City Connects intervention may nonetheless be making a difference in students' development of these skills, particularly for those students who spend a greater amount of years in the intervention. This initial trend suggests that further longitudinal research may be indicated to examine the relationship between City Connects and school readiness

skills over a greater window of time. Furthermore, longitudinal research on other early childhood interventions suggests that early childhood intervention often offers the greatest “bang for the buck” in terms of intervention, such that early intervention is associated with changing academic trajectories and gains that develop and are sustained for years after children leave early education (Barnett & Hustedt, 2005; Campbell et al., 2001). Longitudinal studies utilizing this data are necessary in order to examine whether such relationships may be present with the City Connects intervention as well.

The relationship between peer knowledge and student school readiness skills is a novel finding demonstrated in this study, and may represent a new direction for future research. While the behavioral contagion theory offers hints about possible mechanisms of this effect from the child behavior literature, further inquiry into the underlying instructional and developmental factors that may explain this relationship is indicated so that this finding can be translated into appropriate and effective recommendations for practice.

Summary & Conclusions

School readiness at kindergarten is an important predictor of children’s future academic success (Duncan et al., 2007). While early pre-academic and behavioral skills are important for all students, there is considerable inequality in students’ levels of readiness at the start of school (Coley, 2002). This study offers further evidence that these inequalities in school readiness exist, and are persistent even across multiple years of early education.

While it is important to understand the inequalities that exist when children enter formal early education environments, it is also critical to understand the ways in which

schools and policy makers can implement policies that support children's pre-academic development. This study affirms that while student characteristics are powerful predictors of school readiness, classroom characteristics and educational policies are important as well. Poverty status emerged as a significant predictor in this study, as did years of early education. While the impact of poverty density has limited utility from a policy perspective, the relationship between years of early education and school readiness suggests that greater exposure to early education supports children's pre-academic development. Furthermore, the City Connects intervention was demonstrated to provide additional support for students who have been in early education environments for longer amounts of time. This finding offers guidance for schools and educational systems seeking to support those students who are particularly at risk for underperforming in their early education skills.

Finally, the use of relational developmental systems theory was strongly supported in this study. The most powerful analytical models in this study were those that incorporated student sociodemographic characteristics, student behaviors, classroom characteristics, peer context variables, and the interactions among said variables. While simpler models often generated significant findings, they also missed critical relationships that provided a greater degree of predictive power. It is imperative, therefore, that future research and intervention efforts continue to reflect and incorporate the complexity of child development in order to support children and families and optimize development.

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