THE INFLUENCE OF EARLY PARENT INVOLVEMENT AND DEPRESSION ON ACADEMIC ACHIEVEMENT, PSYCHOSOCIAL BEHAVIORS, AND MOTIVATION IN CHILDREN WITH LEARNING DISABILITIES ACROSS ELEMENTARY SCHOOL

By

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ABSTRACT

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Children with learning disabilities represent the largest category of students served within special education systems in schools, and are at increased risk for academic and psychosocial problems in comparison to peers without learning disabilities. While much of clinical practice and research focus has been on academic interventions, understanding other risk and protective factors that hinder or promote academic and psychosocial development in children with and without learning disabilities is critical to inform other points of intervention. More specifically, parenting behavior in early childhood including, parent depression and parent school involvement, may hinder or promote outcomes for children with learning disabilities. The purpose of this study was to examine whether parent depression, a risk factor, and parent school involvement, a protective factor, predicted academic and psychosocial outcomes in children with subtypes of learning disabilities (i.e., reading disability, math disability, co-morbid reading and math disability) differentially as compared to children without learning disabilities at two time points in elementary school, kindergarten and fifth grade. Primary analyses used multi-sample Structural Equation Modeling (SEM) to evaluate the effects of parent depression and parent school involvement on math and reading academic achievement and psychosocial behavior at kindergarten, as well as on psychosocial behavior in fifth grade. Additionally, the long-term effects of academic achievement and psychosocial behavior in kindergarten on these outcomes in fifth grade were also examined. Data was drawn from the Early Childhood Longitudinal Study –

Kindergarten Cohort of 1998-1999 (ECLS-K) kindergarten and fifth grade data collection waves. The final study sample consisted of approximately 10,630 children. Results indicated that parent depression did not significantly predict parent school involvement, however direct effects of parent depression on kindergarten reading achievement and direct effects of parent school involvement on kindergarten outcomes were noted for children with and without learning disabilities. Additionally, complex relations between kindergarten and fifth grade academic and psychosocial outcomes arose. Finally, effects of gender, age, race, and socio-economic status were examined and significantly influenced both kindergarten and fifth grade outcomes. Findings point to the importance of promoting parent school involvement as a means to improve outcomes for children with and without learning disabilities, as well as the importance of promoting early academic achievement and psychosocial development.

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CHAPTER 1

INTRODUCTION

Currently, students with a learning disability (LD) represent the largest category of disability in schools (Cortiella & Horowitz, 2014). By definition, children with LD experience more academic difficulties than their typically developing peers due to underlying neurological and psychological deficits that interfere with learning (APA, 2013; IDEA, 2004). Research also suggests that children with LD are at increased risk of experiencing social-emotional and behavioral problems (Willcutt et al., 2013), and diminished motivation in school (Bender & Wall, 1994; Graham & Harris, 2003; Grolnick & Ryan, 1990). Moreover, children with LD are a heterogeneous group. Research indicates that children with various subtypes of LD experience different academic and psychosocial problems, and children with multiple LD's experience worse prognoses compared to children with one LD or no LD (Martinez & Semrud-Clikeman, 2004; Willcutt et al., 2013). Studies of long-term outcomes indicate that children with LD are more likely to drop out of grade school, have lower levels of post-secondary education, remain unemployed or receive fewer promotions, have low self-esteem, and have increased likelihood of mental health problems, behavioral problems, and juvenile delinquency (Boetsch, Green, & Pennington, 1996; Daniel et al., 2006; Goldston et al., 2007; McGee, Prior, Williams, Smart, & Sanson, 2002; Willcutt et al., 2013).

Despite the multiple points of intervention, much of the extant research and practical efforts for children with LD have been focused on academic interventions in schools to target the primary academic problem. More recently, with the passage of special education legislation that reflects the need for earlier intervention and inclusion of parents in their children's educational planning, educators and researchers have begun to pay more attention to early preventative

efforts that may mitigate the long-term academic problems for children with LD, including consideration of other psychological, motivational, and social-emotional factors. In order to develop interventions designed to target academic and non-academic factors, several areas must be investigated further. First, gaining an understanding of how academic and psychosocial factors develop and influence one another in children with LD over the course of time is important. It has been established that early academic performance is related to later academic performance, and that early psychosocial problems are related to later psychosocial problems (Morgan, Farkas, Tufis, & Sperling, 2008; Morgan, Farkas, & Wu, 2012). However, evidence regarding how academic achievement and psychosocial behaviors influence one another is mixed; some studies indicate that early psychosocial problems do not influence later academic achievement (Morgan, Farkas, Tufis, & Sperling, 2008), whereas others do (Hinshaw, 1992; Lepola, Poskiparta, Laakkonen, & Niemi, 2005; Trzesniewski, Moffitt, Caspi, Taylor, & Maughan, 2006). Finally, there is evidence that children experiencing academic problems demonstrate lower motivation to learn (Tabassam & Grainger, 2002). However, much of the research examining these relations in children with LD is confounded by methodological factors including various definitions of LD, no differentiation of subgroups of LD, small sample sizes, and lack of control groups. Thus, relatively little is known about whether these relationships hold for children with LD compared to typical populations, and more specifically for children with various subtypes of LD.

Second, understanding the early risk and protective factors that exist in relation to developing an LD and associated problems, and how those risk and protective factors influence one another may lead to more targeted preventative efforts. Various risk factors for developing an LD have been researched including, genetic predisposition, prenatal and postnatal biological

insults, and environmental factors such as poverty (Aarnoudse-Moens et al., 2009; Bhate & Wilkinson, 2006; Cortiella & Horowitz, 2014; Gaddes, 2013; Piper et al., 2012). Additional risk factors such as parent depression can exacerbate academic and social-emotional problems (National Research Council and Institute of Medicine, 2009). On the other hand, protective factors such as increased parent involvement have been related to more positive academic and behavioral outcomes, social-emotional well-being, and motivation to learn (Christenson, 2000; Epstein, 1994; Gonzalez-DeHass, Willems, & Holbein, 2005; McWayne et al., 2004; Pianta, Rimm-Kaufman, & Cox, 1999).

Overall, the purpose of this study is to examine whether parent depression, a risk factor, and parent involvement, a protective factor, predict academic, psychosocial, and motivational outcomes in children with subtypes of LD compared to children without LD over the course of elementary school. The current study will test a hypothesized latent variable model to examine the relations between parent depression, parent involvement, early academic and psychosocial outcomes, and later academic, psychosocial, and motivation outcomes across elementary school in a sample of children with reading disability, math disability, reading-math disability, and without LD. By determining the magnitude by which parent variables influence child outcomes, conclusions about whether parent depression and parent involvement serve as risk and protective factors differentially for children with and without LD may be drawn. This study takes advantage of a large, nationally representative dataset in order to address methodological problems in other studies including small sample sizes and lack of control groups. This model also accounts for various environmental factors including, socioeconomic status and race-ethnicity that are associated with LD and various academic and psychosocial outcomes (Cortiella & Horowitz, 2014; Coutinho, Oswald, & Best, 2002; O'Connor & Fernandez, 2006).

CHAPTER 2

LITERATURE REVIEW

Learning Disabilities and Academic Achievement

Learning disability (LD) is an umbrella term used to describe a range of neurologically-based disorders that affect a person's ability to process, think about, and perform verbal and/or non-verbal tasks. Over the past several decades, researchers have identified specific psychological and neurological processes that characterize specific types of LD (e.g., dyslexia, dyscalculia). Additionally, researchers have also examined the genetic and environmental factors that influence the development of learning disabilities, including prenatal and postnatal risk factors. For example, maternal illness, malnutrition, and exposure to teratogens in utero, low birth weight, premature birth, postnatal traumatic injuries, exposure to environmental toxins, and nutritional or environmental deprivation are risk-factors for developing an LD (Aarnoudse-Moens et al., 2009; Bhate & Wilkinson, 2006; Cortiella & Horowitz, 2014; Gaddes, 2013; Piper et al., 2012). Environmental factors, including poverty, have also been shown to affect the likelihood of developing an LD. For example, children from low-income families are over-identified with LD's in schools (Cortiella & Horowitz, 2014). The effects of poverty (e.g., malnutrition, lower levels of early academic enrichment, greater likelihood of exposure to toxins such as lead) may account for the fact that there is a higher incidence of LD's for children living in poverty (Cortiella & Horowitz, 2014). Similarly, children from African-American and Hispanic backgrounds tend to be diagnosed with LD's at a disproportionate rate. Research suggests that differences in diagnostic practices, and racial biases or stereotypes may play a part in over-identification of minority children with an LD (Harris-Murri, King, & Rostenberg, 2006).

One way to conceptualize how genetic and environmental factors influence development of an LD and outcomes for children with LD is through a risk-resiliency model. Zimmerman and Arunkumar (1994) described a risk-resiliency model that posits that positive child outcomes can occur despite risk factors through a process by which the interaction between protective factors and risk factors alters the influence of risk factors and decreases the likelihood of negative outcomes. Following this model, if a child has multiple genetic and environmental risk factors for developing an LD (e.g., familial history of LD, cognitive deficits), protective factors including parent involvement, access to education, and positive parent mental health, may improve the prognosis of the child who does develop an LD. Understanding the nature of LD, as well as the risk and protective factors that may influence the development of an LD and associated academic and psychosocial problems is imperative to designing assessment and intervention practices that target more than just the symptoms of the LD (e.g., academic interventions).

In general, LD's are persistent and permanent (Cortiella & Horowitz, 2014). According to the National Center for Learning Disabilities (Cortiella & Horowitz, 2014), students with a learning disability account for approximately 42% of all children with disabilities served by the special education system in public schools across the country (Cortiella & Horowitz, 2014). It is estimated that an additional 15% of students struggle academically due to unidentified learning disabilities or lack of intervention (Cortiella & Horowitz, 2014). Thus, children with learning disabilities represent the largest group of students with a disability in schools. Children with LD's are at-risk for poorer prognosis in life including, low academic achievement, higher rates of high school drop-out, lower level of higher education attainment and future employment, increased behavioral problems and juvenile delinquency, poorer social skills and self-esteem,

and increased likelihood of mental health problems including depression and anxiety (Boetsch, Green, & Pennington, 1996; Daniel et al., 2006; Goldston et al., 2007; McGee, Prior, Williams, Smart, & Sanson, 2002; Reschly & Christenson, 2006; Robinson & Oppenheim, 1998; Willcutt et al., 2013). The following sections will provide an overview of how LD's are defined and diagnosed, the prominent features associated with LD, and the extant research on academic outcomes for children with LD.

Definitions of Learning Disability

There are two widely accepted definitions of and guides to diagnosing an LD. First, the Individuals with Disabilities Education Act (IDEA, 2004) states that a specific learning disability (SLD), another term for LD, is

> "a disorder in one or more of the basic psychological processes involved in understanding or in using language, spoken or written, that may manifest itself in the imperfect ability to listen, think, speak, read, write, spell, or do mathematical calculations, including conditions such as perceptual disabilities, brain injury, minimal brain dysfunction, dyslexia, and developmental aphasia. Such term does not include a learning problem that is primarily the result of visual, hearing, or motor disabilities, of mental retardation, of emotional disturbance, or of environmental, cultural, or economic disadvantage (pg. 118)."

According to IDEA, there are eight categories of SLD: oral expression, listening comprehension, written expression, basic reading skills, reading fluency skills, reading comprehension, mathematics calculation, and mathematics problem solving. IDEA stipulates two main ways to diagnose an SLD. The first method is based on a pattern of strengths and weaknesses in the student's academic performance and/or intellectual ability in relation to their

age, intellectual development, or state age- or grade-level standards, and consideration of quality of instruction received. If a student exhibits significant weaknesses in one of the eight areas and strengths in other areas, they may be diagnosed with an LD. The second method is based on the student's progress towards state age- or grade-level standards after receiving evidence-based interventions (EBI), typically through a process known as Response-to-Intervention (RtI). RtI involves a systematic process of assessing the student's deficits, applying EBI's, and monitoring the student's progress or growth following intervention. If a student does not make adequate progress after a certain amount of time receiving intervention, the student may be diagnosed with an LD.

The second definition of LD is from the Diagnostic and Statistical Manual of Mental Disorders (DSM-5; APA, 2013). The DSM-5 defines a specific learning disorder, another term for LD, as a

> "persistent difficulty in reading, writing, arithmetic, or mathematical reasoning skills during formal years of schooling. Symptoms may include inaccurate or slow and effortful reading, poor written expression that lacks clarity, difficulties remembering number facts, or inaccurate mathematical reasoning. Current academic skills must be well below the average range of scores in culturally and linguistically appropriate tests of reading, writing, or mathematics. The individual's difficulties must not be better explained by developmental, neurological, sensory (vision or hearing), or motor disorders and must significantly interfere with academic achievement, occupational performance, or activities of daily living (APA, 2013b, pg. 1)."

According to the DSM-5, a diagnosis should be based on a review of a person's developmental, medical, educational, and familial history, previous academic reports, observations from teachers, and a student's progress after academic interventions have been conducted.

Despite the definitions and guidelines provided by the IDEA and DSM-5, there is still considerable variability in diagnosis of LD in both research and practice. Individual school districts and practitioners may set more specific criteria to determine whether a student is making "adequate" progress or "demonstrates a pattern of strengths and weaknesses." For example, a school might implement an intervention for 6 weeks, whereas another school may implement an intervention for 8 weeks before determining whether a student's progress (or lack thereof) is indicative of an LD. Likewise, a school may stipulate that a student must show at least two or three areas of strength in comparison to a weakness. In research, studies may use more liberal (e.g., performing at or below the 30^{th} percentile) or more conservative (e.g., performing at or below the 10^{th} percentile) criteria to determine whether a student demonstrates an LD (Murphy, Mazzocco, & Hanich, 2007).

Another source of variability stems from the changing definitions of LD. Currently, the DSM-5 and IDEA models of identification both highlight the importance of considering student's academic growth based on the application of EBI's; however this is a fairly new consideration. Previous models of LD identification recommended diagnosis of LD based on a severe discrepancy between a student's achievement scores and their intellectual ability (i.e., IQ score). Research has demonstrated that a severe discrepancy model may be biased in identification of students with LD (Fletcher, Coulter, Reschly, & Vaughn, 2004). Thus, previous research may inaccurately identify students with an LD.

Finally, previous research has often studied children with LD as a homogeneous group, irrespective of the specific types of academic struggles that they may have (e.g., reading, math). Rourke and Fuerst (1992) noted that there is "an almost lack of sensitivity to the notion that there may be subtypes of children with LD for whom various kinds of academic and social learning may be more or less difficult to achieve." (p. 362). Thus, greater specificity and attention to LD subtypes is warranted in both clinical and research efforts aimed at understanding the risk and protective factors that influence important outcomes and providing the most effective and appropriate intervention. More recent research has begun to explore the differences and similarities among subtypes of LD, although more work is needed in this area. The remainder of this section will focus on math disability and reading disability, two of the most common subtypes of learning disability.

Mathematics Disability. Historically, research on academic achievement has centered on reading disabilities; however the number of children who show deficits in math is reportedly equal to, if not greater, than those with reading problems (Mazzocco, 2001). Mathematics learning disability (MD) refers to a number of neuropsychological deficits that interfere with learning of concepts and/or procedures in one or more domains of math, such as algebra or geometry (Geary, 2004; Geary, Hoard, Nugent, & Bailey, 2012; Mazzocco, 2007). Estimates of the prevalence of MD vary; some report between 5%-8% of children have an MD, which is comparable to the number of children with reading disabilities (Geary, Hoard, Nugent, & Bailey, 2012; Judge & Watson, 2011). Berch and Mazzocco (2007) report that up to 10% of children have persistent math difficulties, indicating that there may be more children who are low achieving in math or not identified with an LD. As with reading disabilities, research indicates both genetic and environmental factors contribute to the development of MD (Light & DeFries,

1995; Shalev & Gross-Tsur, 2001). In one study, parents and siblings of children with arithmetic-based subtypes of MD were ten times more likely to be diagnosed with MD compared to the general population (Shalev & Gross-Tsur, 2001).

A major barrier to understanding the true prevalence of MD is the lack of consensus on the definition of MD across research studies and clinical practice, as well as few specific screening or diagnostic protocols to evaluate a student for a MD (Geary, 2004; Gersten, Jordan, & Flojo, 2005). According to some researchers, children who perform at or below the 35th percentile on a standardized assessment of math are characterized as having math difficulties (Clements & Sarama, 2009). Researchers argue that this more liberal definition allows for identification of children who are performing in the low average range and may be at greater risk for developing more serious math difficulties or MD in the future to receive earlier intervention (Gersten, Jordan, & Flojo, 2005). However, liberal criterion may conflate research on students with MD with low achievement in general. Other researchers have used a cut-point of performance below the 25th percentile (1st quartile) on a standardized assessment (Geary, Hamson, & Hoard, 2000; Gross-Tsur, Manor, & Shalev, 1996; Morgan, Farkas, Hillemeier, & Maczuga, 2014; Murphy et al, 2007). However, Geary (2004) points out that a cut-point at the 25th percentile (or higher) does not align with the estimation of 5%-8% of students having a true MD. The most conservative criterion of performance that has been used by researchers to study children with MD is performance at or below the 10th percentile (Mazzocco & Myers, 2003). Overall, the standardized achievement tests used to gauge performance capture a wide range of mathematical procedures and concepts, whereas children with MD often have more severe deficits in some areas and not others (Geary, 2004). Thus, scores on standardized tests may over or underestimate the student's competencies in specific procedures and domains of mathematics.

Researchers indicate that true MD is generally persistent, and reliance on one test score at one point in time does not indicate a MD in and of itself. Consideration of academic history and response to evidence-based interventions is an important component of diagnosis (Geary, 2004). For example, some research indicates that children who do not respond to intensive intervention in fact retrieval may have more complex cognitive and memory deficits, and the persistence of retrieval problems despite intervention is a strong indicator of MD (Howell, Sidorenko, & Jurica, 1987). Overall, when examining the research on MD, it is important to consider how the disability is defined. Throughout this literature review, children with MD will refer to children who demonstrate low achievement (e.g., below 35th percentile) to very low achievement (e.g., below the 10th percentile) in mathematics.

Children with mathematics learning disability do not follow a typical developmental trajectory when learning math. A typical developmental pattern for most children begins with numerical knowledge and builds into conceptual knowledge of mathematics, and finally to computational mechanisms involved in solving more complex problems. In infancy, children begin to develop an understanding of numbers and quantity. Investigation of infant ability using dishabituation paradigms indicates that infants discriminate small quantities when presented with arrays of dots or objects (Starkey & Cooper, 1980). Mathematics research in infancy suggests that there is some inherent drive to understand basic numerical principles and counting (Geary, 2006), although there is little doubt that experience and observational learning account for much of mathematical development. For children with MD, research suggests that the ability to identify numbers and discriminate quantities is generally intact, although these skills are often delayed (Badian, 1983; Geary, Hoard, & Hamson, 1999; Gross-Tsur, Manor, & Shalev, 1996).

As children begin preschool and kindergarten they are exposed to more formal number-related activities. During this time, foundational skills of math, including counting knowledge and strategy development, are reinforced. Counting knowledge begins as children learn to make associations between written numbers, number names, and mental representations of quantities. By around age four, most typically developing children have the ability to sequence numbers from one to ten (Geary, 2006). There are several principles of counting knowledge that continue to develop during early childhood, and with application and error correction become more automatized and accurate. These principles include learning one-to-one correspondence (only one word for each object), stable order (the order of number words remains the same despite the set), cardinality (the final number word represents the total quantity of objects), abstraction (any object(s) can be grouped and counted), order-irrelevance (items can be counted in any order), and ordinality (successive number words signify sequentially larger quantities) (Geary, 2004). These principles form the basis for understanding of arithmetic operations.

In regards to counting knowledge, studies indicate that children with MD are able to accurately identify some counting principles, but not all. In a study by Gelman and Meck (1983), first grade children were asked to watch a puppet count objects and identify if there were errors in counting. Children with MD and reading disability (RD) accurately identified one-to-one correspondence errors when they occurred on the last item (i.e., double counting last item), but not when they occurred on the first item, indicating difficulties with working memory. Also, these children identified violations of non-essential counting principles, such as counting adjacent items consecutively, as errors. These findings were replicated in a subsequent study, which also found that children with MD and RD-MD persist with these same errors in second grade, and only children with reading disabilities did not show these same counting errors

(Geary, Bow-Thomas, & Yao, 1992). Thus, many children with MD show difficulty understanding counting principles, particularly principles of order irrelevance. These difficulties likely delay their ability to learn and complete higher-order arithmetic problems (Ohlsson & Rees, 1991).

Typical development of arithmetic concepts, including addition, subtraction, multiplication, and division, develop through several mechanisms. Applying counting knowledge, use of manipulatives to aid counting, and successively more complex strategy use evolves with practice. For example, children typically begin to solve addition problems using a "count all" strategy in which they count all the objects in a given problem set starting with "one." As children develop memory skills and fluidity with counting, they may begin with the larger addend and count on, also known as the min strategy (e.g. to solve 5 + 3, a child would begin with "five" and count up three numbers until they reach "eight") (Geary, 2006). As children amass repeated practice with solving basic operations, they develop associations between the problem and answer. These associations are stored in long-term memory and can be retrieved relatively effortlessly and quickly. Siegler (1989) noted that children use multiple strategies to solve math problems at any point in time and that strategy use depends on the accuracy and speed associated with using a given strategy and overall efficiency. Retrieval is the most efficient process, thus math fluency is characterized by accurate and quick retrieval of basic math facts.

Development of math calculation skills involves not only fluency of basic math facts but also deep conceptual knowledge. Deep conceptual knowledge, often taught and practiced in elementary and secondary school, may include but is not limited to learning properties of basic operations such as the associative property (order of addition or multiplication of multiple numbers is irrelevant), understanding ratios (parts of a whole), and estimation. Many of these

concepts are learned through physical manipulation of objects, applications to other concepts, and continual maturation of memory, attention, and other executive functioning capacities (Geary, 2004; Geary 2006).

For children with MD, research suggests that the types of math strategies used and change in strategy use over time is less developed (Geary, Hoard, & Hamson, 1999; Hanich, Jordan, Kaplan, & Dick, 2001; Jordan & Montani, 1997; Gross-Tsur, Manor, & Shalev, 1996). In a study by Jordan and colleagues (2003), children with MD used finger counting in second and third grade, whereas their peers without MD used primarily verbal counting and automatic retrieval of math facts. Children with RD and typically achieving children showed maturation in strategy use between first and second grade, from finger counting to verbal counting and automatic retrieval. Some studies indicate that by the end of elementary school children with MD do become more proficient at verbal counting strategies and demonstrate fewer counting errors (Geary & Brown, 1991). In terms of using the most advanced strategy, retrieval, to solve arithmetic and word problems, children with MD and RD-MD demonstrate significantly more errors and variable response times compared to typically achieving peers, and do not show the same improvements in fact retrieval over time, as with verbal counting (Barrouillet, Fayol, & Lathuliere, 1997; Fayol, Barrouillet, & Marinthe, 1998; Geary & Brown, 1991; Gersten, Jordan, & Flojo, 2005; Rasanen & Ahonen, 1995). Similar deficits in fact retrieval have also been noted in children who have a lesion to the left hemisphere and associated subcortical regions early in life (Ashcraft, Yamashita, & Aram, 1992). Another study found that children with poor automaticity of fact retrieval performed similarly to children who are fluent in fact retrieval on untimed story problems, but performed significantly worse when the problems were timed (Jordan, Hanich, & Kaplan, 2003). Thus, cognitive processes including, working memory and

long-term storage and retrieval, as well as development of more efficient strategies differ in children with MD compared to typically achieving peers or peers with RD only. The use of inefficient strategies uses additional attention and working memory resources, and further hinders the development of automaticity of fact retrieval and understanding of more abstract concepts.

Mathematics disability subtypes. As previously mentioned, children with MD are a heterogeneous group, and may show strengths and weaknesses in different mathematical domains influenced by their developmental trajectory. There is evidence to support several subtypes of MD including, procedural, semantic, and visual-spatial subtypes. Characteristics of children with procedural subtype of MD include more counting errors, immature strategy use (e.g., finger counting, counting all), misalignment of numbers, and errors with regrouping (e.g., carrying or borrowing). These features may be related to working memory and attention deficits that make it difficult for children to hold and manipulate number words and counting procedures mentally (Hitch & McAuley, 1991). Additionally, problems with the phonetic-articulatory system may also hinder a child's ability to process, hold, and attend to verbal representations of numbers (Geary, 1993; McLean & Hitch, 1999). Characteristics of children with semantic subtype of MD include difficulty retrieving basic facts from long-term memory, more errors with fact retrieval, and inconsistent reaction time patterns with fact retrieval. It is hypothesized that problems with the language system responsible for encoding long-term memories representations of phonetic (the number word) and semantic (the quantity of the number) properties associated with arithmetic problems are at play (Geary, 2004). Another possibility is that difficulties inhibiting irrelevant associations lead to difficulties with fact retrieval (Barrouillet, Fayol, & Lathuiere, 1997; Hanich et al., 2001). For example, in a study by Geary and colleagues (2000)

children with MD and children with RD made more counting-string errors (6 + 2 = 7 or 3, because 7 comes after 6, and 3 comes after 2), indicating that they had difficulty inhibiting the irrelevant information in working memory related to the problem addends. Finally, characteristics of children with visual-spatial subtype of MD include difficulties with estimation tasks and misunderstanding or errors in representing numerical information spatially (e.g., on a number line or graph).

Summary. Given the developmental nature of mathematics learning, it would not be unreasonable to assume that early math difficulties subsume later math difficulties, and that in general MD is a persistent disability. Several studies indicate that math difficulties do persist across elementary school grades (Morgan, Farkas, Hillemeier, & Maczuga, 2014; Morgan, Farkas, & Wu, 2009). In one study, students performing below the 10th percentile in fall and spring of kindergarten had the slowest growth rates in math from first through fifth grade, and approximately 65%-70% of students with MD in kindergarten continued to experience MD in first, third, or fifth grade (Morgan, Farskas, & Wu, 2009). Morgan, Faskas, Hillemeier, and Maczuga (2014) found that children with who were performing in the lowest 25th percentile in mathematics at the end of kindergarten were seventeen times more likely to have math disability throughout elementary and middle school. These studies not only demonstrate the stability of MD, but also highlight the importance of early academic skills in predicting later academic problems. Early math skills have been shown to predict reading, math, and science achievement from kindergarten through eighth grade, including for students who enter school with lower math skills (Claessens & Engle, 2013). Additionally, general math achievement in kindergarten entry has been shown to be highly predictive of math achievement in third grade (Claessens, Duncan, & Engel, 2009; Duncan et al., 2007; Jordan, Kaplan, Ramineni, & Locuniak, 2009), and studies

indicate that the gap between children with and without math difficulties tends to remain stable or increase over time (Shin, Davison, Long, Chan, & Heistad, 2013).

In sum, children with MD represent a heterogeneous group of students with neuropsychological deficits that interfere with learning and performance of procedures and concepts in various mathematical domains. These children often show a different developmental trajectory that is characterized by poor counting knowledge, problems with fact retrieval, and inefficient strategy use. Although researchers have begun to examine the defining features, and neuropsychological and biological correlates of subtypes of MD, there is a lack of consensus on the diagnostic criteria for MD and various definitions of MD complicate the interpretation of many research findings. Nevertheless, it is well established that children with MD have lower academic achievement compared to peers, greater social and emotional problems, and face poorer prognosis in later life for employment and social-emotional adjustment in adulthood (Reschly & Christenson, 2006; Martinez & Semrud-Clikeman, 2004).

Reading Disability. Literacy is one of the most important skills in today's society, required for success in school, the work force, and daily living. However, many children and adults struggle to read. In fact, the majority of students with an LD have a RD (Lerner & Johns, 2009; Shaywitz & Shaywitz, 2003). Reading disability (RD) is characterized by neuropsychological deficits that lead to difficulty reading, not otherwise attributable to low intellectual functioning or environmental factors such as cultural considerations, poverty, social-emotional problems, or lack of instruction or exposure to language and text (Shaywitz & Shaywitz, 2005). The predominant features of RD include inaccurate or dysfluent word recognition, poor decoding skills, and poor spelling (Judge & Watson, 2011; Pennington, 2009). RD is typically diagnosed based on a persistent pattern of difficulty in reading despite

intervention and performance in the lowest 10th percentile on standardized assessment of reading. The prevalence of RD in children is estimated between 5% and 17.5% (Shaywitz & Shaywitz, 2005). Reading disabilities are equally prevalent among boys and girls, although some studies indicate that boys are more likely to be identified with LD in reading in school and receive special education services (Shaywitz, 2003). This phenomenon may be due to different behavioral manifestations of learning problems (e.g., more hyperactivity, behavioral problems) between boys and girls that leads to differential attention from teachers regarding the severity of the learning problems. Etiological studies indicate that RD is highly heritable; 23% to 65% of children with RD have a parent with RD (Scarborough, 1990), and approximately 40% of their siblings have RD (Pennington & Gilger, 1996).

For typically developing children, there are two general routes (dual-route model) by which they learn to read: the phonological and orthographic routes (Ehri, 2015; Woollams, 2015). Infants and toddlers pick up on language sounds from their environment (Hart & Risley, 1995). As children begin formal instruction in reading, they learn to associate orthographic representations (print) of letters with their respective language sounds, also known as phonemic awareness (Ehri, 2015). Through the process of decoding, or segmenting words into their individual phonemes and stringing phonemes together, children use the phonetic code (letter-sound associations) to read words. Meaning is assigned to the word once the child decodes the word. This process is known as the phonological route (Ehri, 2015). The phonological route is an indirect method of reading, used by beginning readers and by advanced readers when faced with a complex, unfamiliar word. It is a slow, deliberate, and effortful process that requires attention, working memory, and visual, auditory, and language-processing. On the other hand, the orthographic route (also known as the word-form route) is a more direct method of reading used

by skilled readers (Ehri, 2015). The orthographic route involves automatic recognition of whole words associated with their semantic meaning, and is the most efficient and fastest method of reading. When a child uses the phonological route to read words multiple times, they commit words and their associated meanings to memory. As a child progresses from using the phonological route to the orthographic route to read, they develop greater reading fluency, or the ability to read accurately, quickly, and with little effort. As children develop reading fluency, they begin to read to learn, or in other words, read to comprehend new information. Reading comprehension is the ability to understand, remember, and think about the text that is being read. Reading fluency and comprehension influence one another, such that children who are fluent readers are better able to understand what they read and children who have strong comprehension skills become more fluent readers (Klauda, & Guthrie, 2008).

There is considerable research that supports the dual-route model of reading. Functional neuroimaging research indicates that three main areas of the brain are involved in reading (Shaywitz, 2003; Pugh et al., 2000). Two posterior systems in the left hemisphere, the dorsal temporo-parietal circuit and the ventral occipito-temporal circuit, are involved in automatic word recognition. The temporo-parietal region (also known as the word analysis system) contains Wernicke's area, and is implicated in phonological awareness (Pugh et al., 2000). The occipito-temporal circuit (also known as the word form system) is involved in rapid recognition of whole words (Pugh et al., 2000). Finally, the inferior frontal gyrus in the anterior portion of the brain, which contains Broca's area, is involved in articulation and has been associated with silent reading (Pugh et al., 2000). Thus, beginning readers rely on the temporo-parietal circuit to decode words via the phonological route, but as they practice decoding the word multiple times it

becomes stored in the occipito-temporal word form area and is retrieved via the orthographic route.

Children with RD have core deficits in phonological processing that impact their decoding skills, reading fluency, and/or reading comprehension (Brady, 1991; Bus & Ijzendoorn, 1999; Cain, Oakhill, & Bryant, 2000; Olson, Forsberg, & Wise, 1994; Pennington, 2009; Snowling, 2001; Torgesen, 2000; Wagner, Torgesen, & Rashotte, 1994; Yuill & Oakhill, 1991). Although several models of RD point to deficits in auditory perceptual processing and naming speed (e.g., Tallal, 1980; Wolf & Bowers, 1999; Wolf, Bally, & Morris, 1986), a substantial amount of research supports the hypothesis that RD is related to core problems with phonological processing. Pennington (2009) found that individuals with RD showed underactivation in the temporo-parietal regions of the brain associated with phonological awareness and decoding. Consequently, underactiviation in the occipito-temporal word form system was also found given that storage of known words is dependent on accurate decoding (Pennington, 2009). Several studies have also indicated individuals with RD demonstrate weaknesses in other neuropsychological and cognitive domains after controlling for performance on phonological measures such as, verbal comprehension and speech and language processing (Pennington & Bishop, 2009), slower verbal naming speed and general processing speed (Compton, DeFries, & Olson, 2001; Landerl, Fussenegger, Moll, & Willburger, 2009), and impairments in executive functions including verbal working memory, response inhibition, and attention (Ebejer et al., 2010; Purvis & Tannock, 2000; Roodenrys, Koloski, & Grainger, 2001; Willcutt, Pennington, Olson, Chhabildas, & Hulslander, 2005).

Similar to MD, studies have indicated that RD is persistent over time, and that student's early reading achievement and skills are predictive of later reading achievement (Algozzine,

Wang, & Violette, 2011; Froiland, Powell, Diamond, & Son, 2013; Judge & Bell, 2010; Lin, Morgan, Hillemeier, Cook, Maczuga, & Farkas, 2013). For example, McNamara, Scissons, and Dahleu (2005) found that measures of phonemic awareness and alphabetic principle in kindergarten predicted first grade reading achievement. The results of this study also revealed that children who were poor readers in kindergarten were more likely to have reading difficulties in first grade. This trend is true in later grades as well; Lin and colleagues (2013) found that children with RD in third grade (performing in the lowest 10% on reading achievement test) were almost twenty times more likely to still have an RD in fifth grade. Similarly, Judge and Bell (2010) found that children with reading disabilities made less growth in reading across kindergarten through fifth grade compared to children without LD. Despite the evidence indicating that RD is stable over time, and children with RD typically demonstrate problems early on, a study by Lipka and colleagues (2006) found a small subset of children who did not demonstrate reading or phonological deficits until third and fourth grade. Thus, RD is a heterogeneous category, and there may be some children who develop reading problems later in life, particularly in regards to problems with reading comprehension but not word reading.

Overall, children with RD have marked impairments in their ability to decode, read fluently, and comprehend text. These features are based in core deficits in phonological processing, and are associated with individual neurological differences and neuropsychological impairments such as verbal working memory, processing speed, and attention deficits. Similar to children with other disabilities, children with RD are at-risk for poor academic achievement, higher levels of academic frustration, school dropout, low self-esteem, and poorer prognosis in adulthood (e.g., unemployment) (Boetsch, Green, & Pennington, 1996; Daniel et al., 2006; Goldston et al., 2007; McGee, Prior, Williams, Smart, & Sanson, 2002; Willcutt et al., 2013).

Co-morbid Mathematics and Reading Disability. Research indicates that math and reading disabilities co-occur (RD-MD) in approximately 30% to 70% of individuals with either disorder (Kovas et al., 2007; Landerl & Moll, 2010; Willcutt et al., 2013). One proposed model of co-morbidity with empirical support is the correlated liabilities model (Willcutt et al., 2013). This model suggests that RD and MD co-occur more frequently than expected by chance because they share etiological factors, whereas additional etiological influences specific to RD or MD lead to distinct disabilities occurring alone. Twin analyses indicate that there are shared genetic influences between RD and MD, as well as separate genetic and environmental influences that uniquely influence the development of RD or MD alone (Knopik, Alarcon, & DeFries, 1997; Kovas et al., 2007; Willcutt et al., 2010). In concordance with the correlated liabilities model, several research studies suggest that children with RD-MD think and perform differently from children with RD or MD alone (Jordan, Hanich, & Kaplan, 2003b; Jordan & Montani, 1997; Martinez & Semrud-Clikeman; 2004; Willcutt et al., 2013).

In a comprehensive study examining academic, neuropsychological, and psychosocial functioning of children with RD, MD, RD-MD, and children without LD, results indicated that children with RD-MD demonstrated significantly more impairments than children with one LD or without LD, and that children with LD demonstrated more impairments than children without LD (Willcutt et al., 2013). Children with RD-MD demonstrated greater inattention symptoms, higher internalizing symptoms, lower grades in school, lower global functioning in daily responsibilities, greater social isolation, and greater neuropsychological impairments in verbal comprehension, phoneme awareness, working memory, naming speed, processing speed, vigilance, and response variability compared to children with one LD. Further analyses also revealed that verbal comprehension, working memory, and processing speed were associated

with both math and reading deficits, whereas phoneme awareness and naming speed were associated independently with reading deficits and set shifting was associated with math deficits. These findings remained after controlling for performance IQ, ADHD symptoms, and co-morbidity. Overall, this study suggests that RD-MD is characterized by multiple neuropsychological deficits that are distinct, but related to RD and MD.

Other studies have also found that children with RD-MD perform differently from children with one LD. For example, on math calculation tasks, children with RD-MD demonstrated more errors with finger counting and performed worse overall than children with MD only (Jordan, Hanich, & Kaplan, 2003b). Additionally, children with RD-MD showed more stability in math and reading problems throughout second and third grade compared to children with MD only. Interestingly, in a study by Jordan, Kaplan, and Hanich (2002) children with RD performed similarly to children with MD in mathematics at the end of third grade. This finding may be indicative of a negative influence of reading difficulties on mathematics performance, and possibly, more globally across multiple academic subjects (Grimm, 2008; Jordan, Kaplan, & Hanich, 2002). Overall, children with multiple LD's tend to have greater academic and psychosocial problems and neuropsychological deficits compared to children with one LD and children without LD.

Psychosocial Development in Children with Learning Disabilities

Psychosocial development describes the interactions between social factors (e.g., interpersonal relationships, school environment) and psychological factors (e.g., cognitions, behaviors, and affect) that influence an individual's daily functioning. Although the main focus of attention in regards to identification, intervention, and research of children with LD's is the neuropsychological and academic profile, attention to non-academic outcomes, such as

psychosocial development, is equally important (Moore, Lippman, & Ryberg, 2015). Research indicates that although academic outcomes are strong predictors of occupation, health, income, and other important life success indices, non-academic outcomes such as social competence (e.g., interpersonal skills), emotional well-being (e.g., internalizing problems), and maladaptive behaviors (e.g., externalizing problems) all serve important roles in supporting or hindering academic achievement, and child development broadly (Moore, Lippman, & Ryberg, 2015). For children who are already at-risk for academic underachievement, such as children with LD, understanding how psychosocial factors may serve as protective factors may inform interventions that improve their overall success in school.

Research suggests that early academic problems influence children's behavior and mood (Morgan, Farkas, & Wu, 2012). Experiencing academic problems in reading and/or math early on may lead to increased feelings of frustration, anxiety, depressed mood, and negative behaviors (e.g., interpersonal problems, aggression), triggering a cycle of reciprocal influences between poor academic performance and negative mood and behavior (Fleming, Harachi, Cortes, Abbott, & Catalano, 2004; Lane, Beebe-Frankenberger, Lambros, & Pierson, 2001; Morgan, Farkas, & Wu, 2012; Wehby, Falk, Barton-Arwood, Lane, & Cooley, 2003). Furthermore, as children experience academic failure in reading and/or math, they are more likely to actively avoid reading or math activities at home or school thereby reducing the opportunities they have for academic practice and growth (Griffiths & Snowling, 2002; Guthrie, Schafer, & Huang, 2001; Senechal, LeFevre, Hudson, & Lawson, 1996). Given that children with LD are, by definition, more likely to experience school failure, it is not surprising that studies have found that children with LD are more vulnerable to psychosocial problems (Gadeyne, Ghesquiere, & Onghena, 2004), even in comparison to generally low-achieving children (La Greca & Stone, 1990;

Maughan, Pickles, Hagell, Rutter, & Yule, 1996; Ochoa & Palmer, 1995; Roeser, Eccles, & Strobel, 1998).

Although a link between academic achievement and psychosocial factors has been established, the exact mechanisms by which problems develop are unclear. Some researchers have posited that increased psychosocial problems in children with academic difficulties may be related to a "common cause" variable, such as inattention, which leads to problems in academics, behavior, and social-emotional well-being (Morgan, Farkas, Tufis, & Sperling, 2008). Deficits in higher-order executive functioning skills such as, attention and inhibition, are common features in children with LD, as well as children with behavior and social-emotional problems. Another possibility is that academic and behavioral problems are reciprocally causative over time, indicating that interventions targeting both academics and psychosocial factors are necessary. Hinshaw (1992) examined seventeen studies that suggested an overall bidirectional causal model between reading and behavior problems (see also Lepola, Poskiparta, Laakkonen, & Niemi, 2005; Onatsu-Arvilommi & Nurmi, 2000; Trzesniewski, Moffitt, Caspi, Taylor, & Maughan, 2006), however several of these studies do not control for earlier reading problems as predictors. Although the current study is unable to address whether academic problems lead to psychosocial adjustment issues, whether psychosocial adjustment issues lead to academic failure, or whether academic problems and psychosocial adjustment issues are reciprocally causative, this study aims to understand the patterns in academic achievement and psychosocial behaviors across kindergarten to fifth grade and may be able to shed light on whether children with academic problems and/or psychosocial adjustment issues in kindergarten continue on a negative trajectory in one or both areas.

Overall, more studies are needed to determine how early academic and psychosocial problems influence the academic and psychosocial trajectory of children with LD's. Much of the research on psychosocial problems in children with LD's has focused on behaviors, cognitions, and emotions related to academic task such as, attitudes towards reading (Chapman, Tunmer, & Prochnow, 2000; Lepola, Salonen, & Vauras, 2000; Viljaranta, Lerkkanen, Poikkeus, Aunola, & Nurmi, 2009), in comparison to research on more general internalizing, externalizing, and interpersonal problems. The following sections will review the current literature on externalizing problems, internalizing problems, and interpersonal problems in children with LD.

Externalizing Problems. Externalizing problems describe a range of maladaptive behaviors including, aggression, disruptiveness, and poor emotional control (e.g., anger), as well as inattention, hyperactivity, and impulsivity. McIntosh (2005) hypothesized that a "coercive cycle of education failure" leads students to view academic demands as aversive and engage in maladaptive behaviors that are maintained by escaping academic tasks such as, receiving a time-out or being sent to the principal's office. The loss of instruction time increases the academic gap between what is expected in the classroom and what the student can do, which leads to increased aversion and escape-maintained problem behaviors. Several studies have demonstrated a relationship between low academic achievement and behavior problems in children with LD (Algozzine, Wang, & Violette, 2011; Algozzine, Horner, & Putnam, 2008; Beitchman & Young, 1997; Bender & Smith, 1990; Konstantareas & Homatidis, 1989). Other studies indicate that externalizing problems tend to be stable and have negative long-term impacts (Bub, McCartney, & Willett, 2007; Kwon, Kim, & Sheridan, 2012). For example, children with high levels of externalizing problems in kindergarten were more at-risk for continued externalizing problems in third and fifth grade (Morgan, Farkas, & Wu, 2009).

Some studies estimate that nearly half of individuals with RD meet criteria for at least one behavioral or emotional disorder (Goldston et al, 2007; Maughan, Rowe, Loeber, & Stouthamer-Loeber, 2003). Attention deficit hyperactivity disorder (ADHD) is one of the most frequent co-occurring externalizing problems, particularly inattentive and combined subtypes that are characterized by significant inattention (Willcutt et al., 2010). Individuals with RD are also at a higher risk for externalizing disorders such as, ODD and CD, but several studies suggest that associations between RD and antisocial behavior may be restricted to the subset of individuals with comorbid ADHD (Frick et al., 1991; Maughan et al., 2003; Willcutt & Pennington, 2000). Other studies have found that poor readers are more likely to act out, be aggressive and argumentative, and have higher rates of externalizing pathology than children without reading difficulties (Fleming et al., 2004; Hinshaw, 1992; Lin, Morgan, Hillemeier, Cook, Maczuga, & Farkas, 2013; Morgan, Farkas, & Wu, 2009; Trzesniewski, Moffitt, Caspi, Taylor, & Maughan, 2006).

Academic problems have been found to be long-term predictors of externalizing pathology. Morgan, Farkas, and Wu (2012) found that students who identified as poor readers in third grade were twice as likely to identify themselves as angry in fifth grade, compared to those who were not identified as poor readers. Another study found that children in first grade with RD (bottom 10% on standardized reading test) were more likely to have externalizing and internalizing problems in third grade than children without RD. Interestingly, children with poor task engagement in first grade were more likely to experience reading problems (bottom 10% on standardized reading test) in third grade, however this was not true for children who demonstrated severe externalizing behaviors in first grade. Analyses included an autoregressor

variable for reading or behavioral problems in first grade to account for the influence of existing problems (Morgan, Farkas, Tufis, & Sperling, 2008).

In regards to children with MD, there are no previous studies that have reported the prevalence of co-morbid behavioral or emotional disorders (Willcutt et al., 2013); however some studies have found elevated attentional problems, and internalizing and externalizing symptoms in children with MD compared to children without LD (Auerbach, Gross-Tsur, Manor, & Shalev, 2008; Cirino, Fletcher, Ewing-Cobbs, Barnes, & Fuchs, 2007; Lin, Morgan, Hillemeier, Cook, Maczuga, & Farkas, 2013; Shalev, Auerbach, & Gross-Tsur, 1995; Willcutt et al., 2011). Scarborough and Parker (2003) found that children with MD and MD+RD had more behavioral problems in second grade compared to children with RD and without LD. Additionally, some studies have found that elevated inattention and externalizing symptoms are more prevalent in children with RD+MD compared to children with MD only, indicating that multiple learning challenges increase the prevalence of externalizing psychopathology (Badian, 1999; Shalev, Auerbach, & Gross-Tsur, 1995; White, Moffitt, & Silva, 1992). Greenham (1999) conducted a review of psychosocial adjustment in children with LD and concluded "the literature regarding externalizing behavior problems in individuals with LD is fairly consistent," (p.179) with the majority of studies indicating increased aggression, disruptive behaviors, and/or hyperactive-inattentive behaviors in children with LD compared to typically developing children, as rated by parents and/or teachers.

Overall, there is strong evidence to suggest that children with reading challenges are at-risk for greater externalizing psychopathology concurrently and in the future compared to children without LD. Levels of externalizing problems in children with LD tend to be at the subclinical level, but are still more problematic compared to children without LD (Greenham,

1999). Although there is less research on children with MD, the preliminary results also point to increased risk of externalizing pathology in elementary and middle school grades. In addition to externalizing behaviors, children with LD also seem to be challenged with internalizing disorders disproportionate to their non-LD peers.

Internalizing Problems. Internalizing problems describe a range of emotional difficulties including, anxiety and depression. Several studies suggest that children with LD experience more internalizing problems than their peers without LD (Arthur, 2003; Margalit, 1998). Earlier studies have found that middle school students with LD are more likely to report loneliness, victimization, less social satisfaction (Bender & Wall, 1994; Sabornie, 1994), and chronic depression and anxiety (Cohen, 1986; Goldstein, Paul, & Sanfilippo-Cohn, 1985), compared to their non-LD peers. These findings suggest that internalizing problems in children with LD may be even more prevalent in later elementary and middle school grades. Studies also indicate that higher levels of stress and anxiety in older students with LD are related to lower academic self-efficacy, self-confidence, and increased self-doubt and self-criticism, compared to students without LD (Sparks & Lovett, 2009).

Studies examining children with RD have found that elevated levels of anxiety and depression (Arnold et al., 2005; Carroll, Maughan, Goodman, & Meltzer, 2005) was related to increased suicidal ideation or suicide attempts in adolescents with RD compared to their neurotypical peers (Daniel et al., 2006). These findings remain even after controlling for other symptoms of psychopathology including, ADHD and conduct disorders (Daniel et al., 2006, Goldston et al., 2007; Maughan, Rowe, Loeber, & Stouthamer-Loeber, 2003; Willcutt & Pennington, 2000; Willcutt et al., 2013). Some researchers have found that as children with RD become more aware of their learning challenges in comparison to their typically achieving peers,

they report feeling more depression (Maughan, Rowe, Loeber, & Stouthamer-Loeber, 2003). Children with RD and RD+MD have also self-reported more impairment on the Sense of Inadequacy scale on the Behavior Assessment System for Children, 2nd Edition (BASC-2; Reynolds & Kamphaus, 2006) compared to typically achieving children (Martinez & Semrud-Clikeman, 2004). As with externalizing problems, there appears to be a longitudinal effect of academic problems on later internalizing psychopathology. For example, students with RD in third grade were twice as likely to identify themselves as sad, lonely, and distractible in fifth grade (Morgan, Farkas, & Wu, 2012).

There are very few studies that examine internalizing problems in children with MD. One study examined the differences in emotional adjustment and school functioning in a group of 120 middle school (6th to 8th grade) students with RD, MD, RD-MD, and students who were typically achieving. They found that students with RD-MD reported the poorest functioning on the School Maladjustment, Clinical Maladjustment, and Emotional Symptoms Index on the BASC-2 self-report, compared to the typically achieving students. Additionally, the MD group reported poorer functioning on the School Maladjustment Composite compared to typically achieving children. Further analysis revealed that the RD-MD group showed greater impairment on Atypicality scale (e.g., odd and immature social behaviors) and Depression scale compared to the typically achieving group (Martinez & Semrud-Clikeman, 2004). Literature on children with nonverbal learning disorder (NVLD), a disorder characterized by weak math skills, intact word decoding, and deficits in motor coordination, spatial organization, and social competence, indicates higher levels of social isolation, elevated symptoms of withdrawal from social engagement, and more internalizing problems (Greenham, 1999; Osman, 2000; Rourke, 1989; White, Moffitt, & Silva, 1992). These studies may provide additional support for the hypothesis that children with MD

and associated social deficits are also at-risk for greater internalizing psychopathology; although more research to clarify the psychosocial correlates of MD with and without RD is needed.

Despite findings of increased internalizing problems in children with one or more LD, some studies have found that children with one LD do not show a discernable increase in internalizing psychopathology (Barkauskiene, 2009; Jorm, Share, Matthews, & McLean, 1986; Miller, Hynd, & Miller, 2005; Sideridis, Mouzaki, Simos, & Protopapas, 2006). For example, Barkaukiene (2009) examined 204 children in second to fourth grade, of which 102 children were diagnosed with one or more LD through a school psycho-educational evaluation. Results indicated that only children with multiple LD demonstrated higher internalizing problems, in comparison to children with single LD or no LD. This finding extended the findings of a study conducted by Miller, Hynd, and Miller (2005) indicating that children with RD did not show significant internalizing psychopathology based on parent, teacher, and self-report of internalizing symptoms on the Behavioral Assessment System for Children (BASC; Reynolds & Kamphaus, 2002) and Children's Depression Inventory (CDI; Kovacs, 1985). It is important to note that this study classified children as RD based on two models: a 20-point discrepancy between a reading achievement score and their IQ, or based on a reading achievement standard score below 85. Thus, findings may be conflated based on inclusion of children with low average reading skills or systematic biases or errors involved in using a severe discrepancy model to diagnose a true LD.

Along with differences in diagnostic criteria, the mixed findings in the literature may be due to differences in rater's perceptions (e.g., parent, teacher, or self). For example, one study found that children with RD did not self-report higher internalizing problems, although parents and teachers did (Heiervang, Stevenson, Lund, & Hugdahl, 2001). A recent meta-analysis

indicated that approximately 70% of children with LD have higher levels of anxiety compared to children without LD (Nelson & Harwood, 2011), however, levels of anxiety in the LD population were not clinically significant and several important factors moderated the relationship between LD status and anxiety level including, type of rater and setting of LD diagnosis (e.g., clinic/hospital or school). This study found that there was low agreement between types of raters (parents, teachers, child), and that children diagnosed in clinic/hospital settings were regarded as having higher internalizing symptomology.

Overall, the research is inconclusive regarding whether children with LD, and more specifically certain subtypes of LD, experience increased internalizing symptoms compared to children without LD. It seems that children with LD tend to experience more internalizing symptoms dependent on the type of informant and diagnostic criteria. However, this relationship may not always be clinically significant and may hold true for children with multiple LD compared to children with one LD. As with externalizing problems, children with high levels of internalizing problems in kindergarten are more likely to have persistent internalizing problems in third and fifth grade (Morgan, Farkas, & Wu, 2009). Greater risk for internalizing problems in school is likely influenced by academic failure and peer comparisons. This study will add to the current literature by exploring whether children with LD experience more internalizing symptomology compared to children without LD, based on teacher-reports of LD within a school-diagnosed sample. Additionally, differences between sub-groups of children will be explored, potentially adding more clarity to this issue. Finally, given that internalizing and externalizing problems often negatively influence children's social competence, with some research suggests that children with LD demonstrate more deficits in interpersonal skills, this

study will explore the relations between internalizing and externalizing problems and interpersonal skills.

Interpersonal Problems. Interpersonal problems involve difficulties getting along with others, making or maintaining friendships, and experiencing social isolation or rejection. Across several studies, children with LD consistently demonstrate more interpersonal problems. For example, studies have reported increased social isolation (Mishna, 1996), peer rejection (Kuhne & Weiner, 2000; Ochoa & Olivarez, 1995), and difficulties with social integration (Gadeyne, Ghesquiere, & Onghena, 2004) in children with LD from first grade through adolescence. More specifically, children with RD tend to experience more peer rejection and lower social status (Lopes, Cruz, & Rutherford, 2002). Estimates from meta-analyses and review studies indicate that approximately 25% to 30% of children with LD are socially rejected compared to 8% to 16% in the typical population (Greenham, 1999). However, several studies have reported that 40% to 70% of children with LD are rated within the average range in terms of acceptance by peers (Conderman, 1995; Ochoa & Palmer, 1991). Thus, there is evidence to support that children with LD tend to be rejected by peers more than children without LD but, similar proportions of children with and without LD are rated within the average range for peer acceptance.

Regarding social skills, the extant literature reveals a similar trend to those findings on peer acceptance/rejection. Namely, although children with LD are typically rated has having poorer social skills in comparison to children without LD, a similar proportion of children with and without LD are rated as having average social skills (Greenham, 1999). For example, a meta-analysis examining 152 studies, found that approximately 75% of children with LD demonstrate social skills deficits, and that these deficits differentiated children with LD from children without

LD (Kavale & Forness, 1996). However, other researchers have found that children with LD and low-achieving children without LD received similar, low ratings on social skills and demonstrated fewer social interactions in comparison to typically-achieving children (Tur-Kaspa & Bryan, 1995; Vaughn & Haager, 1994). Thus, the research suggests that children with LD tend to experience more social skills problems; however there may be a common factor of academic underachievement that underlies interpersonal skill deficits.

In terms of subtypes of LD, several studies report small, but significant, weaknesses in social functioning for children with RD (Goldston et al., 2007; Willcutt, Pennington, Olson, & DeFries, 2007; Willcutt et al., 2011). Children with RD in third grade are twice as likely to self-report as unpopular in fifth grade compared to children without RD (Morgan, Farkas, & Wu, 2012). For children with MD, research indicates similar findings, including more problems with social awareness, social anxiety, social isolation, and social withdrawal compared to children without MD (Auerbach, Gross-Tsur, Manor, & Shalev, 2008; Shalev, Auerbach, & Gross-Tsur, 1995; Shalev, Auerbach, Manor, & Gross-Tsur, 2000; Willcutt et al., 2011). In general, research supports the notion that children with LD tend to experience more interpersonal problems than children without LD, although there appears to be equivalent numbers of children with and without LD who possess average social skills. Given that interpersonal problems are often associated with other externalizing and internalizing problems this pattern is not unexpected. However, there is limited research that examines the relation between externalizing, internalizing and interpersonal problems in children with LD. Research examining the protective and risk factors related to development of psychosocial problems in children with LD, particularly subtypes of LD, is warranted and will better inform the types of interventions that may be implemented both at home and in the classroom.

Motivational Factors in Children with Learning Disabilities

Motivation can be defined as the desire and decision to engage in goal-oriented behaviors. This broad definition encompasses multiple constructs of motivation including, an individual's ability to demonstrate self-regulated behavior, show effort, persistence, and interest, and evaluate thoughts about their behavior. Compared to the literature on typically achieving children, there is relatively little research on the motivational profile of children with LD, especially for subtypes of LD, and for motivational constructs including intrinsic motivation. The following sections review the extant literature on three aspects of motivation in children with LD: self-regulated learning, ability beliefs, and intrinsic motivation.

Self-Regulation. Self-regulation, or self-regulated learning, is a cornerstone of goal-directed behavior, and is an important component of academic performance (Pintrich, 2000; Pintrich & De Groot, 1990; Pintrich & Zusho, 2002). Self-regulation involves an individual's ability to engage in a recursive process of self-monitoring their thoughts, behaviors, and emotions (e.g., What am I doing? What can I do? How do I feel about this?), self-instructing or guiding their behavior (e.g., What do I have to do? How do I do it?), and self-reinforcing their behavior based on performance (e.g., How did I do? What do I need to do the same or differently?) (Bandura, 1991). Self-regulated learning requires three components. First, a student must possess metacognitive skills to monitor, plan (e.g., set goals), evaluate, and change their thoughts and behaviors. Second, a student must persist and engage in a task in order to evaluate their performance, use feedback, and make modifications. Finally, a student must possess strategies to engage cognitively with the task (e.g., memory and comprehension strategies). This model of self-regulated behavior is rooted in social cognitive theory (Bandura, 1991), which

posits that behavior is influenced by one's own perceptions of their abilities, thoughts, behaviors, and emotions within their social context (e.g., social comparisons to peer groups).

Several studies have found that children with lower academic achievement demonstrate greater difficulty with self-regulated learning tasks. For example, children with academic difficulties are more impulsive, set lower academic goals, have difficulty evaluating their performance accurately, and are more critical of themselves (Borkowski & Thorpe, 1994). These problems with self-regulated learning have negative effects on their psychosocial development including greater levels of anxiety, lower self-esteem, and lower levels of intrinsic motivation (Sideridis, Morgan, Botas, Padeliadu, & Fuchs, 2006; Zimmerman & Risemberg, 1997). Children with identified LD's demonstrate less academic self-regulated learning and are less motivated to engage or persist in on-task behaviors in class (Bender & Wall, 1994; Graham & Harris, 2003; Grolnick & Ryan, 1990; Wilson & David, 1994; Wong, Harris, Graham, & Butler, 2003). Using the ECLS-K, 1998-1999 Kindergarten Cohort data, Morgan, Farkas, Tufis, and Sperling (2008) investigated trends in task engagement and LD across first through third grade, and found that children with RD in first grade were more likely to demonstrate poor task engagement in school in third grade. Several components of self-regulated learning including goal-directed behavior and persistent task engagement have been associated with increased academic achievement in reading and math (Bodovski & Youn, 2011; DiPerna, Lei, & Reid, 2007; Fantuzzo et al, 2007; McClelland, Acock, & Morrison, 2006; McClelland, Morrison, & Holmes, 2000; McWayne, Fantuzzo, & McDermott, 2004).

Researchers have hypothesized why children with LD exhibit lower levels of self-regulation. First, students with LD often struggle with self-awareness and self-assessment (Butler, 1998, 1999), which may impede their ability to evaluate their performance accurately

and make use of feedback to employ more efficient cognitive strategies and persist on tasks. Second, self-regulated learning relies on several executive functioning abilities, including attention, working memory, planning, organization, and the ability to work independently (i.e., initiation). Given that children with LD demonstrate deficits in executive functioning including, working memory and attention regulation (Fuchs, Compton, Fuchs, Bryant, Hamlett, & Lambert, 2012; Fuchs et al., 2006; Geary, Hoard, Byrd-Craven, Nugent, Numtree, 2007; Geary, Hoard, & Hamson, 1999; Goldston et al., 2007; Passolunghi & Siegel, 2001, 2004), it is plausible that core executive functioning deficits impede self-regulated learning in children with LD. Issues with self-regulated learning, including executive functioning and self-evaluation, are also likely related to one's beliefs about their skillset and ability.

Ability Beliefs. Ability beliefs (also known as perceived competence), includes a students' belief about their ability to perform a given task. In other words, ability beliefs encompass a student's answer to the question, "Can I do this task?" More positive ability beliefs have been associated with increased task persistence, use of more advanced cognitive strategies, better metacognitive skills, lower levels of anxiety, increased intrinsic motivation, mastery learning goals, and increased achievement (Bouffard-Bouchard, Parent, & Larivee, 1991; Fincham & Cain, 1986; Paris & Oka, 1986; Pintrich & De Groot, 1990; Schunk, 1985; Wong, Wiest, & Cusick, 2002).

Several studies have shown that students with LD possess more negative ability beliefs. In one study of elementary school children with school-identified LD, students with LD reported lower academic ability beliefs and academic self-concept compared to their typically achieving peers (Tabassam & Grainger, 2002). In a more recent study, sixth through twelfth grade students with and without LD were assessed on measures of academic self-efficacy, theories of

intelligence, academic goal preferences, and attributions for task persistence (Baird, Scott, Dearing, & Hamill, 2009). Students with LD were more likely to report low academic self-efficacy, and attributed more effort as a sign of low academic ability. Mediational models suggested that these findings were influenced by the tendency of students with LD to view intelligence as fixed (i.e., entity view instead of malleable). Negative ability beliefs may arise in children with LD, in part, due to attribution of failure to internal causes such as their ability or their effort, and attribution of academic successes to external causes such as help from the teacher or good luck (Bender & Wall, 1994; Butkowsky & Willows, 1980; Cooley & Ayres, 1988; Fincham & Cain, 1986; Kistner, Osborne, & LeVerrier, 1988; Lewis & Lawrence-Patterson, 1989; Pearl, 1982, 1992; Rogers & Saklofske, 1985). However, negative ability beliefs seem to be restricted to the academic domain for children with LD; non-academic self-concept has not been found to differ from typically achieving peers (Chapman, 1988; Harter, Whitesell, & Junkin, 1998; Kloomok & Cosden, 1994). Chapman (1988) argued that negative school attitudes develop earlier in the lives of children who experience academic failure and persist through high school.

Motivational constructs are often highly related to one another. For example, ability beliefs play a role in self-regulatory mechanisms that influence a student's behavior, cognitions (Eccles & Wigfield, 2002; Pajares, 1996; Wigfield & Eccles, 2000) and affect, such as, anxiety that can hinder achievement (Bandura, Caprara, Barbaranelli, Gerbino, & Pastorelli, 2003; Cervone, Kopp, Schaumann, & Scott, 1994). Several studies suggest that more positive ability beliefs are related to self-regulated learning including, increased persistence and use of cognitive strategies (Chapman, 1988). Meltzer and colleagues (2004) found that students with LD who held positive academic ability beliefs were more likely to engage and persist in academic tasks,

and to use cognitive strategies. Additionally, academic ability beliefs are related to intrinsic motivation; as children feel more academically competent they become more intrinsically motivated to learn and vice-versa (Guay, Boggiano, & Vallerand, 2001; Ryan & Deci, 2000).

Intrinsic Motivation. Intrinsic motivation encompasses a student's desire and value towards a goal and/or tasks to reach a goal. Research indicates that students who are interested in a task and value the task for its importance and for the purposes of learning and challenging themselves are more likely to engage in self-regulated learning and have improved academic performance (Ames & Archer, 1988; Deci & Ryan, 1985; Dweck & Elliott, 1983; Greene, Miller, Crowson, Duke, Akey, 2004; Meece, Blumenfeld, & Hoyle, 1988; Nolen, 1988; Pintrich & De Groot, 1990; Paris & Oka, 1986). Froiland and Oros (2014) found that student's self-rating of interest in reading in fifth grade positively predicted 8th grade reading achievement, even after controlling for SES, ethnicity, gender, and prior reading achievement. Thus, when students enjoy and value a task, they are more likely to be engaged in school work which increases the likelihood of academic achievement (Lepper, Corpus, & Iyengar, 2005; Unrau & Schlackman, 2006).

Several studies have also shown that intrinsic motivation is related to academic achievement in children with LD (Adelman, 1978; Adelman & Taylor, 1986; Deci & Chandler, 1986; Deci, Hodges, Pierson, & Tomassone, 1992; Switzky & Schultz, 1988) However, studies examining levels of intrinsic motivation in children with LD are mixed. Some studies have found that children with LD demonstrate less intrinsic motivation than students without LD. In a study of fifth and sixth grade students in Greece, children with LD demonstrated lower intrinsic motivation and academic ability beliefs compared to children without LD (Zisimopoulos & Galanaki, 2009). In a study of 89 students with LD in fourth through eighth grade, children with

LD had lower academic intrinsic motivation, as well as more negative self-perceptions of their academic ability in comparison to children without LD (Wilson & David, 1994). However, in a study by Pintrich, Anderman, and Klobucar (1994), fifth grade children with LD did not differ on measures of intrinsic motivation or ability beliefs from children without LD, but did have lower levels of metacognitive skills. Inconsistent findings may be due to study confounds including grouping children with different subtypes of LD and different conceptualizations of motivational constructs. Further research is needed to examine how these motivational constructs develop and influence academic achievement.

Despite the mixed results regarding levels of intrinsic motivation in children with LD, studies do indicate that intrinsic motivation fosters persistence on difficult tasks, such as a challenging reading passage (Guthrie et al., 2007). Similar to findings regarding attribution style and academic ability beliefs, children with LD who attribute academic success to their effort instead of to other external factors are more likely to show greater levels of academic intrinsic motivation (Adelman, 1978; Black, 1974). Intrinsic motivation is associated with several positive academic and social-emotional outcomes including lower rates of school dropout (Deci & Ryan, 2008; Grant, 2008; Hardre & Reeve, 2003).

Summary. Overall, research suggests that children with LD may have more difficulty with self-regulated learning, lower academic ability beliefs, and lower academic intrinsic motivation. Some research suggests that deficits in self-awareness and executive functioning such as, attention, planning, and organization, may contribute to these motivational problems. Additionally, social comparisons with peers and academic failure in school also contribute to poorer academic ability beliefs which in turn affect intrinsic motivation. However, it is still unclear whether motivation differs among children with different subtypes of LD or multiple

LDs. Additionally, it is unclear how psychosocial problems, particularly internalizing and interpersonal problems, may influence motivation in children with LD.

Parent Influences on Psychosocial Development, Motivation, and Academic Achievement

It is well-established that parenting effects children's development. Several parenting variables have been studied including, parent psychological well-being, parenting style, family structure, and parent involvement in their child's education and development. Within the literature, more attention has been paid to the relation between parenting variables and child outcomes in early infancy and toddlerhood or in adolescence, with relatively fewer studies examining outcomes in elementary school-age children (Bodovski & Youn, 2010). This section will review the extant literature on two dimensions of parenting, parent depression and parent school involvement, in relation to children's academic and psychosocial development, with particular attention to research on elementary school-age children with and without LD.

Parental Depression. According to the DSM-5, depression in adults is characterized by episodic or persistent symptoms of depressed mood signified by feelings or observations of sadness, emptiness, and hopelessness, loss of interest or pleasure in daily activities, maladaptive changes in sleeping and eating patterns, fatigue, restlessness or psychomotor retardation, feelings of worthlessness or excessive guilt, difficulty thinking or concentrating, and/or suicidal ideation or attempts (APA, 2013). These symptoms impede an individual's ability to function in daily life, and are not due to a medical condition or the use of substances. Parent depression, particularly maternal depression, has been widely studied in relation to child outcomes (Goodman, 2007; Goodman et al., 2011; National Research Council and Institute of Medicine, 2009). Many studies indicate that high levels of parent depression are associated with increased behavioral problems in toddlers (Coyne, Low, Miller, Seifer, & Dickstein, 2007; Dietz, Jennings,

Kelley, & Marshal, 2009; Gross, Shaw, Burwell, & Nagin, 2009). Elementary school-age children with highly depressed mothers have been shown to have more internalizing and externalizing problems and lower reading skills in kindergarten and first grade (Ashman, Dawson, & Panagiotides, 2008; Kurstjens & Wolke, 2001; Sohr-Preston & Scaramella, 2006). Maternal depression has also been linked to increased risk-taking behavior (e.g., substance use and sexual risk behavior), increased likelihood of internalizing problems including depression, increased problem behaviors, social impairments, and lower academic achievement in adolescents (Champion et al., 2009; Cortes et al., 2009; Goosby, 2007; Gross, Shaw, & Moilanen, 2008; Gross, Shaw, Moilanen, Dishion, & Wilson, 2008; Martins & Gaffan, 2000; Mazza et al., 2009; Rice, Lifford, Thomas, & Thapar, 2007).

Researchers have hypothesized about the mechanisms by which parental depression negatively influences child development. Several researchers have found that higher parental depression is associated with decreased parent engagement in their children's development and education (McLoyd, 1998; National Research Council and Institute of Medicine, 2009). Some researchers have noted that parental depression is associated with fewer positive interactions between parent and child, more disengaged parenting practices, and more inconsistent and punitive parenting. For example, Bodovski and Youn (2010) found that parental depression was associated with decreased parental warmth and increased use of physical punishment, and those children with more depressed parents in kindergarten had lower reading and math achievement in fifth grade using the Early Childhood Longitudinal Study-Kindergarten dataset. Other researchers have found that mothers living in poverty are more likely to experience depression, and that maternal depression mediates the negative effects of poverty on cognitive, behavioral, and social-emotional outcomes for children (Belle, 1990; Carlson & Corcoran, 2001; Johnson &

Flake, 2007; McLoyd, 1990; Pachter et al., 2006). Moreover, some research suggests that maternal depression is associated with increased behavioral problems across racial-ethnic groups. For example, Pachter and colleagues (2006) found that maternal depression is directly related to increased behavioral problems in African American children age six to nine, and this effect was partially mediated by parenting practices in Caucasian and Latino children. Thus, parental depression may influence children's development via direct and indirect pathways.

Despite research examining the influence of parent depression on child outcomes, no studies have examined the influence on parental depression in children with LD. Several studies have examined other aspects of parent internalizing psychopathology including, anxiety and parenting stress, in relation to child outcomes for children with other chronic conditions. One study examined symptoms of anxiety in mothers of children in middle school with specific LD, which included children with dyslexia, dysgraphia, and dyscalculia (83% of children in the sample were diagnosed with all three LD's) (Karande, Kumbhare, Kulkarni, & Shah, 2009). They found that mothers of children with LD had high levels of anxiety, with concerns mainly related to their child's academic performance, behavior and prognosis in life. Despite a lack of control group, this study provides some evidence that parents of children with LD experience increased internalizing psychopathology. Another study examining parenting stress found that mothers of children with LD reported higher levels of parenting stress compared to mothers of children without LD (Antshel & Joseph, 2006). In this study, mothers of children with RD had the highest level of stress. High parenting stress has been associated with increased maternal depression (Hassiotis, 1997; Lipman, Boyle, Dooley, & Offord, 2002; Moes, Koegel, Schreibman, & Loos, 1992), thus, parenting stress may mediate the effects of maternal depression on child outcomes. Overall, research suggests that parental depression and stress are

higher among parents of children with chronic conditions, such as ADHD or other health problems (National Research Council and Institute of Medicine, 2009), however little is known about the influence of parent depression on children with LD.

In sum, research suggests parental depression is related to a variety of negative outcomes in children from infancy through adolescence, including lower academic achievement, increased internalizing and externalizing problems, and social impairments. Research also suggests that parental depression is related to socioeconomic status, and that the negative effects of parental depression on child development may operate differentially across racial-ethnic groups. Finally, research suggests that parental depression is associated with parenting practices, including lower levels of parental warmth, increased punitive punishment, and lower levels of parent involvement in children's development and learning. Further research is warranted to investigate how parent depression influences the academic and psychosocial outcomes in children with LD.

Parent School Involvement. Parent school involvement is a broad term that encompasses parent behaviors and perceptions that are related to their child's development, cognitively, educationally, behaviorally, socially, and emotionally. Parent involvement has been conceptualized in several ways including, parents' discussion about schooling and their aspirations for their child (Bloom, 1980), parents' participation in school and educational activities (Stevenson & Baker, 1987), and parents' rules and monitoring at home related to schooling and education (Marjoribanks, 1983).

Given the wide range of behaviors that constitute parent involvement, it is important for studies to define the parameters. In this study, parent involvement is defined as parents' participation in school activities such as, contact with teachers and attending school events. It is important to recognize that this type of parent school involvement may not represent all parents

equally. For example, Hill and colleagues (2004) found that parent school involvement, as broadly defined as attending school events, knowing about their child's school performance, and having communication with their child's teacher, was related to lower rates of behavioral problems for students whose parents achieved higher educational levels (a proxy for socio-economic status). Additionally, Grolnick and colleagues (1997) found family SES was a strong predictor of parent's involvement in school and at home, however it was not associated with personal involvement such as sharing aspirations for their child's education were not significantly related to SES. Regarding ethnic differences, studies have also found that parent school involvement was related to improved achievement for African-American students (Hill et al., 2004). Overall, studies have indicated that effects of parent school involvement, as defined by school-based activities in comparison to home-based activities, on academic and psychosocial outcomes vary. Relations may differ by socio-demographic variables including SES and race (Hill & Craft, 2003), and differences may be mediated by the student's level of psychosocial competence and academic skills.

Parental involvement has been associated with a variety of positive child outcomes. Early on, parent involvement helps children transition from home to formal schooling in preschool or kindergarten, and connections between parents and school help children develop early skills vital to later school success (Christenson, 2000; Epstein, 1994; Pianta, Rimm-Kaufman, & Cox, 1999). Studies have found that parent involvement is positively related to early literacy and math skills (Dickinson & DeTemple, 1998; Gauvain, Savage, & McCollum, 2000). In a study by McWayne and colleagues (2004), children in kindergarten whose parents showed higher levels of involvement (e.g., providing enrichment at home) had higher social skills, self-regulation skills, and were more cooperative in school compared to children whose parents were less

involved. Several studies have also suggested that parental involvement is positively related to children's academic achievement across grades and within families of varying socioeconomic statuses and racial-ethnic backgrounds (Christenson, Rounds, & Gorney, 1992; Fan & Chen, 2001; Fehrmann, Keith, & Reimers, 1987; Izzo, Weissberg, Kasprow, & Fendrich, 1999; Jeynes 2005, 2007; Keith, Keith, Quirk, Cohen-Rosenthal, & Franzese, 1996; Keith et al., 1998; Miedel & Reynolds, 2000; Shaver & Walls, 1998; Stevenson & Baker, 1987). In contrast, some studies have not found any significant relations between parent involvement and children's academic achievement (Sheldon, 2002; Watkins, 1997). Mixed results may be due to varying definitions of parental involvement, as well as grouping heterogeneous populations.

Parental involvement has also been linked to children's motivation in school (Gonzalez-DeHass, Willems, & Holbein, 2005; Grolnick & Slowiaczek, 1994; Sanders, 1998). For example, Ames and colleagues (1993) found that when second through fourth grade children perceived their parents are more involved in their education (e.g., knowledge of class and teacher), they had more positive academic competency beliefs and intrinsic motivation. In another study, Izzo and colleagues (1999) found that parent participation in school activities was positively related to children's engagement in school in kindergarten through third grade; however increased parent-teacher contact was related to lower school engagement because the nature of parent-teacher contacts was primarily due to behavioral concerns. On the other hand, some studies indicate that early parent involvement, including contact with teachers, may actually serve as a protective factor because parents are more aware of their child's academic difficulty early on which may lead to early intervention (Miedel & Reynolds, 2000).

The extant literature on the influence of parent involvement on outcomes for children with LD specifically is relatively sparse in comparison to the literature examining parent

involvement in typically developing samples or children with other risk factors such as, low socio-economic status. One of the first articles to examine parental involvement in relation to children with LD highlighted the importance of interactions between parents and educational staff, stating "when parents are actively involved with professionals, three processes occur: the parents and professional exchange information, the parents are encouraged to grow in their role, and a trusting, productive relationship between parents and teachers is built." (McLoughlin, Edge, & Strenecky, 1978, p.291-292). This article also identified several stages and ways in which parents may be involved in promoting the academic success of their child with an LD. For example, monitoring and being aware of early signs of difficulty, participating in school, home, and community activities that promote development of children's skills, and advocating for early intervention. The importance of parental involvement in the academic and behavioral development of children with disabilities is now reflected in special education law which encourages and specifies the rights of parents to be involved in their children's educational planning (IDEA, 2004).

Given that parental involvement increases school readiness, and school readiness has been found to positively influence later academic achievement, it is reasonable to suggest that early parental involvement may help set children on a more positive academic and psychosocial trajectory. In a more recent study using the ECLS-K data, parents' engagement in home literacy activities in kindergarten positively predicted academic achievement in eighth grade indirectly via children's kindergarten achievement (Froiland, Peterson, & Davison, 2012). Children who develop LD's may have a variety of early risk factors including, neurobiological and environmental vulnerabilities (e.g., genetic predisposition, poverty, parental depression). Parental involvement, especially early on in a child's education, may serve a protective factor in children

with LD that alters the influence of risk factors and promotes better psychosocial and academic outcomes. Thus, research suggests that parental involvement leads to improved academic, social-emotional, behavioral, and motivational outcomes in children; however, it is unclear how these mechanisms operate in children with LD and what factors may hinder or promote parent involvement in school-based activities.

Purpose of Present Study

There is a plethora of evidence suggesting that children with LD experience more academic difficulties and are more likely to experience academic failure and be at risk for school dropout (Reschly & Christenson, 2006). Additionally, there is strong research suggesting that children with LD experience more psychosocial problems, including internalizing and externalizing problems and poor interpersonal skills (Willcutt et al., 2013). These problems tend to persist, and put children with LD at greater risk for increased mental health problems in adulthood and juvenile delinquency (Cortiella & Horowitz, 2014). However, there are several gaps and methodological issues in the existing literature. First, many studies use small samples that are not representative of the population at large (La Greca & Stone, 1990; Martinez & Semrud-Clikeman, 2004; Maughan, Rowe, Loeber, & Stouthamer-Loeber, 2003). Second, several studies do not use control samples thereby limiting the conclusions that can be drawn in relation to children with LD (Karande, Kumbhare, Kulkarni, & Shah, 2009; Trzesniewski, Moffitt, Caspi, Taylor, & Maughan, 2006). Third, several studies group children with various subtypes of LD into one category thereby ignoring the differences among these heterogeneous groups and limiting the ability to understand how children defined by different academic problems function (Gadeyne, Ghesquiere, & Onghena, 2004; Rourke & Fuerst, 1992). This study aims to address these issues by using a large, nationally representative dataset, and examining

group differences among children with subtypes of LD including, math disability, reading disability, co-morbid math and reading disability, and children without LD.

These same methodological issues plague the small number of studies that have examined motivational factors including, self-regulated learning, ability beliefs, and intrinsic motivation in children with LD. Some studies have demonstrated that children with LD have more difficulty with self-regulated learning, more negative ability beliefs, and lower intrinsic motivation for learning, but results are far from conclusive. Moreover, despite research indicating the relation between low academic performance, increased psychosocial problems, and lower motivation for learning, it is unclear how these three factors influence one another in children with subtypes of LD.

Very little research has examined the specific role of parent involvement as a protective factor and parent depression as a risk factor in children with LD. Research suggests that increased parent involvement in beneficial for children with LD, but much of the research is theoretical in nature. Likewise, research examining the effects of parental depression on child outcomes mainly focus on typically developing children and does not specifically examine children who develop learning disabilities. Finally, some of the existing research studies do not account for the effects of socio-economic status and race-ethnicity on academic and psychosocial outcomes for children with LD. This study uses statistical methods that can account for these potential influences within a complex model.

The purpose of the current study is to test a structural equation model examining the relations between parent depression, parent involvement, early academic achievement and psychosocial behaviors in kindergarten, and later psychosocial behaviors, motivation, and academic achievement in fifth grade among a sample of children with and without LD. Using

special education eligibility in fifth grade to identify students who have reading disability, math disability, co-morbid reading and math disability, and no LD, the current study examines whether parent depression served as a risk factor and parent involvement served as a protective factor, and differentially predicted improved outcomes for children with and without LD. Structural equation modeling (SEM) will be used test the proposed model (see Figure 2 and Figure 3).

Research Questions and Hypotheses

The following research questions were proposed. A simplified conceptual model is presented in Figure 1. The full conceptual model is explained in detail in the following chapter (colored lines represent pathways examined in different research questions). Research question one focuses on specifying relations between constructs in the conceptual model. Research question two and three focus on testing whether the specified relations are the same or different for children with and without LD.

Research Question 1. What are the relations between parent depression and parent school involvement on early child academic achievement and psychosocial in kindergarten, and motivation, psychosocial behaviors, and academic achievement outcomes in fifth grade?

1a. Does parent depression indirectly predict early academic achievement and psychosocial behaviors in kindergarten via parent school involvement? This question is depicted by red paths in Figure 2 and Figure 3.

Hypothesis 1a. Lower levels of parent depression will indirectly predict higher levels of academic achievement and more positive psychosocial behaviors in kindergarten via parent school involvement. Lower levels of parent depression will be directly related to higher levels of

parent school involvement, which in turn, will predict higher levels of academic achievement and more positive psychosocial behaviors. Parent school involvement is a mediating variable.

1b. Does parent school involvement in kindergarten predict children's motivation and psychosocial behaviors in fifth grade given their level of academic achievement and psychosocial behaviors in kindergarten? This question is depicted by green paths in Figure 2 and Figure 3.

Hypothesis 1b. As the level of academic achievement and psychosocial behaviors in kindergarten increases (e.g., more positive performance) higher levels of parent school involvement will predict higher levels of motivation and more positive psychosocial behaviors in fifth grade. Early academic achievement and psychosocial behaviors are moderating variables.

1c. Does early academic achievement and psychosocial behaviors in kindergarten predict academic achievement in fifth grade? This question is depicted by blue paths in Figure 2 and Figure 3.

Hypothesis 1c. Higher levels of academic achievement and more positive prosocial behaviors in kindergarten will predict higher levels of academic achievement in fifth grade.

1d. Does motivation and psychosocial behaviors in fifth grade predict academic achievement in fifth grade? This question is depicted by yellow paths in Figure 2 and Figure 3.

Hypothesis 1d. Higher levels of motivation and more positive prosocial behaviors in fifth grade will predict higher levels of academic achievement in fifth grade. Previous academic and psychosocial performance will be controlled given that the model is run with all variables simultaneously.

Research Question 2. Do the relations between parent depression and parent school involvement on early child academic achievement and psychosocial in kindergarten, and

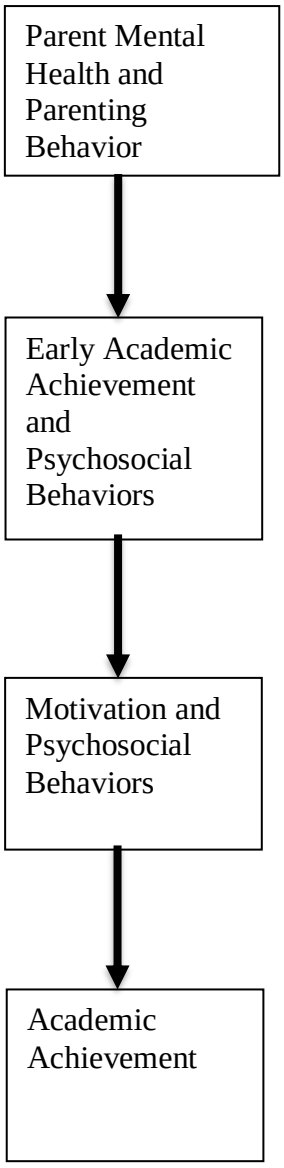
motivation, psychosocial behaviors, and academic achievement outcomes in fifth grade differ for children identified with learning disabilities in 5th grade and children without learning disabilities?

Hypothesis 2. The relations between parenting variables and academic, psychosocial, and motivation outcomes hypothesized in research question 1 will be stronger for high-risk children with LD compared to children without LD. In other words, the magnitude of the relations will be greater for children with LD compared to children without LD. Thus, parent depression will serve as a greater risk factor, parent school involvement will serve as a greater protective factor, and the relations between academic achievement, motivation, and psychosocial behavior will be greater for children with LD compared to children without LD.

Research Question 3. Does type of learning disability (math disability, reading disability, math-reading disability) moderate the relations between parent depression and parent school involvement on early child academic achievement and psychosocial in kindergarten, and motivation, psychosocial behaviors, and academic achievement outcomes in fifth grade?

Hypothesis 3. The relations between the parenting variables and academic, psychosocial, and motivation outcomes hypothesized in research question 1 will be strongest for children with the highest level of risk, children with RD-MD, then for children with one LD (MD or RD), then for children with no LD. In other words, the magnitude of the relations will be the least for children without LD, greater for children with one LD, and the greatest for children with co-morbid RD-MD.

Figure 1. Simplified Conceptual Model



Covariates:

- Gender
- Race
- SES
- Age at Assessment

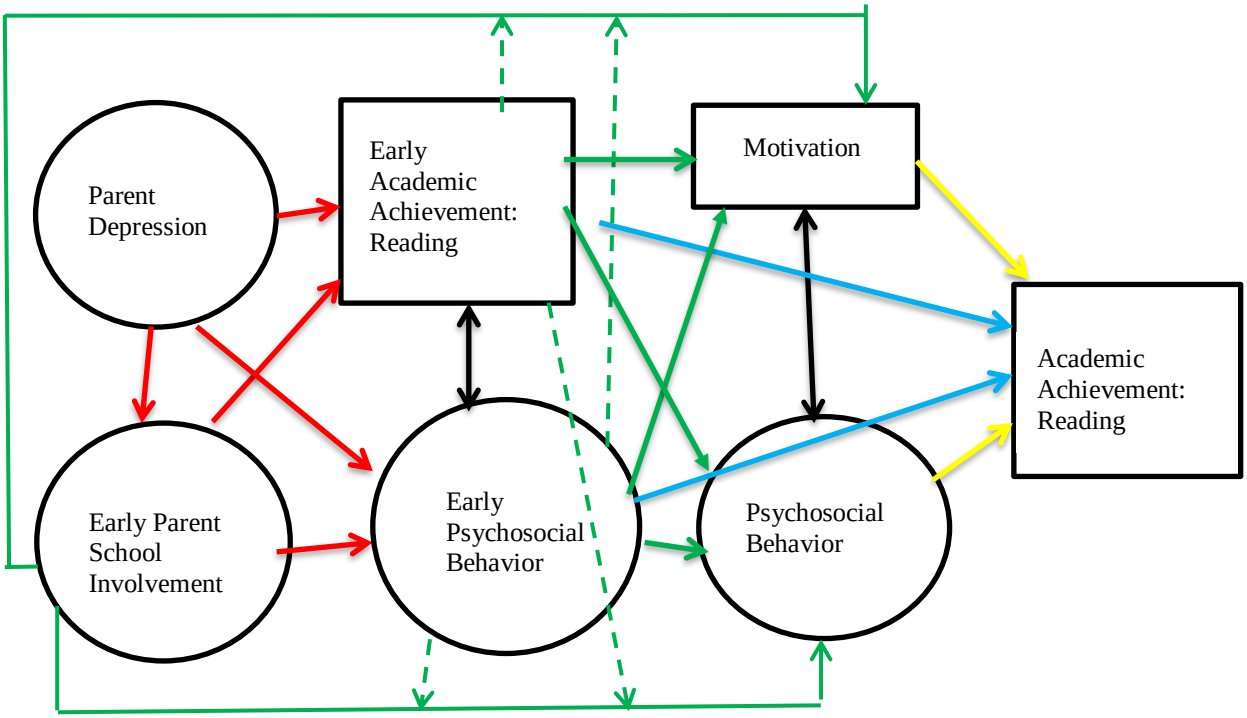
CHAPTER 3

METHOD

Study Model

The current study aimed to test a structural equation model examining the relations between early parenting variables, namely parent depression and parent school involvement, and outcomes in kindergarten and fifth grade. Outcomes of interest included early academic achievement and psychosocial behaviors in kindergarten, and motivation, academic achievement, and psychosocial behaviors in fifth grade among a sample of children with and without LD. A structural equation model specified four latent constructs and five observed variables. The latent variables included parent depression, parent school involvement, early psychosocial behaviors (kindergarten), and psychological behaviors in fifth grade. The observed variables included standard scores on assessments of reading and math in kindergarten and fifth grade, and a mean score on a measure of motivation. Covariates included the child's gender, race-ethnicity, SES, and age at kindergarten assessment. Structural equation modeling (SEM) was used to test the proposed model (see Figure 2 and Figure 3). The model in Figure 2 depicts relations for academic achievement in reading and the model in Figure 3 depicts relations for academic achievement in mathematics. The models are presented separately for simplicity; however academic achievement will be run simultaneously.

Figure 2. Detailed Conceptual Model (Reading)

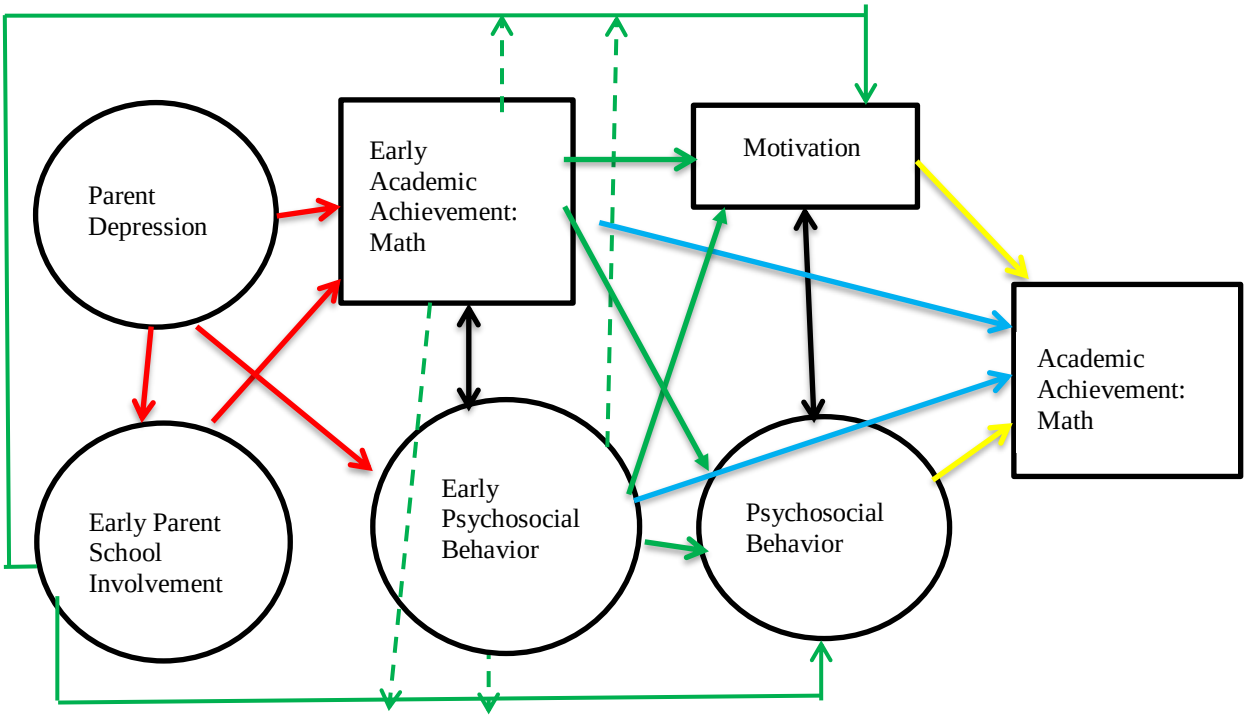


Note: Latent variables are shown in circles. The dashed lines represent the interaction between the endogenous variable (parent school involvement) and the moderator variables.

Covariates:

- Gender
- Race
- SES
- Age at Assessment

Figure 3. Detailed Conceptual Model (Math)



Note: Latent variables are shown in circles. The dashed lines represent the interaction between the endogenous variable (parent school involvement) and the moderator variables.

Covariates:

- Gender
- Race
- SES
- Age at Assessment

Study Design

Data from the Early Childhood Longitudinal Study, Kindergarten Class of 1998-1999 (ECLS-K) kindergarten and fifth grade data collection waves were used to examine the hypothesized relation between parental depression and early parent school involvement, early academic achievement and psychosocial behaviors, and motivation, psychosocial behaviors, and academic achievement outcomes in children with and without learning disabilities in mathematics and/or reading. The U.S. Department of Education's (DOE) National Center for Education Statistics (NCES) within the Institute of Education Science (IES) conducted the ECLS-K by following a nationally representative sample of children entering kindergarten in the fall of 1998 through the eighth grade. This study took advantage of data at two time points to understand the influence of early parenting variables on child motivation, psychosocial behaviors, and academic achievement within a large sample of children identified with and without learning disabilities.

Data Collection. Data were collected using a multi-informant and multi-method design, allowing for in-depth analysis of child, family, school, and other environmental variables related to child development and education. Data were collected at multiple time points: the fall and spring of kindergarten (also known as base year; 1998-1999), the fall and spring of first grade (1999-2000), the spring of third grade (2002), the spring of fifth grade (2004), and the spring of eighth grade (2007) (see Table 1). Children were sampled in the fall of 1998 if they were entering kindergarten. Approximately 81% of children sampled in the fall of kindergarten attended kindergarten for the first time, approximately 4% of children repeated kindergarten, and approximately 15% of children were missing data on kindergarten entry status.

Several sampling procedures were used in subsequent rounds of data collection to address issues of representativeness of the sample to the population and attrition. In the spring of 1999 (kindergarten spring), an additional 1,430[a] children were sampled for the study via efforts to convert schools that had originally refused to participate in the fall. In the fall of 1999 (first grade fall), data were collected for children who had been sampled in kindergarten and stayed in the same school for first grade (i.e., non-movers), and for a random 50% of students who were sampled in kindergarten but transferred to another school for first grade (i.e., movers). However, given that many children do change schools between kindergarten and first grade schools, a high number of students moving to the same first grade location were treated as non-movers. This procedure was done to limit costs associated with data collection. Finally, a half-open interval sampling procedure was implemented in the same 50 percent subsample of schools used in the fall first grade data collection time frame to "freshen" the spring 2000 first grade sample. This was done to include first grade students who had not been enrolled in kindergarten in 1998-1999, and thus, would have not had a chance to be included in the base year sample. A total of 170[a] students were added to the first grade sample via the freshening procedures. For this study, children added during the first grade freshening procedures were not included because they are missing data collected during the spring of kindergarten (see Missing Data and Exclusion Criteria sections below).

The primary methods of data collection involved interviews, questionnaires, and direct child assessments. Computer-assisted telephone or in-person interviewing was used to conduct parent interviews and questionnaires. The parent interview lasted approximately 65 minutes in the spring kindergarten round. Participating parents were sent a thank you letter and educational activity booklet upon completion of the interview. Computer-assisted interviewing and one-on-

one untimed administrations of hard-copy instruments were used to conduct direct child assessments. Self-administered questionnaires were distributed to teachers and school administrators to complete.

Field staff received training prior to conducting assessments. Assessors were selected based on previous experience with other large research studies (e.g., NAEP, TIMSS), and received intensive training on interviewing techniques and assessments via home training modules and in-person training sessions. Spanish-bilingual assessors also received additional training to practice Spanish versions of assessments and interviewing techniques. For the data collection periods used in this study assessors attended five days of training and field supervisors attended an additional two days of training prior to the fall kindergarten data collection. Prior to spring kindergarten data collection assessors attended an additional review of procedures over a four-week period. Prior to the fifth grade data collection, assessors attended at least eight hours of home-study training and five to eight days of in-person training. During the fifth grade data collection period, assessors also completed a certification process involving written exercises and performing a live, observed assessment. Overall, 99% of assessors scored above an 85% on the certification procedures (considered passing), and 1% were offered remedial training and completed a second observed assessment before being cleared. The primary investigator was granted permission to use the restricted-use ECLS-K data for this project under a restricted-data license agreement provided to her dissertation faculty chair. A waiver from the Michigan State University Institutional Review Board was obtained for completion of this project (see Appendix A).

Table 1

Overview of Original ECLS-K Data Collection Sample

Data Collection Wave	Unweighted Sample Size[1,a]	Unweighted Number of Respondents[2,a]	Age of Study Child (months)		Data Collection Period
			Mean	SD	
Kindergarten F	21,390	19,680	65.79	14.80	Fall 1998
Kindergarten S	22,810[3]	20,580	74.63	4.87	Spring 1999
First Grade F	6,510[4]	5,420	79.94	4.97	Fall 1999
First Grade S	21,360[5]	17,320	86.94	4.84	Spring 2000
Third Grade S	21,360	15,300	111.06	4.77	Spring 2002
Fifth Grade S	16,140[6]	11,820	134.63	4.93	Spring 2004
Eighth Grade S	12,130	9,720	171.25	6.69	Spring 2007

Note. F = Fall; S = Spring; [a] All unweighted sample sizes were rounded to the nearest 10 due to restrictions set forth via the licensing agreement; [1] Sample size represents total number of children sampled for the study. Some children were non-responders or ineligible; [2] Represents total number of children with child and/or parent data; [3] approximately 1,430 children were sampled from schools that were converted from refusals in the fall; [4] Data were collected from only 30% of sampled schools containing about 27% of base year students; [5] approximately 21,190 children remained eligible after the base year, and 165 children were sample via the sample freshening procedure; [6] approximately 5,210 children were excluded due to ineligibility (e.g., moved, hard refusals, no first or third grade data) in fifth grade.

ECLS-K Original Sample

The ECLS-K used a multistage, stratified, clustered, equal probability systematic sampling design. The following information is obtained from the publicly available U.S. Department of Education National Center of Education Statistics Early Childhood Longitudinal Study, Kindergarten Class of 1998 –99: User's manual for the ECLS-K base year public-use data files and electronic codebook (2001). The primary sampling units (PSU) consisted of geographic areas based on groups of counties. The 1990 county-level population data and 1994 population estimates of five-year-olds by race-ethnicity were used to determine a total of 1,335 PSUs (U.S. DOE NCES, 2001). One hundred PSUs were selected for the ECLS-K based on census region, race-ethnicity, and 1988 per capita income. Within each PSU, public schools with a minimum of 24 kindergarteners and private schools with a minimum of 12 kindergarteners were selected (schools with fewer students were clustered together) (U.S. DOE NCES, 2001). The target number of schools sampled per PSU was proportional to the weighted measure of size of each PSU, with a minimum of one school per PSU for any PSU that was so small that it would not otherwise have been allocated a school. Of the school districts with sampled schools, 75% of public school districts and 93% of private school districts cooperated with the study. Overall, a total of 1,280 schools (934 public) were selected for the ECLS-K (U.S. DOE NCES, 2001). Children that identified as Asian or Pacific Islander (API) were the only groups that were oversampled to meet the nationally representative sample size criteria. Two independent sampling strata were created within each school, one for API students and another for the remaining students. Within each stratum, students were selected using equal probability systematic sampling. Twins were sampled as a unit (both included), rather than separate. Once the sample was finalized, parental information was obtained from the schools, and parental

consent for each child was obtained. The ECLS-K study followed the consent procedures specified by participating school districts. Implicit consent was obtained from about half of the schools via a form sent to each of the selected student's home. The first wave of data collection in the fall of 1998 and spring of 1999 (kindergarten year) included a total of 21,260 children across the country. Within the base year sample, children were White, non-Hispanic (55.2%), Black or African-American (15.1%), Hispanic, Race Specified (8.3%), Hispanic, Race not Specified (9.4%), Asian (6.4%), Native Hawaiian or Other Pacific Islander (1.0%), Native American or Alaskan Native (1.8%), and Multi-racial (2.4%); 51.1% of children were male (n=10,866); the average age of children was 65.8 months (SD = 14.8). In the spring of 2004 (fifth grade), a total of 11,820 children participated in the study. Demographic characteristics of the fifth grade sample remained roughly the same: White, non-Hispanic (57.0%), Black or African-American (11.4%), Hispanic, Race Specified (9.3%), Hispanic, Race not Specified (9.8%), Asian (6.9%), Native Hawaiian or Other Pacific Islander (1.3%), Native American or Alaskan Native (1.9%), and Multi-racial (2.4%); 50.7% of children were male (n= 5,987); the average age of children was 134.6 months (SD = 4.9).

Missing Data. Given that longitudinal research studies often have missing data due to attrition (e.g., move school, decline participation, death), the data were analyzed to determine the number of children missing data at kindergarten and fifth grade time points (approximately 9,620 children did not have any data at either the kindergarten spring or fifth grade spring time point; after exclusionary criteria were applied approximately 10,720 children did not have any data at one of the time points of interest). To better understand the nature of the missing data and the exclusionary factors, comparison tests were calculated to determine if there were significant differences on demographic variables and predictor variables between children with and without

missing data (see Table 2, Table 3, and Table 4). Given that large sample sizes often yield a higher rate of significant group differences, effect sizes and odds ratios were examined as well. Although several significant differences emerged between the two groups, only a few yielded medium to large effect sizes suggesting a more meaningful statistically significant difference across the groups. There were very small to small effect sizes (Cohen's d ranged from .02 to .31) for differences in SES, age at fifth grade, teacher-rated early psychosocial behaviors in kindergarten, and student-rated motivation in fifth grade. There were medium effect sizes for differences in academic achievement (Cohen's d ranged from .42 to .44), with the included group having higher scores, on average of 4 T-score points, on reading and math achievement at both time points. Medium to large effect sizes were noted for fifth grade psychosocial behavior (Cohen's d ranged from .55 to .81), with the approaches to learning scale having the most significant difference across groups. On average, students included in the study were rated has having higher approaches to learning behavior by approximately .5 points. Differences in the academic achievement and fifth grade psychosocial behavior between the included and excluded study group is a limitation of the study. However, these findings are not entirely unexpected as students with more pervasive disabilities and impairments (e.g., cognitive disability, autism spectrum disorder) were excluded from the study and have a higher likelihood of lower academic and psychosocial skills as they may mature at a slower rate than their typical peers as the demands of school increase over time. Also, the excluded sample had far fewer children with learning disabilities; students with learning disability were 3.11 times more likely to be included in the study. However, the inclusion of children with learning disabilities is important for the aim of this study and the sample of children without learning disabilities is similar in both groups. Instead of imputing a large amount of missing data, sample weights were applied to all analyses

to account for non-response biases and maintain generalizability of the final results to the population. Robust weighted least square and maximum likelihood estimation options within the MPlus program were used to test the factor structure of each latent variable and the full structural model. The final sample used in the structural model consisted of 10,630 children.

Table 2

Comparison of Demographic Information Between Included and Excluded Samples

Characteristics	Included Sample N[a] (%)	Excluded Sample N[a] (%)	Chi-Square (df) Odds Ratio (95% CI)
Total	10,630	10,720	
Child Gender			50.67 *(1)*, p<.001*** 1.22 (1.15-1.28)
Male	5,180 (48.7%)	5,690 (53.1%)	
Female	5,450 (51.3%)	4,930 (46.0%)	
Child Race/Ethnicity			297.60 *(8)*, p<.001*** 1.04 (1.03-1.06)
White/Non-Hispanic	5,930 (55.7%)	5810 (54.2%)	
Black/African-American	1,220 (11.5%)	1,980 (18.5%)	
Hispanic, Race Specified	960 (9.0%)	800 (7.5%)	
Hispanic, No Race Specified	1,120 (10.5%)	890 (8.3%)	
Asian, Non-Hispanic	800 (7.5%)	570 (5.3%)	
Native Hawaiian or Other Pacific Islander	140 (1.3%)	80 (0.7%)	
Native American or Alaskan Native	210 (2.0%)	170 (1.6%)	
More Than One Race	230 (2.2%)	280 (2.7%)	
Learning Disability Status			144.12 *(1)*, p<.001*** 3.11 (2.56-3.78)
With Learning Disability	410 (3.9%)	140 (1.3%)	
Without Learning Disability	10,220 (96.1%)	10,580 (98.7%)	

Note: [a] All unweighted sample sizes were rounded to the nearest 10 due to restrictions set forth via the licensing agreement.

Table 3

Comparison of Covariates and Predictor Variables for Included and Excluded Samples

Variables	Included Sample Mean (*SD*)	Excluded Sample Mean (*SD*)	Independent Samples *t*-test (df)	Cohen's d
Kindergarten SES	.04 *(.80)*	-.03 *(.80)*	-6.96 *(20098)*, p<.001***	.09
Age at Assessment (K, 1999)	68.41 *(4.32)*	68.51 *(4.66)*	1.52 *(18894)*, p=.13	.02
Age at Assessment (5th grade, 2004)	134.54 *(4.38)*	135.81*(5.75)*	7.11 *(1229)*, p<.001***	.25
Kindergarten Achievement				
Direct Math Assessment	51.63 *(9.69)*	47.64 *(9.78)*	-12.64 *(1270)*, p<.001***	.41
Direct Reading Assessment	51.56 *(9.58)*	47.50*(9.92)*	-12.60 *(1251)*, p<.001***	.42
Fifth Grade Achievement				
Direct Math Assessment	51.54 *(9.52)*	47.40 *(10.31)*	-12.68 *(1292)*, p<.001***	.42
Direct Reading Assessment	51.46 (9.56)	47.20 *(10.01)*	-13.27 *(1300)*, p<.001***	.44
Early Psychosocial Behaviors				
Teacher-Rated Approaches to Learning	3.20 *(.65)*	2.99 *(.71)*	-21.18 *(18141)*, p<.001***	.31
Teacher-Rated Self-Control	3.25 *(.59)*	3.07 *(.66)*	-19.28 *(17916)*, p<.001***	.29
Teacher-Rated Interpersonal Skills	3.19 *(.61)*	3.02 *(.66)*	-18.07 *(17983)*, p<.001***	.27
Teacher-Rated Externalizing	1.58 *(.58)*	1.78 *(.70)*	21.79 *(17209)*, p<.001***	.31
Teacher-Rated Internalizing	1.52 *(.48)*	1.64 *(.55)*	15.87 *(17735)*, p<.001***	.23
Fifth Grade Psychosocial Behavior				

Table 3 (cont'd)

Teacher-Rated Approaches to Learning	3.11 *(.66)*	2.58 *(.65)*	-25.65 *(1317)*, p<.001***	.81
Teacher-Rated Self-Control	3.27 *(.58)*	2.90 *(.66)*	-17.40 *(1226)*, p<.001***	.60
Teacher-Rated Interpersonal Skills	3.12 *(.62)*	2.71 *(.67)*	-18.71 *(1245)*, p<.001***	.64
Teacher-Rated Externalizing	1.61 *(.56)*	1.96 *(.70)*	16.11 *(1209)*, p<.001***	.55
Teacher-Rated Internalizing	1.60 *(.51)*	1.98 *(.64)*	18.59 *(1200)*, p<.001***	.66
Motivation				
Student-Rated School	2.75 *(.63)*	2.56 *(.69)*	-8.67 *(1291)*, p<.001***	.29

Note: Equal variance not assumed for all variables.

Table 4

Comparison of Covariates and Predictor Variables for Included and Excluded Samples (Ordinal)

Variables	Included Sample N[a] (%)	Excluded Sample N[a] (%)	Chi-Square (df) Odds Ratio (95% CI)
Parent Depression			
Felt bothered			76.75*(3)*, p<.001***
Never	5260 (49.5%)	4390 (41.0%)	.96 (.92-1.00)
Some Time	3490 (32.8%)	3140 (29.3%)	
Moderate Amount	770 (7.2%)	770 (7.2%)	
Most of Time	260 (2.4%)	420 (3.9%)	
Poor appetite			102.21*(3)*, p<.001***
Never	7090 (66.7%)	5850 (54.6%)	.89 (.86-.93)
Some Time	2010 (18.9%)	1980 (18.4%)	
Moderate Amount	390 (3.7%)	450 (4.2%)	
Most of Time	300 (2.8%)	470 (4.3%)	
Felt the "blues"			69.91*(3)*, p<.001***
Never	7880 (74.1%)	6660 (62.2%)	.99 (.93-1.05)
Some Time	1460 (13.8%)	1510 (14.1%)	
Moderate Amount	250 (2.3%)	280 (2.6%)	
Most of Time	170 (1.6%)	270 (2.5%)	
Trouble focusing			56.43*(3)*, p<.001***
Never	5750 (54.1%)	4790 (44.7%)	.98 (.93-1.03)
Some Time	3300 (31.0%)	3070 (28.7%)	
Moderate Amount	450 (4.2%)	490 (4.6%)	
Most of Time	270 (2.6%)	380 (3.5%)	
Felt depressed			76.30*(3)*, p<.001***
Never	7210 (67.8%)	5960 (55.6%)	.97 (.91-1.04)
Some Time	2090 (19.6%)	2170 (20.3%)	
Moderate Amount	250 (2.3%)	300 (2.8%)	
Most of Time	230 (2.1%)	300 (2.8%)	
Felt things were effortful			86.06*(3)*, p<.001***
Never	5590 (52.6%)	4530 (42.2%)	.93 (.90-.96)
Some Time	2960 (27.9%)	2760 (25.7%)	
Moderate Amount	500 (4.7%)	530 (5.0%)	
Most of Time	700 (6.6%)	900 (8.4%)	
Felt fearful			15.04*(3)*, p=.03**
Never	8320 (78.3%)	7270 (67.8%)	1.04 (.98-1.10)
Some Time	1160 (10.9%)	1130 (10.5%)	
Moderate Amount	160 (1.5%)	190 (1.7%)	
Most of Time	130 (1.2%)	140 (1.3%)	
Difficulty sleeping			75.14*(3)*, p<.001***
Never	4870 (45.8%)	4020 (37.5%)	.95 (.92-.99)
Some Time	3420 (32.2%)	3020 (28.1%)	
Moderate Amount	750 (7.1%)	750 (7.0%)	

Table 4 (cont'd)			
Most of Time	730 (6.9%)	940 (8.8%)	
Talked less			33.98*(3)*, p<.001***
Never	7930 (74.6%)	6820 (63.6%)	1.06 (1.00-1.12)
Some Time	1440 (13.5%)	1450 (13.6%)	
Moderate Amount	260 (2.5%)	250 (2.4%)	
Most of Time	150 (1.4%)	210 (2.0%)	
Felt lonely			83.35*(3)*, p<.001***
Never	7910 (74.4%)	6680 (62.3%)	.89 (.84-.95)
Some Time	1480 (13.9%)	1510 (14.1%)	
Moderate Amount	210 (2.0%)	250 (2.4%)	
Most of Time	170 (1.6%)	300 (2.8%)	
Felt sad			60.88*(3)*, p<.001***
Never	6130 (57.7%)	5110 (47.7%)	1.00 (.94-1.06)
Some Time	3130 (29.4%)	2960 (27.6%)	
Moderate Amount	330 (3.1%)	400 (3.7%)	
Most of Time	190 (1.7%)	270 (2.5%)	
Difficulty "to get going"			51.49*(3)*, p<.001***
Never	5830 (54.9%)	4900 (45.7%)	1.00 (.95-1.04)
Some Time	3210 (30.2%)	2980 (27.8%)	
Moderate Amount	440 (4.2%)	460 (4.3%)	
Most of Time	280 (2.7%)	400 (3.7%)	
Parent School Involvement			
Contact school			66.56*(1)*, p<.001***
Yes	5160 (48.6)	5190 (48.4)	1.27 (1.20-1.35)
No	4800 (45.2)	3800 (35.4)	
Attended open house			63.33*(1)*, p<.001***
Yes	7520 (70.7)	6310 (58.9)	.77 (.72-.82)
No	2430 (22.9)	2650 (24.7)	
Attended PTO			71.74*(1)*, p<.001***
Yes	3680 (34.7)	2790 (26.1)	.77 (.73-.82)
No	6270 (59.0)	6170 (57.6)	
Attended parent group			12.75*(1)*, p<.001***
Yes	920 (8.6)	700 (6.5)	.83 (.75-.92)
No	9040 (85.0)	8270 (77.2)	
Attended teacher conference			27.64*(1)*, p<.001*** .81 (.75-.88)
Yes	8570 (80.6)	7470 (69.7)	
No	1400 (13.1)	1500 (14.0)	
Attended school event			50.18*(1)*, p<.001***
Yes	6870 (64.6)	5750 (53.7)	.80 (.76-.85)
No	3090 (29.0)	3220 (30.0)	
Volunteered at school			87.65*(1)*, p<.001***
Yes	5140 (48.4)	4020 (37.5)	.76 (.72-.81)
No	4820 (45.3)	4950 (46.2)	

Table 4 (cont'd)			
Participated in fundraiser			43.87*(1)*, p<.001***
Yes	6140 (57.8)	5110 (47.6)	.82 (.78-.87)
No	3810 (35.9)	3860 (36.0)	

Note: [a] All unweighted sample sizes were rounded to the nearest 10 due to restrictions set forth via the licensing agreement.

Final Sample for Current Study

The final sample for the current study included children from the ECLS-K data set who had parent and teacher reports of psychosocial behavior, direct assessment of math and reading skills in kindergarten and fifth grade, and self-report of motivation in fifth grade. School staff, namely the primary special education teacher, also completed a questionnaire for each child with an IEP which indicated their primary disability in the spring of fifth grade. This information was used to determine students identified with a primary learning disability in math, reading, or both math and reading in fifth grade. All unweighted sample sizes reported in this document were rounded to the nearest 10 due to restrictions set forth via the licensing agreement.

Participants assigned the longitudinal sample weight C2_6FP0 were retained for the current study. The longitudinal sample weight C2_6FP0 was assigned to children who had parent interview data across four rounds of data collection (spring kindergarten, spring first grade, spring third grade, and spring fifth grade) in conjunction with child assessment, school, teacher or classroom data. This sample weight is more restrictive than a weight that would account for just spring kindergarten and spring fifth grade data, but it is the weight that best fits the analysis based on the available weights published in the ECLS-K restricted dataset. Using a more restrictive weight still adjusts for the current studies intended analyses, and will allow for generalizability to the kindergarten class of 1998-1999.

The final sample consisted of 10,630 children. Mean child age at each time point is reported in Table 5. Children in the final sample were approximately 56% White, non-Hispanic, 11% Black or African-American, 9% Hispanic, race specified, 10% Hispanic, no race specified, 7% Asian, 1% Native Hawaiian or Other Pacific Islander, 2% Native American or Alaskan Native, and 2% Multi-racial; 5,712 were male (50.3%). The majority of children entered

kindergarten in the fall of 1998 for the first time (n=8,900; 83.7%). Approximately 3% of children repeated kindergarten and 13% of children did not have data on kindergarten entry status. By the fifth grade data collection period (spring 2004), a small percentage of students had been retained and were in a grade below fifth grade (n=910; 8.6%) and an even smaller percentage of students had been promoted to a grade above fifth grade (n=20; 0.2%). Within this study, children's age at assessment was used as a covariate to control for effects due to maturation (see Covariates section below for further discussion on retention). See Table 6 for child demographic characteristics.

Exclusion Criteria. Given the interest in the relations between parent involvement, parental depression, motivation, psychosocial behaviors, and academic achievement in children with learning disabilities, children with intellectual disability, neurological conditions (e.g., traumatic brain injury, cerebral palsy), neurodevelopmental disorders (e.g., pervasive developmental disorder, autism spectrum disorder, attention-deficit and hyperactivity disorder), and mental health issues were excluded from the sample so as not to confound results. Exclusion was based on parent and/or school report of a diagnosis of developmental delay, intellectual disability, cerebral palsy, pervasive developmental disorder, autism spectrum disorder, visual or hearing impairment, attention-deficit and hyperactivity disorder, anxiety or depression disorder, or "other disability" during kindergarten and/or fifth grade; 1,100 children met these exclusion criteria. Participants who are missing data entirely across one of the two waves of data collection of interest (kindergarten or fifth grade) were also excluded (9,620 children did not have any data at either the kindergarten spring or fifth grade spring time point). No other exclusionary criteria were applied.

Learning Disabled Sample. Overall, a total of 410 children with a learning disability were included in the current study, of which 180 children had a reading disability, 20 children had a math disability, and 220 children had a reading and math disability. Field supervisors were provided the name of all fifth grade students who received special education services and their primary special education teacher (e.g., teacher who managed the child's Individualized Education Plan (IEP) or spent the most time providing services to the child). Identification of learning disability was based on special education records and report of the child's main disability category by the child's fifth grade primary special education teacher. Thus, in this study diagnosis of a learning disability is presumed to follow IDEA definition of specific learning disability. Schools likely used a pattern of strengths or weaknesses model, response-to-intervention, or discrepancy paradigm to identify a learning disability. Direct information about the child's learning disability category (e.g., reading, math, or both) was unavailable, so LD type was determined based on the special education teacher's report of the child's primary IEP goals. If the child had primary reading goals, it was assumed that they demonstrated academic difficulty in reading and thus, were categorized as LD-Reading. If the child had primary math goals, it was assumed that they demonstrated academic difficulties in math, and were categorized as LD-math. If the child had primary goals in both reading and math, it was assumed that they had academic difficulties in both subjects and were categorized as LD-Co-morbid Math and Reading. Of the 410 children identified with LD, less than 10 children did not have primary reading or math academic goals specified in their IEP, thus they were not included in the categorized analysis.

This study examined how early parenting variables influenced motivation, psychosocial behaviors, and academic achievement in children diagnosed with learning disabilities in fifth

grade, rather than children diagnosed with learning disabilities in kindergarten or children who were diagnosed with learning disabilities at any point in time between kindergarten and fourth grade for two primary reasons. First, research indicates that identification of learning disabilities in very young children (i.e., preschool/early kindergarten) is often unreliable and inaccurate (Rathvon, 2004; Scarborough, 1998). Instead of having a true learning disability, children in kindergarten may be struggling academically because they have not received formal education prior to kindergarten (e.g., instruction in basic reading principles in preschool or at home), children may be adapting to classroom expectations and behavioral or motivational issues may be more salient in screening/testing, and because there is a wide range of natural variation in the rate at which children begin to learn to read or do math (e.g., some children in kindergarten may be "fast learners" compared to other children who take a longer time to grasp reading or math principles).

Second, by examining children who were identified with a learning disability in fifth grade, it is presumed that these children have either had persistent academic problems throughout elementary school and continue to qualify for special education services or they have been recently diagnosed with a learning disability. Moreover, the stability (e.g., persistence and permanence) of learning disabilities is a cornerstone of the diagnosis. Children who have been diagnosed with a learning disability prior to fifth grade, and no longer qualified for special education as a child with a learning disability in fifth grade, presumably were no longer experiencing impairment in academic functioning, and may have received support earlier in elementary school. Given that this study aims to answer questions about how early parenting variables influence outcomes for children with and without *persistent* academic problems it is

rational to examine students who are identified or continue to be identified as a child with a learning disability at the point at which outcomes are measured (fifth grade).

Overall, 3.9% of the study sample had an LD, 1.7% had an RD, 0.2% had an MD, and 2.1% had a RD-MD. This represents a lower prevalence of children with LD in the study sample as compared to general population estimates. Extant literature indicates 5-10% of the population has a MD (Berch & Mazzocco, 2007; Geary, Hoard, Nugent, & Bailey, 2012; Judge & Watson, 2011), 5% and 17.5% of the population has a reading disability (Shaywitz & Shaywitz, 2005), and approximately 30% to 70% of individuals with either disorder have a co-morbid RD or MD (Kovas et al., 2007; Landerl & Moll, 2010; Willcutt et al., 2013). There are several reasons that the study sample may have a lower LD sample size including, overlap in the presence of LD in children who were excluded from the study, particularly children with identified ADHD and social-emotional and behavior problems. Researchers suggest that approximately 24% to 38% of children with RD and/or MD have co-morbid ADHD (Capano, Minden, Chen, Schachar, & Ickowicz, 2008; DuPaul, Gormley, & Laracy, 2013; Langberg, Vaughn, Brinkman, Froehlich, & Epstein, 2010), and between 18%-19% of children with oppositional-defiant disorder, anxiety, and/or depression have an LD (Mayes & Calhoun, 2006). Additionally, students with LD were identified based on report of LD status from the child's IEP, thus children who may receive a clinical diagnosis of LD and who are not yet being served in the school and children who may have an LD but are being served via undocumented accommodations are not able to be accounted for. The relatively lower prevalence of LD compared to the general population is a limitation of the study and conclusions were interpreted with caution.

Sampling Weights. Descriptive analyses on the final sample include unweighted and weighted means. Unweighted descriptive statistics represent the ECLS-K population where each

case was counted equally. Weighted descriptive statistics represents the entire population of children attending kindergarten in 1998, and accounts for those children who were not sampled. The weighted sample reflects population estimates from the 1994 U.S. Census. Full sample weights and nesting variables (based on the Taylor Series method for computing standard errors) were applied to structural equation analyses to adjust for differential selection probabilities, reduce non-response bias and standard error, and allow for results that are generalizable to the population.

Table 5
Overview of Data Collection for Final Sample

Data Collection Wave	Age of Study Child (months)		Data Collection Period
	Mean	SD	
Kindergarten Spring	68.41	4.32	Spring 1999
Fifth Grade Spring	134.54	4.38	Spring 2004

Table 6
Demographic Characteristics of Final Sample (n = 10,630)

Characteristic	Sample N[a]	Sample %	Weighted N	Weighted %
Child Gender				
Male	5,180	48.7%	1,644,099	49.0%
Female	5,450	51.3%	1,709,317	51.0%
Child Race/Ethnicity				
White/Non-Hispanic	5,930	55.7%	1,880,891	56.1%
Black/African-American	1,220	11.5%	553,007	16.5%
Hispanic, Race Specified	960	9.0%	306,944	9.2%
Hispanic, No Race Specified	1,120	10.5%	352,309	10.5%
Asian	800	7.5%	100,708	3.0%
Native Hawaiian or Other Pacific Islander	140	1.3%	27,480	0.8%
Native American or Alaskan Native	210	2.0%	61,841	1.8%
More Than One Race	230	2.2%	68,676	2.0%
Learning Disability Status				
Dichotomized				
With Learning Disability	410	3.9%	123,453	3.7%
Without Learning Disability	10,220	96.1%	3,229,963	96.3%
Categorized				

Table 6 (cont'd)

Math Disability	20	0.2%	9,052	0.3%
Reading Disability	180	1.7%	40,126	1.2%
Co-morbid Math and Reading Disability	220	2.0%	72,492	2.2%

Note: [a] All unweighted sample sizes were rounded to the nearest 10 due to restrictions set forth via the licensing agreement.

Variables and Measures

A description of the measures for each of the predictor and outcome variables are described below in relation to the conceptual model, including parent depression, early parent school involvement, academic achievement, psychosocial behaviors, and motivation. Refer to Table 7 for a list of latent constructs and variables.

Table 7
Summary of ECLS-K Variables Corresponding to Constructs and Covariates

Construct	ECLS-K Variables	ECLS-K Data Source
1. Parent Depression*	a. Parent report of symptoms of depression (Kindergarten Spring)	a. Parent Interview Questionnaire
2. Parent School Involvement*	a. Parent report of school involvement (Kindergarten Spring)	a. Parent Interview Questionnaire
3. Early Psychosocial Behavior*	a. Teacher report on Externalizing Problem Behaviors Scale (Kindergarten Spring) b. Teacher report on Internalizing Problem Behaviors Scale (Kindergarten Spring) c. Teacher report on Interpersonal Scale (Kindergarten Spring) d. Teacher report on Self-Control Scale (Kindergarten Spring) e. Teacher report on Approaches to Learning Scale (Kindergarten Spring)	a/b/c/d/e. Teacher SRS
4. Psychosocial Behavior*	a. Teacher report on Externalizing Problem Behaviors Scale (5^{th} Grade) b. Teacher report on Internalizing Problem Behaviors Scale (5^{th} Grade) c. Teacher report on Interpersonal Scale (5^{th} Grade) d. Teacher report on Self-Control Scale (5^{th} Grade) e. Teacher report on Approaches to Learning Scale (5^{th} Grade)	a/b/c/d/e. Teacher SRS
5. Motivation	a. Child report SDQ School scale (5^{th} grade)	a. Child SDQ. Teacher SRS

Table 7 (cont'd)

6. Early Academic Achievement	a. Math T-Score (Kindergarten Spring) b. Reading T-Score (Kindergarten Spring)	a/b. Direct Child Cognitive Assessment
7. Later Academic Achievement	a. Math T-Score (5th Grade) b. Reading T-Score (5th Grade)	a/b. Direct Child Cognitive Assessment
8. Covariates	a. Gender b. Race c. Age (Kindergarten Spring) d. SES	a/b/c/d. Parent Interview Questionnaire

Note: * indicates a latent construct. Confirmatory Factor Analysis was conducted on individual items to identify constructs.

Parent Depression. Parent symptoms of depression were measured using information obtained from the parent interview during the spring of kindergarten. The respondent was typically the child's mother, although if the mother was unavailable, the respondent was another parent, guardian, or household member (in that order of preference). In the current sample, the majority of the parent interviews were completed by biological mothers (n=7,030; 66%) and female guardians such as adoptive mothers, step-mothers, or foster mothers (n= 100; 1%). In each wave of data collection, attempts were made to collect information from the same respondent (e.g., the mother at each data collection point), however in some cases this was not possible and another parent, guardian, or household member served as the respondent.

Parents answered the following twelve items about their own psychological well-being using a four-point Likert scale (1=Never, 2=Some of the time, 3=A moderate amount of the time, 4=Most of the time). These items map closely to the criteria for depression listed in the DSM-5 (APA, 2013).

- How often during the past week have you felt that you were bothered by things that don't usually bother you?

- How often during the past week have you felt that you did not feel like eating, that your appetite was poor?
- How often during the past week have you felt that you could not shake off the blues even with help from your family?
- How often during the past week have you felt that you had trouble keeping your mind on what you were doing?
- How often during the past week have you felt depressed?
- How often during the past week have you felt that everything you did was effortful?
- How often during the past week have you felt fearful?
- How often during the past week have you felt that your sleep was restless?
- How often during the past week have you felt that you talked less than usual?
- How often during the past week have you felt lonely?
- How often during the past week have you felt sad?
- How often during the past week have you felt that you could not get going?

Parent responses on these items were used as indicators of their psychological well-being. Since these individual items were provided in the ECLS-K data set and no composites were created, factor analysis was conducted in order to combine items to represent the specific construct of interest. Confirmatory Factor Analysis (CFA) was conducted using weighted least square parameter estimates (estimator WLSMV) specifying all twelve items representing the construct of parent depression using MPlus student version 7.4 (Muthén & Muthén, 2012) with the current sample of approximately 10,630 participants. CFA identifies sets of variables that reliably measure a hypothesized construct (Kline, 2011). All the items loaded substantially on the hypothesized factor of parent depression. The model had a close fit with the data. See Table 8

for the final factor loadings and their standardized and unstandardized coefficients. Fit indices included a Root Mean Square Error of Approximation (RMSEA) equal to .031 (CI = .028-.034), CFI =.957, and TLI=.947. Higher scores on this latent variable are indicative of higher rates of depressive symptomology.

Table 8
Confirmatory Factor Analysis for a One-Factor Model of Parent Depression

Items	Unstandardized	Standard Error (SE)	Standardized
Felt bothered	1.000	0.000	0.612
Poor appetite	1.002	0.040	0.613
Felt the "blues"	1.361	0.037	0.832
Trouble focusing	1.080	0.031	0.661
Felt depressed	1.360	0.034	0.832
Felt things were effortful	1.061	0.036	0.649
Felt fearful	0.960	0.050	0.587
Difficulty sleeping	0.970	0.038	0.593
Talked less	1.164	0.041	0.712
Felt lonely	1.206	0.039	0.737
Felt sad	1.311	0.032	0.802
Difficulty "to get going"	1.058	0.035	0.647

Note: All factor loadings were significant (p<.001).

Early Parent School Involvement. Parent school involvement was measured using the parent interview data from the spring of kindergarten. Parents responded to the following eight questions about their involvement in their child's schooling. Parents responded "1=Yes" or "2=No" to the following items:

- During this school year, have you or another adult in your household taken it upon yourself to contact your child's teacher or school for any reason having to do with your child?
- Since the beginning of this school year, have you or the other adults in your household attended an open house or a back-to-school night?

- Since the beginning of this school year, have you or the other adults in your household attended a meeting of a PTA, PTO, or Parent-Teacher Student Organization?
- Since the beginning of this school year, have you gone to a meeting of a parent advisory group or policy counsel?
- Since the beginning of this school year, have you or another adult in your household gone to a regularly-scheduled parent-teacher conference with your child's teacher or meeting with your child's teacher?
- Since the beginning of this school year, have you or another adult in your household attended a school or class event, such as a play, sports event, or science fair?
- Since the beginning of this school year, have you or another adult in your household acted as a volunteer at the school or served on a committee?
- Since the beginning of this school year, have you or another adult in your household participated in fundraising for your child's school?

Parent responses on these eight items were used as indicators of early parent involvement in children's schooling and psychosocial development. Since these individual items were provided in the ECLS-K data set and no composites were created, factor analyses were conducted in order to combine items to represent specific constructs of interest. CFA using weighted least square parameter estimates (estimator WLSMV) specifying all eight items representing the construct of interest using MPlus student version 7.4 (Muthén & Muthén, 2012) was conducted with the current sample of approximately 10,630. All the items loaded onto the hypothesized construct of parent school involvement. The model fit the data closely. Fit indices included a RMSEA equal to .017 (CI = .013-.022), CFI =.962, and TLI=.947. However, one item, "Contact School," had a low standardized factor loading of 0.235 and communality below

0.1, thus it was removed from the final analysis as it did not significantly contribute to the overall construct. See Table 9 for the final factor loadings and their standardized and unstandardized coefficients. All the items loaded onto the hypothesized construct of parent school involvement. The model fit the data closely. Fit indices included a RMSEA equal to .020 (CI = .015-.025), CFI =.964, and TLI=.946. Higher scores on this latent variable are indicative of less school involvement.

Table 9
Confirmatory Factor Analysis for a One-Factor Model of Parent School Involvement

Items	Unstandardized	Standard Error (SE)	Standardized
Attend Open House	1.000	0.000	0.659
Attend PTA/PTO	0.747	0.067	0.492
Attend Parent Advisory Group	0.618	0.060	0.407
Attend Parent-Teacher Conference	0.613	0.072	0.404
Attend School Event	0.872	0.053	0.574
Volunteer at School	1.104	0.060	0.727
Participate in School Fundraising	0.792	0.072	0.522

Note: All factor loadings were significant ($p<.001$).

Academic Achievement. For the current study, early academic achievement is defined as the child's performance on direct cognitive assessments of mathematics and reading skills in the spring of their kindergarten year. Later academic achievement is defined as the child's performance on direct cognitive assessments of mathematics and reading skills in the spring of 5th grade.

Early academic achievement. In the spring of kindergarten, the full ECLS-K direct child cognitive assessment took approximately 50 to 70 minutes to administer per child in a one-on-one setting. Using a two-stage assessment design, children first completed a routing section, consisting of 12 to 20 items of varying difficulty, to determine the appropriate form for each of the subject areas (reading, mathematics, and general knowledge). The assessment included multiple choice and open-ended items. All items were answered with pointing or verbal

responses. The reading assessment included questions to measure print familiarity, letter recognition, beginning and ending sounds, rhyming sounds, word recognition, receptive vocabulary, listening comprehension, and comprehension of words in context. The mathematics assessment included questions to measure number sense, number properties, basic operations, and geometry and spatial sense. Manipulatives and paper and pencil were available from some questions. Children with disabilities with documented Individualized Education Plans (IEP), Individualized Family Service Plans (IFSP), or 504 Plans on file with the school were permitted accommodations during direct assessment. Permitted accommodations included modified setting (e.g., special lighting, quiet room, adaptive chair or table), scheduling testing during a particular time of day or for shorter periods at a time, and assistive devices to improve access to the assessments (e.g., hearing aid, cane, brace, voice synthesizer).

Item-response theory (IRT) standardized scores (T-scores) were calculated for each subject area. For this study, the standardized scores for math and reading will be used in the structural model separately (i.e., not combined average or latent factors). Standardized scores have a mean of 50 and a standard deviation of 10. IRT standardized scores allow for comparison of child performance to the population and direct comparisons of academic achievement across time points. The range of IRT standardized scores on the reading assessment and math assessment were 0.0 to 90.0. The reliability for standardized scores was 0.95 for the reading assessment and 0.94 for the math assessment.

Later academic achievement. Children were assessed using the ECLS-K direct cognitive assessment covering three subject areas (mathematics, reading, and science). The assessment was created with input from child development, elementary education, and content area experts, and validity of the assessment was established via convergent validity with the

Woodcock-McGrew-Werder Mini-Battery of Achievement (MBA) (alpha = 0.73 for reading assessment and 0.80 for math assessment). The content of the assessments extended upon the scales developed for assessments in prior years. For example, in the kindergarten reading assessment, children were asked to read short sentences, whereas in the fifth grade assessment, children were asked to read passages that were more complex. The assessment took approximately 96 minutes to administer and was administered using hard-copy assessments and computer-assisted interviewing. Similar to the kindergarten assessment, a two-stage assessment approach was used to determine which form the student would complete. The routing test included 18 to 25 items, in each subject area.

The reading assessment included questions that measured children's ability to make literal inferences from text (using key words in the text to answer comprehension questions), extrapolate from cues in text to make inferences, use background knowledge and context cues in a sentence to understand homonyms, evaluate connections between problems in narrative and real-life problems, and comprehension of nonfiction text (e.g., biographical and expository text) through questions requiring students to identify the "tone" of the remark, infer the author's intent behind a character or selection in the text, and identify evidence to support or refute ideas presented in the text. The math assessment included questions that measured conceptual, procedural, and problem-solving knowledge in relation to number sense, numerical operations, measurement, geometry and spatial sense, data analysis, statistics, probability, patterns, algebra, and functions. Item-response theory (IRT) standardized scores (T-scores) were calculated for each subject area. Similar to the early academic achievement variable, the standardized scores for math and reading will be used in the structural model separately (i.e., not combined average or latent factors). The range of IRT standardized scores on the reading assessment and math

assessment were 0.0 to 96.0. The reliability for standardized scores was 0.93 for the reading assessment and 0.94 for the math assessment.

Psychosocial Behaviors. For the current study, early psychosocial behaviors were measured using teacher's ratings on a self-administered social rating scale (SRS) in the spring of kindergarten. Later psychosocial behaviors were measured using teacher's ratings on the SRS in the spring of fifth grade. The SRS is a modified version of the *Social Skills Rating System* (Graham & Elliott, 1990). The SSRS has been shown to discriminate between students with and without disabilities (Demaray et al., 1995; Bramlett, Smith, & Edmonds, 1994). For each child, their primary teacher in kindergarten and their reading teacher in fifth grade rated the frequency of specific behaviors using a Likert scale from one (Never) to four (Very Often). The SRS included five scales total. The Approaches to Learning (ATL) Scale consisted of six items in the spring of kindergarten and seven items in the spring of fifth grade. The kindergarten items measured the child's attentiveness, task persistence, eagerness to learn, learning independence, flexibility, and organization. In the spring of fifth grade, a seventh item regarding the child's ability to follow classroom rules was added. The Self-Control (SC) scale consisted of four items relating to the child's ability to respect the property rights of others, control their temper, accept peer ideas for group activities, and respond appropriately to peer pressure. The Interpersonal Skills (IP) scale consisted of five items related to the child's skills in forming and maintaining friendships, getting along with people who are different, comforting or helping other children, expressing feelings, expressing ideas and opinions (and feelings in the kindergarten survey) in a positive way, and showing sensitivity to the feelings of others. The Externalizing Problem Behaviors (EB) scale consisted of five items in the spring of kindergarten and six items in the spring of fifth grade related to the frequency with which a child displayed problem behaviors

including, arguing, fighting, getting angry, acting impulsively, and disturbing ongoing activities. In the spring of fifth grade a sixth item regarding the frequency with which a child talks during quiet study was added. Finally, the Internalizing Problem Behavior (IB) scale consisted of four items related to the presence of symptoms of anxiety, loneliness, low self-esteem, and sadness. Mean scores for each scale were reported on a scale from one to four.

Higher scores on the ATL, SC, and IP scales indicated more positive behavior, whereas lower scores on the EB and IB scales indicated less problem behavior. Thus, the EB and IB scales were reverse coded, so that higher scores were indicative of less problem behavior and more positive functioning. Thus, higher scores on these latent variables are indicative of more positive psychosocial behavior. The split-half reliability for teacher SRS scale scores in the spring of kindergarten was 0.89 for ATL, 0.80 for SC, 0.89 for IP, 0.90 for EB, and 0.78 for IB. In the spring of fifth grade, split-half reliability for teacher SRS scale scores was 0.91 for ATL, 0.79 for SC, 0.88 for IP, 0.89 for EB, and 0.77 for IB, indicating moderate to high reliability.

Kindergarten psychosocial behavior. Although composites were created, factor analyses were conducted in order to combine items to represent the specific construct of interest, psychosocial behaviors. First, Confirmatory Factor Analysis (CFA) using maximum likelihood estimation with robust standard errors (MLR) specifying all five mean scores for the spring of kindergarten representing the construct of interest was conducted with the current sample using MPlus student version 7.4 (Muthén & Muthén, 2012). The model did not fit the data adequately. Results of an Exploratory Factor Analysis (EFA) specifying the five mean scores indicated that the score for the Self-Control scale and the Externalizing Behaviors scale loaded on a second-factor. Based on the factor loadings from the EFA and theoretical considerations, two distinct constructs emerged: learning and social-emotional skills, and maladaptive behaviors. The first

construct, learning and social-emotional skills, consisted of the Approaches to Learning, Interpersonal Skills, and Internalizing Behaviors scales. These scales address self-regulated learning (i.e., attentiveness, task persistence, eagerness to learn, learning independence, flexibility, organization) and social-emotional characteristics including relational skills (i.e., forming and maintaining friendships, getting along with people who are different, comforting or helping other children, expressing feelings, expressing feelings, ideas, and opinions in a positive way, and showing sensitivity to the feelings of others) and emotional well-being (i.e., presence of anxiety, loneliness, low self-esteem, and sadness). The second construct, maladaptive behaviors, consisted of the Self-Control and Externalizing Behaviors scale. These scales address emotional regulation (e.g., ability to respect the property rights of others, control their temper, accept peer ideas for group activities, and respond appropriately to peer pressure) and externalizing problems (e.g., arguing, fighting, getting angry, acting impulsively, and disturbing ongoing activities).

Confirmatory Factor Analysis (CFA) using maximum likelihood estimation with robust standard errors (MLR) representing the two constructs of interest was conducted with the current sample using MPlus student version 7.4 (Muthén & Muthén, 2012). All the items loaded substantially onto the hypothesized factors of psychosocial behavior. The model fit the data adequately. Fit indices included a RMSEA equal to .044 (CI = .035-.053), CFI =.987, and TLI=.966. However, the two second-order factors are highly correlated (r =.857). Given the high correlation between the two-second order factors, and problems associated with identification of latent constructs with only two or three observed variables, the error variances between the Self-Control and Externalizing Behaviors scales were correlated. This allowed for examination of a more parsimonious latent variable identified by five observed scores. See Table 10 for the final factor loadings and their standardized and unstandardized coefficients. All the items loaded

significantly onto the hypothesized construct of psychosocial behavior. The model fit the data adequately. Fit indices included a RMSEA equal to .044 (CI = .035-.053), CFI =.987, and TLI=.966.

Fifth grade psychosocial behavior. Given that there were several different items added to the fifth grade SRS survey, it was hypothesized that all five scales would load onto the hypothesized construct of psychosocial behaviors: Approaches to Learning, Self-Control, Interpersonal Skills, Externalizing Behavior, and Internalizing Behavior. Theoretically, the Approaches to Learning scale consists of items that may closely align with the construct of motivation. For example, task persistence, learning independence, eagerness to learn, and executive functioning skills such as organization, are all related to aspects of self-regulated learning and intrinsic motivation. Since additional data was available to examine motivation as a separate construct at the fifth grade time point, the ATL scale score was examined in context of that construct of motivation, as well as the construct of psychosocial behavior to establish discriminative validity and ensure that it would be most appropriate to include the ATL variable within the construct of psychosocial behavior. It should be noted that this procedure was not done at the kindergarten time point. For the kindergarten construct of psychosocial behavior, the ATL scale was included. This was done for several reasons. First, unlike the fifth grade data, there is no self-report data of student's motivation in kindergarten. Thus, a separate construct for motivation in kindergarten was not examined within the model. Second, although some of the items comprising the SRS, and in particular the ATL scale, were similar in kindergarten and fifth grade, there were additional items in fifth grade. The differential information collected at the two time points contributes to different conceptualizations and combinations of the scales. Thus, in

kindergarten, the ATL scale was examined within the broader construct of psychosocial behavior in order to capture important information related to prosocial and motivation behaviors.

To examine the fit of the ATL scale in fifth grade, correlations were examined first. The correlations between the ATL scale and six observed motivation variables (see Motivation section below for more detailed explanation) were compared to the correlations between the ATL scale and the remaining four observed psychosocial variables (SC, IP, EB, IB). ATL was more strongly correlated with the four observed psychosocial variables (values of *r* ranged from .38 to .72) than with the six observed motivation variables (values of *r* ranged from .13 to .42). Next an exploratory factor analysis specifying all 11 variables (five psychosocial variables and six motivation variables) was conducted. The correlation between two theoretical second-order factors, psychosocial behavior and motivation, was low (r=.24) indicating a shared variance of only 5%. Additionally, although the ATL scale loaded significantly ($p<.05$) on both second-order factors, ATL loaded much higher on the psychosocial factor (standardized factor loading = 0.768) than on the motivation factor (standardized factor loading = 0.121). Thus, it was concluded that the ATL scale more appropriately aligns with the construct of psychosocial behavior rather than motivation.

Confirmatory Factor Analysis (CFA) using maximum likelihood estimation with robust standard errors (MLR) specifying the five hypothesized SRS mean scores for the spring of fifth grade representing the construct of interest was conducted with the current sample using MPlus student version 7.4 (Muthén & Muthén, 2012). See Table 11 for the final factor loadings and their standardized and unstandardized coefficients. All the items loaded significantly onto the hypothesized construct of psychosocial behavior. The model fit the data adequately. Fit indices included a RMSEA equal to .057 (CI = .049 -.065), CFI =.980, and TLI=.959.

Table 10
Confirmatory Factor Analysis for a One-Factor Model of Kindergarten Psychosocial Behavior

Items	Unstandardized	Standard Error (SE)	Standardized
Approaches to Learning	1.000	0.000	0.754
Self-Control	1.002	0.023	0.839
Interpersonal Skills	1.134	0.025	0.919
Externalizing Behavior	0.778	0.030	0.653
Internalizing Behavior	0.389	0.026	0.395

Note: All factor loadings were significant (p<.001).

Table 11
Confirmatory Factor Analysis for a One-Factor Model of Fifth Grade Psychosocial Behavior

Items	Unstandardized	Standard Error (SE)	Standardized
Approaches to Learning	1.000	0.000	0.793
Self-Control	1.009	0.025	0.903
Interpersonal Skills	1.063	0.021	0.898
Externalizing Behavior	0.852	0.026	0.770
Internalizing Behavior	0.421	0.026	0.414

Note: All factor loadings were significant (p<.001).

Motivation. Children's level of motivation in school was measured in 5th grade using a self-report scale, Self-Description Questionnaire (SDQ), and a teacher report of self-regulation and intrinsic motivation from the Social Rating Scale (SRS). For the SDQ, assessors read all questions to children, and took approximately 5 minutes to administer all items. Children answered 42 questions, across six scales, about their perceptions of their competence and interest in peer relations, externalizing behaviors, emotions, and school subjects, including reading and math. The items on the academic and peer scales of the SDQ were adapted from a validated tool, the *Self-Description Questionnaire II* (Marsh, 1992). The internalizing and externalizing scales were created for the ECLS-K study. The SDQ School scale (reliability α=.83) consists of six items regarding how well children feel they do in all school subjects, and their enjoyment of all school subjects. The SDQ Reading scale (reliability α=.90) and Math scale (reliability α=.92) each consisted of eight items regarding children's perceptions of their reading grades, difficulty

of reading work, and interest in and enjoyment of reading and math, respectively. The SDQ Peer (reliability α=.82) scale consisted of six items regarding children's perceptions of their popularity, and ability to make and get along with friends/other children. The Anger/Distractibility (Externalizing) scale (reliability α=.78) included six items regarding children's perceptions of their externalizing problem behaviors including fighting, arguing, talking and disturbing others, and distractibility. The SDQ Sad/Lonely/Anxious (Internalizing) scale (reliability α=.79) consisted of eight items regarding children's perceptions of internalizing problems including, feeling sad, lonely, ashamed of mistakes, frustrated, and worried about school and friendships. Children rated each item using a four-point response scale: 1=not at all true, 2=a little bit true, 3=mostly true, 4=very true. Mean scores for each scale were reported on a scale from one to four. Higher scores on the School, Reading, Math, and Peer scales indicated higher levels of motivation, whereas higher scores on the Externalizing and Internalizing scales indicated perception of more problems and lower levels of motivation. The Externalizing and Internalizing scales were reverse coded, so that higher scores were indicative of less problems and higher levels of motivation.

Since this study aims to understand children's motivation in regards to their academics, the three academic scales (Math, Reading, School) were analyzed for underlying commonality. Exploratory Factor Analyses and Confirmatory Factor Analyses were run on the three academic scales and then on all six scales, however no theoretically meaningful combination of scales arose as significant and adequately fitting the data (e.g., one factor of the three academic scales, two factors of the three academic scales and the three psychosocial scales, or all six scales on one construct of motivation). For the current study, children's mean score the SDQ School scale comprised the construct of motivation. The School scale was chosen over the Math and Reading

scales, because the goal of the study is to examine how early parent variables, academic performance, and psychosocial behaviors influence a child's motivation in school broadly, and the items within the School scale subsume math and reading. Moreover, it is likely that children who struggle in reading and/or math will have lower motivation in those subject areas, however, the effects of academic underperformance in math or reading on general school motivation may be more nuanced.

Covariates. The child's age at assessment (Spring of Kindergarten), socioeconomic status (SES), gender, and race were included in the model to control for their differential influence on parent depression, parent school involvement, child academic achievement, motivation, and psychosocial behaviors. Grade retention was not used as a control variable for two reasons. First, the primary goal of this study is to examine relations between early parenting variables and academic and psychosocial outcomes in children with and without LD, not the effects of grade retention on these outcomes. Second, research has established that children who are retained in grade school have a higher likelihood of academic failure and more psychosocial problems (Cortiella & Horowitz, 2014), thus controlling for retention may remove important variance in the outcomes for children with academic underachievement including children with LD. Finally, a small percentage of students (n= 910; 8.6%) in the study sample were ever retained in grade, thus, the effects of retention are likely minimal within such a large sample.

Age at assessment. A composite of the child's age at the time of assessment in the fall of their kindergarten year was included. This composite was derived by determining the number of days between the child's assessment date and date of birth, and dividing by 30 to obtain age in months. Given that children may start kindergarten at different ages (e.g., five or six), it is

important to control for age in order to remove variance related to age-related maturity or influences of age on the variables of interest.

Gender. A composite of the child's gender was included based on information from the kindergarten fall parent interview. Given that some studies have found gender differences in academic achievement (Duckworth & Seligman, 2006; Matthews, Ponitz, & Morrison, 2009; Nowell & Hedges, 1998; Weaver-Hightower, 2003), motivation and learning behaviors in school (Cvencek, Meltzoff, & Greenwald, 2011; McGeown, Goodwin, Henderson, & Wright, 2011; Silverman, 2003), externalizing problems and internalizing problems (Chaplin & Aldao, 2013; Leadbeater, Kuperminc, Blatt, & Hertzog, 1999), and interpersonal skills (Crombie, 1988), it is important to control for these potential influences within the current study. Additionally, some studies show that female students are more at-risk for math disabilities than their male peers (Fryer & Levitt, 2010; Jordan, Kaplan, Nabor Olah, & Locuniak, 2006) whereas other studies show no gender differences (Lachance & Mazzocco, 2006). Other research indicates that boys are four to five times more likely to be diagnosed with an LD (Shapiro, Church, & Lewis, 2002). Therefore, it is important to control for gender effects that may arise due to disproportional identification of LD.

Race-ethnicity. A composite of the child's race-ethnicity was included based on information gathered through the parent interview. This composite included the following categories: White, non-Hispanic; Black or African-American, non-Hispanic; Hispanic, race specified; Hispanic, no race specified; Asian; Native Hawaiian or other Pacific Islander; Native American or Alaskan Native; and more than one race specified, non-Hispanic. Given that some studies show racial differences in academic achievement (Blackorby & Wagner, 2005; Chatterji, 2006) it is important to control for these potential influences within the study. Additionally,

research has indicated that race-ethnicity, along with gender and socioeconomic status, influence the likelihood of developing and being identified as having a learning disability in school (Judge & Bell, 2010), thus it is important to understand how these factors operate within the proposed model, and account for these influences.

Socioeconomic status. Socioeconomic status (SES) is a measure of social standing. Given that research has shown negative effects of poverty on academic achievement (Chatterji, 2006; Denton & West, 2002; Lee, Grigg, & Donahue, 2007; Morgan, Farkas, Hillemeier, & Maczuga, 2014), psychosocial problems (McLoyd, 1998), and parent school involvement (Evans, 2004), it is important to consider the influence of SES within the hypothesized model. The SES variable used in the current study was a composite variable of three indicators, income, parent education, and parent occupation, and reflects the family's SES in the spring of kindergarten. The SES variable is a continuous variable that ranges from -4.75 to 2.75, with higher values corresponding to higher SES. Only the kindergarten SES variable was used in the current study, because it was highly correlated with the SES variable in the spring of fifth grade (unweighted r= .859, weighted r=.839). The specific components of the SES variable include Father/male guardian's education, Mother/female guardian's education, Father/male guardian's occupation, Mother/female guardian's occupation, and household income. Since not all parents responded to all questions in both rounds, missing values were present for some of the SES indicators (28.2%). Hot deck imputation was used to impute missing values, which involves using the value reported for an item by a respondent that is similar to the non-respondent on other characteristics. A categorical search algorithm, CHAID (Chi-squared Automatic Interaction Detector), was used to analyze and determine the best predictors for respondents and non-respondents. Additionally, for households with one parent, SES was computed by averaging

the available components. Each indicator (income, parent education, and parent occupation) was standardized to have a mean of 0 and standard deviation of 1. The specific indicators are outlined below. Household income was collected from the parent interview in the spring of kindergarten. Income represents the primary caregiver's annual reported household income. Parent education was collected from the parent interview during the fall of kindergarten (or spring if the household did not participate in the fall). The respondent parent reported the highest level of education attained. Education level was recoded from 1 to 9 (1 = 8th grade or below; 2 = 9th to 12th grade, 3 = high school diploma/equivalent, 4= vocational/technical program, 5 = some college, 6 = Bachelor's degree, 7 = graduate/professional school/no degree, 8 = Master's degree, 9 = Doctorate or professional degree). Parent occupation was collected via the parent interview in the fall of kindergarten. Parent occupation was recoded to reflect the average of the 1989 General Social Survey (GSS; Nakao & Treas, 1992) prestige score of the occupation. This was done by averaging the corresponding prestige score of the 1980 Census occupational category codes covered by the ECLS-K occupation (NCES, 2001). The 22-position scale ranks occupation according to their relative prestige.

Data Analyses

Statistical Package for the Social Sciences (SPSS) Premium version 24 was used to prepare data and run descriptive and preliminary analyses. MPlus student version 7.4 (Muthén & Muthén, 2012) was used to model the data. The sample of interest was selected following the application of exclusionary criteria, and variables of interest were imported into SPSS to run preliminary analyses. Analyses were conducted using sample and nesting weights, and compared to results without sample and nesting weights. All data analyses were conducted on a freestanding computer in Erickson Hall at Michigan State University, as required by the

restricted-use license agreement from the IES. Investigators obtained approval for use of the ECLS-K data set for this study by the Institute of Education Sciences (IES) and Michigan State University Institutional Review Board (IRB; see Appendix A).

Preliminary Analyses. Prior to testing the structural equation model, preliminary analyses were conducted. Data screening (e.g., plots) and descriptive statistics (see Table 13) using all variables of interest were conducted to better understand the ECLS-K population and constructs of interest. Correlation matrices (see Table 18 and Table 19) for all variables of interest were run to screen for multicollinearity and the distribution of variables were examined using graphs to address potential problems with outliers and account for skewed distribution. No study variables were highly correlated ($r > .85$), indicating no potential problems with multicollinearity (Kline, 2011). Outliers were included in the study given that the research questions aim to examine group differences among children with LD and it was expected that some parents and children would fall in the extreme ends of the spectrum on measures of depression, academic performance, and psychosocial behaviors.

Additional preliminary analyses were conducted without latent variable modeling prior to testing the structural equation model. Means and standard deviations of continuous variables (see Table 14 and Table 16) and frequencies and percentages of categorical variables (see Table 15 and Table 17) were examined, with and without weights. Independent samples t-test were conducted to determine whether there were significant differences on mean scores for all continuous variables of interest between the LD and non-LD groups. Chi-square test of independence was conducted to determine whether there were significant differences on mean scores for all categorical variables of interest between the LD and non-LD groups.

Structural Equation Analyses. Prior to testing the proposed conceptual model, the proposed latent factor structure was tested using Confirmatory Factor Analysis using MPlus student version 7.4 (Muthén & Muthén, 2012). Brown (2015) recommends testing the measurement model for each construct separately prior to testing the full structural model. The five specified latent variables in the model are described under the variables and measures section above. Each latent variable is measured by several observed variables or indicators, and each indicator loaded on one specified factor. The latent factors included parent depression, parent school involvement, early psychosocial behaviors, and fifth grade psychosocial behaviors using the full study sample (n=10,630). The four latent factors in conjunction with five additional observed variables compose the measurement model.

Given that the full structural model will be tested with different groups, group invariance testing was conducted to determine whether the model measures similar constructs across groups (e.g., children with LD and children without LD; children with MD, RD, MD-RD, and no LD). Group invariance was tested by examining the difference between the Comparative Fit Index (CFI) for configural, metric, and scalar invariance tests for each latent variable. Cheung & Rensvold (2002) recommend a change in CFI between configural, metric, and scalar invariances that is equal or less than .01 to indicate adequate fit across groups. For parent depression, results indicated adequate fit for LD and no-LD groups (CFI=.968 for configural model, CFI=.971 for metric model, CFI=.980 for scalar model, and ΔCFI=.012). For parent involvement, results indicated adequate fit for LD and no-LD groups (CFI=.968 for configural model, CFI=.967 for scalar model, and ΔCFI=-.001; metric model is not available with categorical data). For kindergarten psychosocial behavior, results indicated adequate fit for LD and no-LD groups (CFI=.987 for configural model, CFI=.985 for metric model, CFI=.977 for scalar model, and

ΔCFI=-.01). For fifth grade psychosocial behavior, results indicated adequate fit for LD and no-LD groups (CFI=.975 for configural model, CFI=.972 for metric model, CFI=.968 for scalar model, and ΔCFI=-.007). Overall, all latent variables passed tests for group invariance.

The proposed model was tested using latent variable structural equation modeling (SEM) techniques that allow for unobserved latent variables in the model to be tested in relation to the hypotheses developed using the ECLS-K non-experimental data. Latent variable SEM allows for simultaneous confirmatory factor analysis of all latent variables and the magnitude of the relations between constructs (Kline, 2011). First, it was hypothesized that lower levels of parent depression will indirectly predict better early academic achievement and early psychosocial behavior in kindergarten, via higher parent involvement (research question 1a). Second, it was hypothesized that higher levels of parent school involvement will predict higher academic achievement and psychosocial behaviors in fifth grade dependent on levels of early academic achievement and early psychosocial behaviors in kindergarten (research question 1b). Third, it was hypothesized that increased early academic achievement and psychosocial behaviors in kindergarten will positively predict academic achievement in fifth grade, where early academic achievement and psychosocial behaviors are accounted for (research question 1c). Fourth, it was hypothesized that higher motivation and psychosocial behaviors in fifth grade will positively predict academic achievement in fifth grade (research question 1d).

Next, multiple-group SEM was explored to answer the research questions pertaining to group differences in the specified relationships of the conceptual model. First, children with an LD were compared to children without an LD by simultaneously fitting the model to both groups to determine whether the magnitude of relations between parent depression and school involvement and child academic, psychosocial, and motivational outcomes differ. It was

hypothesized that parent depression and school involvement in kindergarten would be more strongly predictive of motivation, psychosocial behaviors, and academic achievement in children with LD compared to children without LD (research question 2). Thus, low levels of parent depression and increased parent involvement were hypothesized to serve as greater protective factors for children who are academically underachieving compared to children who are not.

Finally, in order to determine whether subtype of LD moderates the effects of the conceptual model, a three group SEM was explored by comparing children with RD, children with RD-MD, and children without LD. Children with MD cannot be included as an independent subgroup in this analysis due to inadequate sample size. However, given that children with MD often experience co-morbid reading problems, regardless of whether they are identified for services through a formal identification process, this study will group children with MD and children with RD-MD for the proposed multi-group analysis (Research Question 3). Significant findings were interpreted with caution, as this was a limitation of the study. Moreover, this analysis was exploratory in nature and may be under-identified given that the sample sizes between the categorical groups are uneven (e.g., n=20 MD, n=180 RD, n=220 RD-MD, n=10,220 non-LD). It was hypothesized that the magnitude of relations between parent depression and school involvement on academic achievement, psychosocial behaviors, and motivation outcomes would be strongest for children with combined LD (e.g., RD-MD), then children with one LD, then children without LD (research question 3); thereby keeping in line with the hypothesis that low levels of parent depression and high levels of parent school involvement serve as a greater protective factor for children who are most academically at-risk (e.g., RD-MD group). In order to compare the groups, it was proposed that cross-group equality were used to derive unstandardized estimates of the parameters in all groups (Kline, 2011). Then,

the parameters would be freely estimated across all groups and a comparison between the constrained and unconstrained (e.g., freely estimated) model fit would be examined using absolute and relative model fit statistics (Kline, 2011). This comparison would determine whether the fit of the model worsened under constrained parameters which would indicate group differences (e.g., unequal direct effects). Overall, multiple-group SEM was used to determine whether parent depression and parent involvement have a different effect on outcomes for children with subtypes of LD (i.e., RD, RD-MD) and without LD. Weighted least squares and maximum likelihood estimation with robust standard errors were used to estimate model parameters.

Table 12
Summary of Research Questions, Variables, and Analyses

Research Question	Analyses	Variables	Covariates
1. Model Fit	Latent Variable Structural Equation Modeling	Parent Depression* Early Parent School Involvement* Early Academic Achievement Early Psychosocial Behavior* Motivation Psychosocial Behavior* Academic Achievement	Gender Race SES Age
2/3. Model Fit for Subsamples of Learning Disabilities	Multiple-Group SEM	Parent Depression* Early Parent School Involvement* Early Academic Achievement Early Psychosocial Behavior* Motivation Psychosocial Behavior* Academic Achievement	Gender Race SES Age

**Note:* See Table 7 for specific indicators corresponding with latent variables.

Model Fit. To determine model fit, absolute and relative fit indices were used. The chi-square statistic, an absolute fit index, was examined in analyses comparing mediation paths. A non-significant chi-square index ($p > 0.01$) signifies that the null hypothesis is not rejected, where the null hypothesis is a perfect fit in the population. Thus, a non-significant chi-square statistic indicates an adequate model fit. However, the chi-square statistic is affected by sample size, which may lead to rejection of the null hypothesis even when there are differences between the observed and predicted covariances (Kline, 2011). Thus, additional fit indices were considered due to the study's large sample size. Comparative Fit Index (CFI) and Tucker-Lewis Fit Index (TLI) are relative fit indices which both account for sample size (Kline, 2011). The CFI and TLI values greater than or equal to 0.95 indicate an adequate fit (Hooper, Coughlan, & Mullen, 2008). Finally, the Root Mean Square Error of Approximation (RMSEA) was used as an indicator of absolute fit. The RMSEA provides an estimation of the model with optimal parameter estimates fits the covariance matrix for the population. An RMSEA value less than or equal to 0.07 and with a 90% confidence interval with an upper limit less than or equal to 0.08 is considered an adequate model fit (Hooper, Coughlan, & Mullen, 2008). For multiple-group SEM analyzing mediation paths, chi-square significance testing was conducted by calculating the chi-square difference statistic between the constrained and unconstrained models. If significant, this suggested the model parameters are unequal across groups.

Table 13
Descriptive Statistics for Full Sample

Variables	Mean	S.D.	Range	Weighted Mean	Weighted S.D.
Covariates					
Kindergarten SES	.04	.80	-4.75-2.75	-.03	.78
Age at Assessment (K, 1999)	68.41	4.32	45.77-96.30	68.31	4.29
Age at Assessment (5^{th} grade, 2004)	134.54	4.38	110.87-153.53	134.53	4.38
Parent Depression					
Felt bothered	1.59	.75	1-4	1.60	.74
Poor appetite	1.38	.71	1-4	1.42	.74
Felt the "blues"	1.25	.59	1-4	1.27	.61
Trouble focusing	1.51	.72	1-4	1.55	.76
Felt depressed	1.33	.64	1-4	1.36	.69
Felt things were effortful	1.62	.88	1-4	1.70	.95
Felt fearful	1.19	.52	1-4	1.21	.54
Difficulty sleeping	1.73	.90	1-4	1.78	.93
Talked less	1.25	.58	1-4	1.27	.63
Felt lonely	1.25	.58	1-4	1.27	.63
Felt sad	1.44	.65	1-4	1.47	.68
Difficulty "to get going"	1.51	.72	1-4	1.55	.75
Parent School Involvement					
Contact school	1.48	.50	1-2	1.46	.50
Attended open house	1.24	.43	1-2	1.28	.45
Attended PTO	1.63	.48	1-2	1.66	.47
Attended parent group	1.91	.29	1-2	1.92	.28
Attended teacher conference	1.14	.35	1-2	1.16	.37
Attended school event	1.31	.46	1-2	1.34	.47
Volunteered at school	1.48	.50	1-2	1.52	.50
Participated in fundraiser	1.38	.49	1-2	1.41	.49
Kindergarten Achievement					
Direct Math Assessment	51.63	9.69	14.39-85.84	50.85	9.68
Direct Reading Assessment	51.56	9.58	17.08-87.73	50.99	9.70
Fifth Grade Achievement					
Direct Math Assessment	51.54	9.52	21.90-80.61	51.11	9.61
Direct Reading Assessment	51.46	9.56	16.61-81.02	51.16	9.52
Early Psychosocial Behaviors					
Teacher-Rated Approaches to Learning	3.20	.65	1-4	3.15	.67
Teacher-Rated Self-Control	3.25	.59	1-4	3.22	.61
Teacher-Rated Interpersonal Skills	3.19	.61	1-4	3.15	.62
Teacher-Rated Externalizing	1.58	.58	1-4	1.62	.60

Table 13 (cont'd)

Teacher-Rated Internalizing	1.52	.48	1-4	1.55	.50
Fifth Grade Psychosocial Behavior					
Teacher-Rated Approaches to Learning	3.12	.66	1-4	3.09	.67
Teacher-Rated Self-Control	3.27	.58	1-4	3.25	.59
Teacher-Rated Interpersonal Skills	3.12	.62	1-4	3.10	.63
Teacher-Rated Externalizing	1.61	.56	1-4	1.64	.58
Teacher-Rated Internalizing	1.60	.51	1-4	1.62	.53
Motivation					
Student-Rated School	2.75	.63	1-4	2.72	.64

Table 14
Unweighted Descriptive Statistics between LD and Non-LD Samples

Variables	Learning Disability		No Learning Disability		Independent Samples *t*-test (df)	Cohen's d
	N[a]	Mean (SD)	N[a]	Mean (SD)		
Covariates						
Kindergarten SES	390	-.32 (.71)	9880	.06 (.80)	10.38*(428)*, p<.001***	.50
Age at Assessment (K, 1999)	380	69.18 (4.94)	9330	68.38 (4.30)	-3.13*(404)*, p=.002**	.17
Age at Assessment (5th grade, 2004)	400	135.23 (5.00)	9790	134.51 (4.35)	-2.85*(423)*, p=.005**	.15
Kindergarten Achievement						
Direct Math Assessment	390	40.81 (9.06)	9930	52.06 (9.47)	23.89*(418)*, p<.001***	1.21
Direct Reading Assessment	350	40.32 (7.52)	9500	51.98 (9.40)	28.34*(394)*, p<.001***	1.37
Fifth Grade Achievement						
Direct Math Assessment	400	41.41 (8.86)	9790	51.95 (9.31)	23.29*(435)*, p<.001***	1.16
Direct Reading Assessment	390	39.17 (8.15)	9790	51.95 (9.28)	30.33*(433)*, p<.001***	1.46
Early Psychosocial Behaviors						
Teacher-Rated Approaches to Learning	390	2.56 (.67)	9700	3.23 (.64)	19.21*(415)*, p<.001***	1.02
Teacher-Rated Self-Control	390	3.03 (.64)	9630	3.26 (.59)	7.06*(412)*, p<.001***	.37
Teacher-Rated Interpersonal Skills	380	2.86 (.65)	9610	3.20 (.61)	9.87*(407)*, p<.001***	.54

Table 14 (cont'd)

Teacher-Rated Externalizing	380	1.78 (.70)	9660	1.57 (.57)	-5.80*(403)*, p<.001***	.34
Teacher-Rated Internalizing	380	1.71 (.55)	9610	1.51 (.48)	-6.97*(404)*, p<.001***	.39
Fifth Grade Psychosocial Behavior						
Teacher-Rated Approaches to Learning	410	2.67 (.61)	9310	3.14 (.65)	15.14*(449)*, p<.001***	.75
Teacher-Rated Self-Control	400	3.04 (.63)	9230	3.28 (.58)	7.58*(434)*, p<.001***	.40
Teacher-Rated Interpersonal Skills	400	2.84 (.66)	9110	3.13 (.62)	8.95*(434)*, p<.001***	.45
Teacher-Rated Externalizing	410	1.80 (.61)	9250	1.60 (.55)	-6.28*(436)*, p<.001***	.34
Teacher-Rated Internalizing	410	1.79 (.54)	9150	1.59 (.51)	-7.29*(437)*, p<.001***	.38
Motivation						
Student-Rated School	400	2.56 (.69)	9790	2.76 (.62)	5.70*(426)*, p<.001***	.30

Note: Equal variance not assumed for all variables. [a] All unweighted sample sizes were rounded to the nearest 10 due to restrictions set forth via the licensing agreement.

Table 15

Unweighted Descriptive Statistics between LD and Non-LD Samples (Categorical Variables)

Variables	Learning Disability	No Learning Disability	Chi-Square (df)
	N[a] (%)	N[a] (%)	
Parent Depression			
Felt bothered			6.36*(3)*, p=.10
Never	190 (47.1%)	5070 (49.6%)	
Some Time	120 (30.2%)	3360 (32.9%)	
Moderate Amount	30 (6.3%)	740 (7.3%)	
Most of Time	20 (4.1%)	240 (2.4%)	
Poor appetite			13.94*(3)*, p=.003**
Never	240 (58.0%)	6850 (67.1%)	
Some Time	80 (19.8%)	1920 (18.8%)	
Moderate Amount	20 (5.8%)	370 (3.6%)	
Most of Time	20 (4.3%)	280 (2.7%)	
Felt the "blues"			11.64*(3)*, p=.009**
Never	270 (65.5%)	7610 (74.5%)	
Some Time	60 (15.7%)	1400 (13.7%)	
Moderate Amount	10 (3.4%)	230 (2.3%)	
Most of Time	10 (2.9%)	160 (1.6%)	
Trouble focusing			9.69*(3)*, p=.021**
Never	210 (50.2%)	5550 (54.3%)	
Some Time	110 (27.3%)	3180 (31.2%)	
Moderate Amount	30 (6.3%)	420 (4.2%)	
Most of Time	20 (3.9%)	260 (2.5%)	
Felt depressed			8.80*(3)*, p=.032**
Never	260 (62.6%)	6950 (68.0%)	
Some Time	80 (18.4%)	2010 (19.7%)	
Moderate Amount	20 (4.1%)	230 (2.3%)	
Most of Time	10 (2.9%)	210 (2.1%)	
Felt things were			3.05*(3)*, p=.38
effortful	200 (49.3%)	5390 (52.7%)	
Never	100 (24.9%)	2860 (28.0%)	
Some Time	20 (5.8%)	480 (4.7%)	
Moderate Amount	30 (7.5%)	670 (6.6%)	
Most of Time			11.24*(3)*, p=.01**
Felt fearful	310 (74.9%)	8010 (78.4%)	
Never	30 (8.0%)	1130 (11.1%)	
Some Time	10 (2.4%)	150 (1.5%)	
Moderate Amount	10 (2.4%)	120 (1.1%)	
Most of Time			7.13*(3)*, p=.07
Difficulty sleeping	170 (40.1%)	4700 (46.0%)	
Never	130 (30.4%)	3290 (32.2%)	
Some Time	30 (8.2%)	720 (7.0%)	
Moderate Amount	40 (9.2%)	690 (6.8%)	

Table 15 (cont'd)

Most of Time			
Talked less			13.51*(3)*, p=.004**
Never	280 (68.6%)	7640 (74.8%)	
Some Time	60 (13.8%)	1380 (13.5%)	
Moderate Amount	10 (1.9%)	250 (2.5%)	
Most of Time	10 (3.4%)	140 (1.4%)	
Felt lonely			2.66*(3)*, p=.45
Never	290 (69.3%)	7620 (74.6%)	
Some Time	60 (13.8%)	1420 (13.9%)	
Moderate Amount	10 (2.7%)	200 (1.9%)	
Most of Time	10 (2.2%)	160 (1.6%)	
Felt sad			3.27*(3)*, p=.35
Never	230 (55.1%)	5910 (57.8%)	
Some Time	110 (26.3%)	3020 (29.5%)	
Moderate Amount	10 (3.4%)	310 (3.1%)	
Most of Time	10 (2.7%)	180 (1.7%)	
Difficulty "to get going"			.69*(3)*, p=.88
Never	210 (51.4%)	5620 (55.0%)	
Some Time	120 (28.7%)	3090 (30.3%)	
Moderate Amount	20 (4.6%)	420 (4.2%)	
Most of Time	10 (2.9%)	270 (2.7%)	
Parent School Involvement			
Contact school			3.08*(1)*, p=.08
Yes	210 (51.0%)	4950 (48.5%)	
No	160 (39.6%)	4640 (45.4%)	
Attended open house			11.40*(1)*, p=.001***
Yes	250 (61.6%)	7260 (71.1%)	
No	120 (28.7%)	2310 (22.7%)	
Attended PTO			10.29*(1)*, p=.001***
Yes	110 (26.3%)	3580 (35.0%)	
No	260 (64.0%)	6010 (58.8%)	
Attended parent group			.40*(1)*, p=.53
Yes	40 (9.2%)	880 (8.6%)	
No	340 (81.4%)	8700 (85.2%)	
Attended teacher conference			2.56*(1)*, p=.11
Yes	330 (80.4%)	8230 (80.6%)	
No	40 (10.1%)	1350 (13.3%)	
Attended school event			10.97*(1)*, p=.001***
Yes	230 (55.3%)	6640 (65.0%)	
No	140 (35.0%)	2940 (28.8%)	
Volunteered at school			16.94*(1)*, p<.001***
Yes	150 (37.2%)	4990 (48.8%)	

Table 15 (cont'd)

No	220 (53.1%)	4600 (45.0%)	
Participated in fundraiser			17.16*(1)*, p<.001***
Yes	190 (46.4%)	5950 (58.2%)	
No	180 (43.7%)	3630 (35.5%)	

Note: [a] All unweighted sample sizes were rounded to the nearest 10 due to restrictions set forth via the licensing agreement.

Table 16

Weighted Descriptive Statistics between LD and Non-LD Samples

Variables	Learning Disability			No Learning Disability			Independent Samples *t*-test (df) Cohen's d
	N	Mean (SD)		N	Mean (SD)		
Covariates							
Kindergarten SES	123,453	-.44	.87	3,229,963	-.01	.78	170.59*(131,117)*, p<.001*** .52
Age at Assessment (K, 1999)	116,267	69.56	5.45	2,995,631	68.27	4.23	-79.95*(121,779)*, p<.001*** .26
Age at Assessment (5th grade, 2004)	117,910	135.48	5.44	2,810,864	134.49	4.33	-61.60*(124,247)*, p<.001*** .20
Kindergarten Achievement							
Direct Math Assessment	117,019	41.00	8.69	3,128,922	51.22	9.51	393.64*(127,748)*, p<.001*** 1.21
Direct Reading Assessment	107,695	39.86	7.35	2,992,525	51.39	9.53	499.98*(121,110)*, p<.001*** 1.35
Fifth Grade Achievement							
Direct Math Assessment	118,237	40.85	8.71	2,810,503	51.54	9.40	412.05*(130,101)*, p<.001*** 1.18
Direct Reading Assessment	115,974	39.69	7.60	2,804,928	51.63	9.29	519.08*(130,705)*, p<.001*** 1.41
Early Psychosocial Behaviors							
Teacher-Rated Approaches to Learning	116,739	2.53	.68	3,019,827	3.17	.66	320.16*(125,521)*, p<.001*** .96
Teacher-Rated Self-Control	116,783	3.04	.64	3,003,567	3.22	.60	94.50*(125,036)*, p<.001*** .29
Teacher-Rated	114,804	2.83	.64	2,991,553	3.16	.62	172.19*(123,251)*, p<.001***

Table 16 (cont'd)

							.52
Interpersonal Skills							
Teacher-Rated	115,625	1.83	.76	3,010,906	1.61	.59	-96.62*(121,071)*, p<.001*** .32
Externalizing							
Teacher-Rated	115,557	1.71	.56	2,988,811	1.54	.50	-99.38*(122,667)*, p<.001*** .32
Internalizing							
Fifth Grade							
Psychosocial							
Behavior							
Teacher-Rated	121,416	2.67	.63	2,577,957	3.11	.67	238.27*(134,658)*, p<.001*** .68
Approaches to Learning	120,939	3.07	.57	2,551,266	3.26	.59	
Teacher-Rated Self-Control	120,671	2.81	.63	2,503,546	3.11	.63	116.34*(133,427)*, p<.001*** .33
Teacher-Rated	121,233	1.79	.59	2,553,381	1.63	.58	160.60*(132,447)*, p<.001*** .48
Interpersonal Skills	121,416	1.76	.48	2,525,138	1.61	.53	
Teacher-Rated Externalizing							-93.33*(132,475)*, p<.001*** .27
Teacher-Rated Internalizing							-103.67*(135,808)*, p<.001*** .30
Motivation							
Student-Rated School	118,237	2.59	.78	2,810,151	2.73	.64	59.60*(124,952)*, p<.001*** .20

Note: Equal variance not assumed for all variables.

Table 17

Weighted Descriptive Statistics between LD and Non-LD Samples (Categorical Variables)

Variables	Learning Disability	No Learning Disability	
	N (%)	N (%)	Chi-Square (df)
Parent Depression			
Felt bothered			1802.44*(3)*,
Never	67,928 (56.4%)	1,678,074 (52.9%)	p<.001***
Some Time	40,785 (33.8%)	1,149,172 (36.2%)	
Moderate Amount	7,557 (6.3%)	270,662 (8.5%)	
Most of Time	4227(3.5%)	74,467 (2.3%)	
Poor appetite			8182.52*(3)*,
Never	76,606 (63.6%)	2,240,349 (70.5%)	p<.001***
Some Time	26,806 (22.2%)	680,528 (21.4%)	
Moderate Amount	11,686 (9.7%)	139,603 (4.4%)	
Most of Time	5399 (4.5%)	115,078 (3.6%)	
Felt the "blues"			3086.84*(3)*,
Never	89,679 (74.4%)	2,539,143 (80.0%)	p<.001***
Some Time	25,628 (21.3%)	487,456 (15.4%)	
Moderate Amount	2959 (2.5%)	82,716 (2.6%)	
Most of Time	2230 (1.9%)	64,737 (2.0%)	
Trouble focusing			11576.32*(3)*,
Never	62,341 (51.7%)	1,849,482 (58.2%)	p<.001***
Some Time	38,569 (32.0%)	1,046,561 (32.9%)	
Moderate Amount	8,629 (7.2%)	171,109 (5.4%)	
Most of Time	10,958 (9.1%)	110,021 (3.5%)	
Felt depressed			13355.76*(3)*,
Never	85,769 (71.2%)	2,306,057 (72.6%)	p<.001***
Some Time	24,381 (20.2%)	695,835 (21.9%)	
Moderate Amount	8,649 (7.2%)	70,261 (2.2%)	
Most of Time	1,698 (1.4%)	102,708 (3.2%)	
Felt things were			1704.75*(3)*,
effortful	72,607 (60.4%)	1,730,262 (54.6%)	p<.001***
Never	30,606 (25.5%)	961,967 (30.3%)	
Some Time	5,950 (4.9%)	166,363 (5.2%)	
Moderate Amount	11,058 (9.2%)	312,837 (9.9%)	
Most of Time			24168.65*(3)*,
Felt fearful	98,819 (82.0%)	2,677,019 (84.2%)	p<.001***
Never	11,696 (9.7%)	403,675 (12.7%)	
Some Time	1,723 (1.4%)	54,854 (1.7%)	
Moderate Amount	8,259 (6.9%)	42,146 (1.3%)	
Most of Time			
Difficulty sleeping			3906.93*(3)*,
Never	55,487 (46.0%)	1,520,760 (47.9%)	p<.001***
Some Time	44,091 (36.6%)	1,109,936 (34.9%)	
Moderate Amount	5,821 (4.8%)	269,732 (8.5%)	

Table 17 (cont'd)

Most of Time	15,097 (12.5%)	277,753 (8.7%)	
Talked less			12382.25*(3)*,
Never	90,992 (75.5%)	2,550,184 (80.2%)	p<.001***
Some Time	16,565 (13.7%)	469,415 (14.8%)	
Moderate Amount	4,911 (4.1%)	96,061 (3.0%)	
Most of Time	8,029 (6.7%)	63,820 (2.0%)	
Felt lonely			3352.69*(3)*,
Never	91,892 (76.3%)	2,549,165 (80.3%)	p<.001***
Some Time	21,557 (17.9%)	471,399 (14.8%)	
Moderate Amount	5,424 (4.5%)	78,789 (2.5%)	
Most of Time	1,624 (1.3%)	76,233 (2.4%)	
Felt sad			588.51*(3)*,
Never	75,437 (62.8%)	1,950,599 (61.4%)	p<.001***
Some Time	37,218 (31.0%)	1,038,623 (32.7%)	
Moderate Amount	5,480 (4.6%)	115,544 (3.6%)	
Most of Time	2,007 (1.7%)	71,723 (2.3%)	
Difficulty "to get going"			1865.93*(3)*,
Never	63,205 (52.5%)	1,832,568 (57.7%)	p<.001***
Some Time	47,986 (39.8%)	1,073,920 (33.8%)	
Moderate Amount	5,360 (4.4%)	152,764 (4.8%)	
Most of Time	3,946 (3.3%)	116,180 (3.7%)	
Parent School Involvement			271.29*(1)*,
Contact school			p<.001***
Yes	69,276 (56.3%)	1,741,317 (53.9%)	.91 (.90-.92)
No	53,769 (43.7%)	1,488,311(46.1%)	
Attended open house			10969.61*(1)*,
Yes	72,137 (59.1%)	2,348,497 (72.8%)	p<.001***
No	49,874 (40.9%)	877,730 (27.2%)	1.85 (1.83-1.87)
Attended PTO			3956.06*(1)*,
Yes	31,396 (25.7%)	1,111,307 (34.4%)	p<.001***
No	90,615 (74.3%)	2,116,551 (65.6%)	1.52 (1.50-1.54)
Attended parent group			23.13*(1)*,
Yes	9,884 (8.0%)	270,813 (8.4%)	p<.001***
No	113,569 (92.0%)	2,955,952 (91.6%)	1.05 (1.03-1.08)
Attended teacher conference			2465.32*(1)*, p<.001***
Yes	109,988 (89.1%)	2,706,336 (83.8%)	.63 (.62-.65)

Table 17 (cont'd)

No	13,464 (10.9%)	522,551 (16.2%)	
Attended school event			733.50*(1)*,
Yes	86,347 (69.9%)	2,138,755 (66.2%)	p<.001***
No	37,105 (30.1%)	1,090,376 (33.8%)	.84 (.83-.85)
Volunteered at school			4427.23*(1)*,
Yes	47,701 (38.6%)	1,559,005 (48.3%)	p<.001***
No	75,752 (61.4%)	1,670,182 (51.7%)	1.48 (1.47-1.50)
Participated in fundraiser			5665.41*(1)*, p<.001***
Yes	60,403 (48.9%)	1,924,517 (59.7%)	1.54 (1.63-1.56)
No	63,050 (51.1%)	1,301,651 (40.3%)	

Table 18

Correlation Matrix for LD (upper) and Non-LD (lower) Sample Part 1

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1	-	-.04	**.17**	.03	.09	.02	-.03	-.01	.05	.12	.02	.07	-.07	.05	.03	.03	-.09	-.07	.04	-.05
2	.01	-	**.16**	.09	**.15**	-.06	-.07	**-.15**	**-.32**	-.08	-.08	**-.17**	**-.32**	**-.32**	**-.24**	-.01	-.13	-.12	-.05	-.12
3	**.16**	**.19**	-	**.59**	**.65**	**-.46**	**-.31**	.02	**-.16**	.00	.05	-.09	-.09	-.08	-.06	.07	-.00	-.05	-.01	-.00
4	**.06**	**.13**	**.64**	-	**.74**	**-.71**	**-.25**	.02	-.11	.08	-.06	-.10	-.06	-.08	-.01	-.01	-.01	-.00	-.01	.01
5	**.07**	**.15**	**.68**	**.79**	-	**-.54**	**-.33**	-.00	**-.17**	-.02	-.06	-.08	**-.16**	**-.15**	-.13	.11	-.04	-.00	.02	.02
6	**-.03**	**-.09**	**-.49**	**-.70**	**-.57**	-	**.29**	-.06	**.15**	.05	.06	.09	.04	.10	.01	-.06	-.04	-.10	-.04	-.10
7	**-.05**	**-.09**	**-.37**	**-.28**	**-.34**	**.26**	-	-.12	**.18**	.04	-.03	.05	.10	**.15**	.02	-.07	-.04	-.05	-.01	-.04
8	-.01	**-.11**	**.06**	**.07**	**.06**	**-.09**	**-.07**	-	.09	-.02	.06	.06	**.22**	.08	.12	-.05	.02	.01	-.01	.08
9	**-.03**	**-.25**	**-.10**	**-.07**	**-.09**	**.06**	**.05**	**.08**	-	**.24**	.10	**.36**	**.31**	**.35**	**.23**	.01	.03	.05	.09	.12
10	.00	**-.12**	**-.10**	**-.06**	**-.089**	**.06**	**.06**	**.04**	**.18**	-	**.31**	.08	.11	**.26**	**.16**	.04	-.02	-.03	.00	.05
11	-.02	**-.09**	-.03	-.02	-.02	.02	.02	**.07**	**.08**	**.17**	-	.09	.10	**.17**	.08	-.04	.02	-.01	.02	.06
12	.00	**-.16**	**-.03**	-.02	-.02	.01	.02	**.05**	**.16**	**.05**	**.04**	-	**.29**	**.21**	.07	.01	.06	.05	-.00	-.04
13	**-.04**	**-.27**	**-.10**	**-.07**	**-.08**	**.04**	**.04**	**.11**	**.26**	**.12**	**.06**	**.14**	-	**.32**	**.22**	-.02	.10	.12	-.07	.09
14	-.03	**-.35**	**-.15**	**-.12**	**-.14**	**.09**	**.08**	**.11**	**.26**	**.21**	**.12**	**.16**	**.30**	-	.11	.05	.06	.04	.01	.02
15	-.02	**-.26**	**-.12**	**-.07**	**-.10**	**.06**	**.06**	**.08**	**.20**	**.19**	**.07**	**.09**	**.21**	**.28**	-	.04	.01	.07	-.01	.06
16	.02	**-.05**	-.02	**-.03**	-.02	**.04**	.02	**-.06**	.00	.02	.01	.01	.01	.02	.01	-	**.34**	**.41**	**.38**	**.37**
17	.01	**-.17**	**-.06**	**-.05**	**-.05**	**.05**	**.06**	**-.04**	**.07**	**.03**	.02	**.05**	**.05**	**.07**	**.04**	**.30**	-	**.39**	**.33**	**.31**
18	-.01	**-.14**	**-.05**	**-.06**	**-.06**	**.06**	**.03**	-.03	**.06**	**.03**	.00	**.06**	**.06**	**.07**	**.05**	**.38**	**.38**	-	**.34**	**.61**
19	**.03**	**-.04**	-.01	**-.03**	-.02	**.03**	.02	**-.10**	-.01	.01	-.00	.01	-.01	-.01	-.01	**.37**	**.29**	**.41**	-	**.41**
20	-.00	**-.16**	**-.05**	**-.04**	**-.05**	**.04**	**.04**	-.02	**.07**	**.03**	.00	**.06**	**.07**	**.07**	**.07**	**.38**	**.33**	**.60**	**.39**	-
21	.01	**-.15**	**-.07**	**-.07**	**-.06**	**.07**	**.03**	**-.04**	**.05**	.02	.02	**.05**	**.04**	**.08**	.02	**.31**	**.30**	**.35**	**.33**	**.35**
22	.02	**-.07**	-.01	**-.03**	-.02	**.03**	.02	**-.03**	.03	-.01	-.01	.01	**.04**	**.03**	**.05**	**.24**	**.20**	**.31**	**.27**	**.34**
23	**.03**	**-.03**	-.02	**-.04**	**-.03**	**.04**	**.03**	**-.08**	.00	.01	.01	.00	-.02	-.01	.00	**.27**	**.29**	**.29**	**.34**	**.30**

Table 18 (cont'd)

24	-.01	**-.11**	**-.04**	**-.05**	**-.06**	**.06**	.02	-.03	**.04**	.02	.01	**.05**	**.06**	**.06**	**.05**	**.31**	**.35**	**.40**	**.32**	**.41**
25	-.01	**-.14**	**-.06**	**-.06**	**-.07**	**.06**	**.05**	**-.04**	**.06**	.02	.00	**.05**	**.05**	**.07**	**.07**	**.28**	**.27**	**.45**	**.32**	**.50**
26	.00	**-.06**	**-.03**	**-.05**	**-.05**	**.05**	**.03**	**-.07**	**.03**	-.00	-.02	.02	.00	.01	.00	**.37**	**.30**	**.50**	**.38**	**.58**
27	**.03**	**-.10**	**-.04**	**-.04**	**-.04**	**.05**	**.03**	**-.06**	-.00	.01	.01	**.03**	-.00	.03	.01	**.29**	**.29**	**.36**	**.39**	**.36**
28	.16	**.37**	**.42**	**.20**	**.23**	**-.15**	**-.17**	**-.03**	**-.16**	**-.11**	**-.03**	**-.05**	**-.15**	**-.22**	**-.15**	**-.04**	**-.11**	**-.09**	**-.03**	**-.10**
29	**.23**	**.42**	**.42**	**.20**	**.23**	**-.15**	**-.19**	**-.05**	**-.20**	**-.10**	**-.05**	**-.08**	**-.20**	**-.25**	**-.18**	**-.05**	**-.12**	**-.10**	-.02	**-.12**
30	**.10**	**.46**	**.36**	**.20**	**.22**	**-.15**	**-.14**	**-.07**	**-.20**	**-.10**	**-.06**	**-.10**	**-.20**	**-.26**	**-.20**	**-.05**	**-.13**	**-.11**	-.00	**-.11**
31	**.08**	**.43**	**.37**	**.20**	**.22**	**-.16**	**-.17**	**-.05**	**-.18**	**-.09**	**-.05**	**-.11**	**-.16**	**-.24**	**-.15**	**-.05**	**-.12**	**-.09**	-.02	**-.10**
32	-.01	**.08**	**.17**	**.08**	**.10**	-.10	**-.07**	.02	**-.05**	**-.04**	-.01	**-.03**	-.02	**-.05**	**-.03**	**-.04**	**-.04**	**-.06**	**-.04**	**-.05**
33	.02	**.20**	**.39**	**.31**	**.30**	-.33	**-.13**	**.04**	**-.09**	**-.07**	-.02	**-.03**	**-.07**	**-.14**	**-.09**	**-.04**	**-.09**	**-.08**	**-.04**	**-.08**
34	-.01	**.16**	**.26**	**.31**	**.27**	-.36	**-.08**	**.05**	**-.08**	**-.04**	-.03	**-.03**	**-.05**	**-.10**	**-.06**	**-.05**	**-.08**	**-.07**	**-.05**	**-.06**
35	-.01	**.17**	**.27**	**.30**	**.29**	-.34	**-.11**	**.04**	**-.08**	**-.05**	-.02	-.02	**-.07**	**-.12**	**-.07**	**-.04**	**-.08**	**-.07**	**-.04**	**-.05**
36	.03	**-.14**	**-.27**	**-.33**	**-.28**	**.42**	**.05**	**-.07**	**.05**	**.03**	.02	.02	**.04**	**.09**	**.06**	**.03**	**.06**	**.08**	**.05**	**.06**
37	-.01	**-.12**	**-.21**	**-.14**	**-.15**	**.13**	**.19**	**-.03**	**.06**	**.05**	.01	.01	**.05**	**.08**	**.04**	.02	**.06**	**.04**	.02	**.03**

Note. 1=age, 2=SES, 3=K teacher ATL, 4=K teacher SC, 5= K teacher interpersonal, 6=K teacher externalizing, 7= K teacher internalizing, 8=parent contact, 9=parent open house, 10=parent PTA, 11=parent advisory group, 12=parent-teacher conference, 13=parent school event, 14=parent volunteer, 15=parent fundraising, 16=parent bothered, 17=parent appetite, 18=parent blues, 19=parent trouble focusing, 20=parent depressed, 21=parent things effortful, 22=parent fearful, 23=parent sleep restless, 24=parent talk less, 25=parent lonely, 26=parent sad, 27=parent "not get going," 28=K reading t-score, 29=K math t-score, 30=5th grade reading t-score, 31=5th grade math t-score, 32= motivation school, 33= 5th teacher ATL, 34=5th teacher SC, 35=5th teacher interpersonal, 36=5th teacher externalizing, 37=5th teacher internalizing

Table 19

Correlation Matrix for LD (upper) and Non-LD (lower) Sample Part 2

	21	22	23	24	25	26	27	28	29	30	31	34	38	39	40	41	42
1	-.06	.01	.01	-.09	-.07	.06	.01	**.17**	**.31**	.08	.03	.00	-.04	.01	-.00	.04	-.05
2	**-.14**	**-.21**	-.04	**-.18**	-.13	-.03	-.11	**.25**	**.28**	**.37**	**.32**	-.02	.03	.07	.07	-.10	-.13
3	-.03	-.03	-.03	-.06	-.09	.01	.01	**.34**	**.39**	**.25**	**.31**	.01	**.35**	**.32**	**.32**	**-.27**	**-.18**
4	-.11	-.01	-.08	-.03	-.11	-.04	-.06	**.16**	**.14**	.10	.04	.06	**.30**	**.33**	**.33**	**-.38**	**-.16**
5	-.07	-.00	-.05	.01	-.04	.04	-.04	**.20**	**.20**	**.14**	.13	-.00	**.29**	**.33**	**.33**	**-.34**	-.13
6	.02	-.05	.06	-.00	.01	-.00	-.02	-.09	-.05	-.01	.00	-.09	**-.38**	**-.43**	**-.37**	**.51**	**.22**
7	.01	-.08	-.04	-.03	.06	-.03	-.05	-.09	-.10	.00	-.08	.04	-.09	-.12	**-.15**	.10	**.25**
8	.07	.05	**-.17**	.05	.05	.03	-.05	-.12	-.09	-.09	-.13	.06	-.02	-.10	-.01	-.02	-.02
9	.10	**.16**	-.02	.10	.03	.07	.01	**-.17**	**-.19**	**-.22**	**-.17**	.07	-.01	-.08	-.09	.08	**.14**
10	-.00	.06	-.04	-.03	-.01	.02	-.03	-.06	-.05	.10	-.05	-.06	-.06	-.04	-.04	.00	.10
11	.07	.06	-.01	-.02	.04	-.05	.01	.02	.01	.03	.01	-.01	-.05	-.06	-.04	.05	-.06
12	.05	.10	-.00	.12	.03	-.01	.06	-.03	-.07	**-.16**	-.10	-.07	.00	-.07	-.04	.07	-.00

Table 19 (cont'd)

13	.12	.09	-.08	.07	.13	.04	.00	-.06	**-.18**	**-.21**	-.13	-.02	-.04	-.05	.00	.06	.01
14	.11	.05	-.05	.04	.01	.02	.02	**-.15**	**-.15**	**-.18**	**-.19**	.01	-.05	-.09	-.08	.10	.12
15	-.06	.10	-.08	.00	.08	-.01	-.02	-.10	-.09	**-.17**	-.13	.01	-.04	-.05	-.04	-.03	.01
16	**.29**	**.24**	**.29**	**.32**	**.32**	**.42**	**.36**	.05	.07	.01	-.05	-.04	**-.14**	-.07	-.11	.00	.06
17	**.30**	**.32**	**.37**	**.36**	**.31**	**.32**	**.28**	-.02	-.02	-.07	-.03	-.02	-.06	-.05	-.08	.07	.06
18	**.34**	**.35**	**.30**	**.47**	**.60**	**.57**	**.38**	-.03	-.078	-.08	-.06	-.06	-.12	.02	-.02	.03	-.00
19	**.27**	**.26**	**.30**	**.37**	**.36**	**.42**	**.28**	-.01	.07	.03	-.04	-.03	-.00	.02	-.05	.02	.04
20	**.32**	**.33**	**.36**	**.44**	**.60**	**.58**	**.32**	-.03	-.06	-.02	-.03	.02	-.04	-.00	-.02	-.00	.00
21	-	**.29**	**.25**	**.34**	**.26**	**.32**	**.37**	-.06	-.07	-.13	-.09	-.01	-.07	-.09	-.08	**.16**	.07
22	**.22**	-	**.23**	**.30**	**.33**	**.39**	**.18**	-.05	-.10	-.14	-.11	.04	-.13	-.10	**-.16**	.10	.08
23	**.30**	**.21**	-	**.34**	**.27**	**.32**	**.41**	-.01	.03	-.07	-.05	.04	-.06	.00	-.05	.09	.03
24	**.30**	**.28**	**.31**	-	**.50**	**.43**	**.36**	-.06	-.05	-.08	-.06	-.03	-.10	-.08	-.06	.09	.08
25	**.28**	**.33**	**.26**	**.41**	-	**.50**	**.35**	-.00	-.06	-.01	-.00	-.04	-.07	-.08	-.06	.05	.04
26	**.29**	**.35**	**.31**	**.38**	**.52**	-	**.29**	.06	.04	-.01	-.03	-.04	-.12	-.08	-.08	.10	.04
27	**.37**	**.21**	**.36**	**.34**	**.30**	**.32**	-	.03	.03	.02	.02	.01	-.08	-.01	-.03	.02	-.02
28	**-.12**	**-.04**	**-.04**	**-.08**	**-.10**	**-.05**	**-.05**	-	**.65**	**.39**	**.32**	-.04	.10	**.15**	.13	-.13	**-.14**
29	**-.12**	**-.05**	-.01	**-.08**	**-.11**	**-.04**	**-.04**	**.73**	-	**.49**	**.60**	**-.20**	.11	**.15**	**.14**	-.10	-.09

Table 19 (cont'd)

30	**-**	**-**	-	**-.10**	**-.10**	-.02	**-.05**	**.61**	**.64**	-	**.59**	**-.19**	.12	**.18**	.13	**-**	-.11
	.13	**.06**	.01													**.16**	
31	**-**	**-**	-	**-.09**	**-.10**	-.02	**-.06**	**.56**	**.71**	**.72**	-	**-.17**	**.13**	.10	.11	-	-.10
	.12	**.04**	.02													.06	
32	**-**	-	-	**-.05**	**-.05**	**-.03**	**-.05**	**.15**	**.13**	**.17**	**.18**	-	.10	.04	.08	-	-.03
	.04	.03	**.04**													.02	
33	**-**	-	-	**-.06**	**-.07**	**-.05**	**-.07**	**.29**	**.29**	**.37**	**.35**	**.29**	-	**.66**	**.68**	**-**	**-.21**
	.09	.03	**.04**													**.57**	
34	**-**	-	-	**-.05**	**-.07**	**-.04**	**-.06**	**.17**	**.16**	**.22**	**.21**	**.16**	**.68**	-	**.78**	**-**	**-.30**
	.09	.02	.02													**.73**	
35	**-**	-	-	**-.05**	**-.06**	**-.03**	**-.06**	**.18**	**.18**	**.24**	**.21**	**.20**	**.71**	**.80**		**-**	**-.38**
	.08	.02	.02													**.61**	
36	**.08**	.03	.02	**.06**	**.07**	**.05**	**.06**	**-.15**	**-.13**	**-.20**	**-.18**	**-.15**	**-.59**	**-.70**	**-.61**	-	**.27**
37	**.04**	.01	.02	.02	**.04**	.02	**.04**	**-.15**	**-.20**	**-.18**	**-.20**	**-.14**	**-.38**	**-.30**	**-.35**	**.28**	-

Note. 1=age, 2=SES, 3=K teacher ATL, 4=K teacher SC, 5= K teacher interpersonal, 6=K teacher externalizing, 7= K teacher internalizing, 8=parent contact, 9=parent open house, 10=parent PTA, 11=parent advisory group, 12=parent-teacher conference, 13=parent school event, 14=parent volunteer, 15=parent fundraising, 16=parent bothered, 17=parent appetite, 18=parent blues, 19=parent trouble focusing, 20=parent depressed, 21=parent things effortful, 22=parent fearful, 23=parent sleep restless, 24=parent talk less, 25=parent lonely, 26=parent sad, 27=parent "not get going," 28=K reading t-score, 29=K math t-score, 30=5th grade reading t-score, 31=5th grade math t-score, 32= motivation school, 33= 5th teacher ATL, 34=5th teacher SC, 35=5th teacher interpersonal, 36=5th teacher externalizing, 37=5th teacher internalizing

CHAPTER 4

RESULTS

Preliminary Analyses

Group means and standard deviations of predictor, covariate, and outcome variables for the study sample are displayed in Table 14, 15, 16, and 17.

Differences between LD and non-LD Groups. Based on independent samples t-tests, all predictor, covariate, and outcome variables were significantly different across samples with and without LD. However, due to a large sample size and unequal sample sizes across groups, effect sizes (Cohen's d) and odds ratios were analyzed to determine meaningful statistical significance between groups. In terms of covariates, a small effect size was noted for age at kindergarten between the LD and non-LD group, indicating that children with an LD diagnosis were approximately 24 days older than their peers without LD. A medium effect size was noted for family SES, indicating that children with LD came from families with lower SES than their non-LD peers.

In terms of predictor variables, such as parent depression symptoms, children with LD had a significantly higher likelihood (odds ratio = 1.84) of having a parent endorse having a poor appetite "most of the time" compared to "never" having a poor appetite than children without LD. Children with LD were 2.11 times more likely to have a parent endorse feeling the "blues" "most of the time" compared to "never" feeling the blues than children without LD. Children with LD had a significantly higher likelihood (odds ratio = 1.65) of having a parent endorse trouble focusing "most of the time" compared to "never" having trouble focusing as compared to parents of children without LD. Children with LD had a significantly higher likelihood (odds ratio = 1.50) of having a parent endorse feeling depressed "most of the time" compared to

"never" feeling depressed than parents of children without LD. Children with LD were 2.21 times more likely to have a parent endorse feeling fearful "most of the time" compared to "never" feeling fearful than children without LD. Children with LD had a significantly higher likelihood (odds ratio = 2.70) of having a parent report talking less "most of the time" compared to "never" talking less than children without LD.

In regards to parent school involvement indicators, children with LD were 1.46 times more likely to have a parent not attend an open house event than children without LD. Children with LD had a significantly higher likelihood (odds ratio = 1.45) of not having a parent attend a PTO meeting than children without LD. Children with LD were 1.55 times more likely to have a parent not volunteer at school than children without LD. Children with LD had a significantly higher likelihood (odds ratio = 1.54) of not having a parent participate in fundraisers at school than children without LD.

In terms of outcome variables, children with LD had significantly lower academic achievement scores in reading and math in kindergarten and in fifth grade compared to their peers without LD. The effect sizes for difference in academic achievement scores was large (ranging from 1.16 to 1.46). In regards to early psychosocial behavior in kindergarten, children with LD had lower scores as rated by their teachers on the approaches to learning scale, self-control scale, interpersonal skills scale, and externalizing and internalizing scales. However, the effect size was large for only the approaches to learning scale, medium for the interpersonal skills scale, and small for the remainder of the scales. In regards to psychosocial behavior in fifth grade, children with LD had lower scores as rated by their teachers on all five scales again, however only the approaches to learning scale had a large effect. Finally, children with LD self-

reported lower motivation for all school subjects compared to children without LD, however the effect size was small.

Differences between Categories of LD. In order to examine the group mean differences in study variables of interest between samples with subtype of LD, a between-group, one-way analysis of variance (ANOVA) was conducted for continuous variables: academic achievement, psychosocial behaviors, and motivation. Since the assumption of homogeneity of variance was not met with regards to academic achievement, psychosocial behavior, or motivation scores, the Welch correction (Welch, 1951) was applied to these ANOVA's and Games-Howell post-hoc analyses were used. To examine the group mean differences for categorical study variables of interest, parent depression and parent school involvement, the Kruskal-Wallis H Test, a non-parametric equivalent of an ANOVA, was conducted; Dunn-Bonferroni post-hoc analyses were used. Unweighted and weighted subpopulation means and standard deviations are found in Tables 20, 21, 22 and 23. A new variable was created and participants were grouped via learning disability status. Identification of learning disability was based on special education records and report of the child's main disability category by the child's fifth grade primary special education teacher. Direct information about the child's learning disability category (e.g., reading, math, or both) was unavailable, so LD type was determined based on the special education teacher's report of the child's primary IEP goals. If the child had primary reading goals, it was assumed that they demonstrated academic difficulty in reading and thus, were categorized as LD-Reading. If the child had primary math goals, it was assumed that they demonstrated academic difficulties in math, and were categorized as LD-math. If the child had primary goals in both reading and math, it was assumed that they had academic difficulties in both subjects and were categorized as LD-co-morbid Math and Reading. Overall, 410 children had a learning disability of which 180

children had a RD, 20 children had a MD, and 220 children had a co-morbid RD-MD. Of the 410 children identified with LD, less than 10 children did not have primary goals specified in their IEP, thus they were not included in the categorized analysis. Due to the small sample size of the MD group and the exploratory nature of this study, and given that children with MD often experience co-morbid reading problems, regardless of whether they are identified and receive services through a formal identification process, the MD sample was grouped with the RD-MD sample (*n*=230).

Parent depression group differences. Significant group differences were found on three items related to parent depression. Specifically, a Kruskal-Wallis H test showed a statistically significant difference across groups in parent responses regarding having a poor appetite, $\chi^2(2) = 14.83$, p=.001, having difficulty "shaking the blues," $\chi^2(2) = 10.92$, p=.004, and feeling fearful, $\chi^2(2) = 6.86$, p=.032. Dunn-Bonferroni post-hoc analyses indicated children without LD had parents whom reported significantly less frequency of problems with poor appetite compared to children with RD-MD (p<.001). Children without LD also had parents who reported significantly less frequency of difficulty "shaking the blues" compared to children with RD (p<.05). Finally, children with RD had parents who reported significantly less frequency of feeling fearful compared to children with RD-MD (p<.05). No other statistically significant group differences emerged.

Parent school involvement group differences. Significant group differences were found on five items related to parent school involvement. A Kruskal-Wallis H test showed a statistically significant difference across groups in parent responses regarding the frequency with which parent's report attending school open houses, $\chi^2(2) = 21.22$, p<.001, attending PTA meetings, $\chi^2(2) = 12.01$, p=.002, attending school events, $\chi^2(2) = 12.84$, p=.002, acting as a

school volunteer, $\chi^2(2) = 18.50$, $p<.001$, and participating in school fundraisers, $\chi^2(2) = 16.53$, $p<.001$. Post-hoc analyses indicated children without LD had parents whom reported attending school open houses ($p<.001$), PTA meetings ($p<.05$), school events ($p=.001$), acting as a school volunteer ($p<.001$), and participating in school fundraisers ($p<.05$) significantly more frequently than parents of children with RD-MD. Parents of children without LD also reported participating in school fundraisers significantly more frequently than parents of children with RD ($p<.05$). Additionally, children with RD had parents whom reported attending school open houses significantly more frequently than parents of children with RD-MD ($p<.05$). No other statistically significant group differences emerged.

Academic achievement group differences. Significant group effects on academic achievement in reading scores in kindergarten, $F (2, 9850) = 417.39$, $p<.001$, math scores in kindergarten, $F (2, 10304) = 333.47$, $p<.001$, reading scores in fifth grade, $F (2, 10171) = 482.84$, $p<.001$, and math scores in fifth grade, $F (2, 10178) = 393.56$, $p<.001$ were found. Effect sizes, calculated using eta squared, were .05 for reading scores in kindergarten, .05 for math scores in kindergarten, .07 for reading scores in fifth grade, and .05 for math scores in fifth grade, suggesting small effect sizes. Games-Howell post-hoc analyses revealed that children without LD performed higher than children with RD and children with RD-MD ($p<.05$) on both reading and math achievement tests at both time points. Similarly, children with RD performed significantly higher than children with RD-MD ($p<.05$) on both academic measures at both time points. On average, children with RD-MD scored approximately 13 points lower on the kindergarten reading assessment, 14 points lower on the kindergarten math assessment, 14 points lower on the fifth-grade reading assessment, and 14 points lower on the kindergarten math assessment when compared to children without LD. Children with RD only scored, on average, 3

points higher on kindergarten reading, 6 points higher on kindergarten math, 3 points higher on fifth grade reading, and 7 points higher on fifth grade math compared to children with RD-MD.

Psychosocial behavior group differences. Significant group effects on all five scales of psychosocial behavior in kindergarten and all five scales of psychosocial behavior in fifth grade were found. In kindergarten, significant group differences emerged for the approaches to learning scale, $F (2, 10080) = 203.42$, $p<.001$, the self-control scale, $F (2, 10012) = 25.98$, $p<.001$, the interpersonal scale, $F (2, 9980) = 50.32$, $p<.001$, the externalizing behaviors scales, $F (2, 10039) = 16.63$, $p<.00$, and the internalizing behaviors scale, $F (2, 9987) = 25.79$, $p<.001$. Effect sizes, calculated using eta squared, were .04 for the approaches to learning scale, .01 for the self-control scale, .01 for the interpersonal scale, .01 for the externalizing behaviors scale, and .01 for the internalizing behaviors scale, suggesting small effect sizes. Games-Howell post-hoc analyses revealed that children without LD received more positive ratings from teachers indicating better approaches to learning, self-control, and interpersonal skills, and fewer externalizing behaviors and internalizing behaviors compared to children with RD and children with RD-MD ($p<.05$) in kindergarten. Children with RD performed significantly higher than children with RD-MD ($p<.05$) on the approaches to learning scale and significantly lower on the internalizing behaviors scale ($p<.05$), but no significant differences were found regarding self-control, interpersonal skills, or externalizing behaviors in kindergarten. On average, children with RD-MD scored approximately .3 to .8 points lower on the approaches to learning, self-control, and interpersonal scales, and .2-.3 points higher on the externalizing behaviors and internalizing behaviors scales when compared to children without LD in kindergarten. Children with RD scored, on average, .3 points higher on the approaches to learning scale and .1 points

lower on the internalizing behaviors scale when compared to children with RD-MD in kindergarten.

In fifth grade, significant group differences emerged for the approaches to learning scale, $F(2, 9713) = 114.37$, $p<.001$, the self-control scale, $F(2, 9624) = 30.67$, $p<.001$, the interpersonal scale, $F(2, 9506) = 40.28$, $p<.001$, the externalizing behaviors scales, $F(2, 9655) = 19.28$, $p<.00$, and the internalizing behaviors scale, $F(2, 9546) = 27.55$, $p<.001$. Effect sizes, calculated using eta squared, were .02 for the approaches to learning scale, .01 for the self-control scale, .01 for the interpersonal scale, .01 for the externalizing behaviors scale, and .01 for the internalizing behaviors scale, suggesting small effect sizes. Games-Howell post-hoc analyses revealed that children without LD received more positive ratings from teachers indicating better approaches to learning, self-control, and interpersonal skills, and fewer externalizing behaviors and internalizing behaviors compared to children with RD and children with RD-MD ($p<.05$) in fifth grade as well. Children with RD did not perform significantly differently than children with RD-MD ($p<.05$) on any of the scales. On average, children with RD-MD scored approximately .3 to .5 points lower on the approaches to learning, self-control, and interpersonal scales, and .2 points higher on the externalizing behaviors and internalizing behaviors scales when compared to children without LD in fifth grade.

Motivation group differences. Significant group effects on student's self-reported motivation across all school subjects, $F(2, 10183) = 20.40$, $p<.001$, however with statistically negligible effect size (eta=0.004). Interestingly, children with RD rated themselves significantly lower in terms of school motivation than children without LD ($p<.05$), as well as children with RD-MD ($p<.05$). There was no significant mean difference in student's self-reported school motivation between children without LD and children with RD-MD.

Table 20
Unweighted Subpopulation Descriptive Statistics

Variables	No Learning Disability		Reading Disability		Reading-Math Disability	
	N[a]	Mean (SD)	N[a]	Mean (SD)	N[a]	Mean (SD)
Covariates						
Kindergarten SES	9880	.06 (.80)	170	-.23 (.73)	220	-.40 (.68)
Age at Assessment (K, 1999)	9330	68.38 (4.30)	170	69.00 (4.63)	210	69.27 (5.21)
Age at Assessment (5th grade, 2004)	9790	134.51 (4.35)	180	135.00 (4.73)	220	135.40 (5.22)
Kindergarten Achievement						
Direct Math Assessment	9930	52.06 (9.47)	170	44.19 (8.47)	210	38.10 (8.69)
Direct Reading Assessment	9500	51.98 (9.40)	160	41.60 (6.60)	190	39.07 (7.98)
Fifth Grade Achievement						
Direct Math Assessment	9790	51.95 (9.31)	189	45.55 (8.43)	220	37.96 (7.68)
Direct Reading Assessment	9790	51.95 (9.28)	170	40.81 (7.65)	210	37.65 (8.21)
Early Psychosocial Behaviors						
Teacher-Rated Approaches to Learning	9700	3.23 (.64)	170	2.74 (.65)	210	2.42 (.65)
Teacher-Rated Self-Control	9630	3.26 (.59)	170	3.08 (.63)	210	2.98 (.63)
Teacher-Rated Interpersonal Skills	9610	3.20 (.61)	170	2.95 (.65)	210	2.80 (.65)
Teacher-Rated Externalizing	9660	1.57 (.57)	170	1.73 (.66)	210	1.81 (.73)
Teacher-Rated						

Table 20 (cont'd)

Internalizing	9610	1.51 (.48)	160	1.63 (.50)	210	1.77 (.58)
Fifth Grade Psychosocial Behavior						
Teacher-Rated Approaches to Learning	9310	3.14 (.65)	180	2.73 (.62)	230	2.63 (.60)
Teacher-Rated Self-Control	9230	3.28 (.58)	170	3.11 (.62)	230	2.98 (.63)
Teacher-Rated Interpersonal Skills	9110	3.13 (.62)	170	2.90 (.64)	220	2.79 (.67)
Teacher-Rated Externalizing	9250	1.60 (.55)	180	1.78 (.60)	230	1.80 (.63)
Teacher-Rated Internalizing	9150	1.59 (.51)	170	1.77 (.58)	230	1.81 (.52)
Motivation						
Student-Rated School	9790	2.76 (.62)	180	2.46 (.66)	220	2.64 (.71)

Note: [a] All unweighted sample sizes were rounded to the nearest 10 due to restrictions set forth via the licensing agreement.

Table 21
Unweighted Subpopulation Descriptive Statistics (Categorical Variables)

Variables	No Learning Disability		Reading Disability		Reading-Math Disability	
	N[a] (%)	Mean (SD)	N[a] (%)	Mean (SD)	N[a] (%)	Mean (SD)
Parent Depression						
Felt bothered		1.59		1.55		1.70
Never	5070 (53.9)	(.74)	90 (59.9)	(.79)	100 (48.3)	(.83)
Some Time	3360 (35.7)		50 (29.3)		80 (38.8)	
Moderate Amount	740 (7.9)		10 (7.0)		10 (7.5)	
Most of Time	240 (2.6)		10 (3.8)		10 (4.7)	
Poor appetite		1.37		1.44		1.56
Never	6850 (72.7)	(.70)	110 (71.3)	(.82)	120 (61.4)	(.83)
Some Time	1920 (20.4)		30 (19.1)		50 (25.2)	
Moderate Amount	370 (3.9)		10 (3.8)		20 (8.9)	
Most of Time	280 (3.0)		10 (5.7)		10 (4.5)	
Felt the "blues"		1.25		1.40		1.33
Never	7610 (80.9)	(.58)	110 (72.4)	(.77)	150 (76.1)	(.67)
Some Time	1400 (14.9)		30 (19.2)		30 (17.4)	
Moderate Amount	230 (2.5)		10 (3.8)		10 (4.0)	
Most of Time	160 (1.7)		10 (4.5)		10 (2.5)	
Trouble focusing		1.51		1.53		1.64
Never	5550 (58.9)	(.71)	100 (63.1)	(.81)	100 (52.2)	(.81)
Some Time	3180 (33.8)		40 (25.5)		70 (35.8)	
Moderate Amount	420 (4.5)		10 (7.0)		10 (7.5)	
Most of Time	260 (2.8)		10 (4.5)		10 (4.5)	
Felt depressed		1.33		1.40		1.41
Never	6950 (73.9)	(.64)	110 (70.7)	(.72)	140 (70.8)	(.74)
Some Time	2010 (21.4)		30 (21.7)		40 (20.8)	
Moderate Amount	230 (2.4)		10 (4.5)		10 (5.0)	
Most of Time	210 (2.3)		10 (3.2)		10 (3.5)	

Table 21 (cont'd)

Felt things were effortful		1.62 (.88)		1.67 (1.0)		1.70 (.89)
Never	5390 (57.3)		100 (60.5)		100 (52.0)	
Some Time	2860 (30.4)		40 (22.9)		70 (33.5)	
Moderate Amount	480 (5.1)		10 (5.7)		10 (7.5)	
Most of Time	670 (7.1)		20 (10.8)		10 (7.0)	
Felt fearful		1.19 (.51)		1.13 (.44)		1.31 (.75)
Never	8010 (85.1)		140 (90.4)		160 (70.3)	
Some Time	1130 (12.0)		10 (7.0)		20 (10.9)	
Moderate Amount	150 (1.6)		<10 (1.9)		10 (3.5)	
Most of Time	120 (1.2)		<10 (.6)		10 (4.5)	
Difficulty sleeping		1.72 (.89)		1.79 (.95)		1.89 (1.0)
Never	4700 (50.0)		80 (49.0)		90 (43.6)	
Some Time	3290 (35.0)		50 (31.2)		70 (36.1)	
Moderate Amount	720 (7.7)		20 (11.5)		20 (7.9)	
Most of Time	690 (7.4)		10 (8.3)		20 (12.4)	
Talked less		1.24 (.57)		1.30 (.71)		1.33 (.70)
Never	7640 (81.2)		130 (80.9)		150 (76.2)	
Some Time	1380 (14.6)		20 (12.1)		40 (18.3)	
Moderate Amount	250 (2.7)		10 (3.2)		<10 (1.5)	
Most of Time	140 (1.5)		10 (3.8)		10 (4.0)	
Felt lonely		1.25 (.58)		1.29 (.71)		1.29 (.60)
Never	7620 (81.0)		130 (81.5)		160 (77.2)	
Some Time	1420 (15.1)		20 (11.5)		40 (18.3)	
Moderate Amount	200 (2.1)		10 (3.2)		10 (3.0)	
Most of Time	160 (1.8)		10 (3.8)		<10 (1.5)	
Felt sad		1.44 (.65)		1.43 (.72)		1.51 (.72)
Never	5910		100 (66.9)		120	

Table 21 (cont'd)

	(62.8)				(59.0)	
Some Time	3020 (32.1)		40 (26.1)		70 (34.0)	
Moderate Amount	310 (3.3)		10 (3.8)		10 (4.0)	
Most of Time	170 (1.9)		10 (3.2)		10 (3.0)	
Difficulty "to get going"		1.51 (.72)		1.54 (.84)		1.54 (.66)
Never	5620 (59.7)		100 (63.1)		110 (54.2)	
Some Time	3090 (32.9)		40 (25.5)		80 (39.3)	
Moderate Amount	420 (4.5)		10 (5.7)		10 (5.0)	
Most of Time	270 (2.9)		10 (5.7)		<10 (1.5)	
Parent School Involvement						
Attended open house		1.24 (.43)		1.23 (.42)		1.38 (.49)
Yes	7260 (75.8)		120 (77.0)		130 (62.0)	
No	2310 (24.2)		40 (23.0)		80 (38.0)	
Attended PTO		1.63 (.48)		1.66 (.47)		1.74 (.44)
Yes	3580 (37.3)		50 (33.5)		50 (26.0)	
No	6010 (62.7)		110 (66.5)		150 (74.0)	
Attended parent group		1.91 (.29)		1.91 (.29)		1.89 (.31)
Yes	880 (9.2)		10 (9.3)		20 (11.1)	
No	8700 (90.8)		150 (90.7)		180 (88.9)	
Attended teacher conference		1.14 (.35)		1.08 (.27)		1.13 (.34)
Yes	8230 (85.9)		150 (92.0)		180 (86.5)	
No	1350 (14.1)		10 (8.0)		30 (13.5)	
Attended school event		1.31 (.46)		1.34 (.48)		1.42 (.50)
Yes	6640 (69.3)		110 (60.5)		120 (58.0)	
No	2940 (30.7)		50 (34.0)		90 (42.0)	

Table 21 (cont'd)

Volunteered at school		1.48		1.56		1.61
Yes	4990 (52.0)	(.50)	70 (43.8)	(.50)	80 (38.6)	(.49)
No	4600 (48.0)		90 (56.2)		130 (61.4)	
Participated in fundraiser						
Yes	5950 (62.1)	1.38 (.49)	90 (52.5)	1.48 (.50)	100 (51.0)	1.49 (.50)
No	3630 (37.9)		80 (47.5)		100 (49.0)	

Note: [a] All unweighted sample sizes were rounded to the nearest 10 due to restrictions set forth via the licensing agreement.

Table 22
Weighted Subpopulation Descriptive Statistics

Variables	No Learning Disability		Reading Disability		Reading-Math Disability	
	N	Mean (SD)	N	Mean (SD)	N	Mean (SD)
Covariates						
Kindergarten SES	3,353,415	-.03 (.78)	40,126	-.25 (.75)	81,545	-.54 (.91)
Age at Assessment (K, 1999)	3,111,8989	68.31 (4.30)	38,867	68.58 (4.57)	75,835	70.02 (5.83)
Age at Assessment (5th grade, 2004)	2,928,775	134.53 (4.38)	40,126	134.63 (4.62)	76,003	135.91 (5.81)
Kindergarten Achievement						
Direct Math Assessment	3,245,941	50.85 (9.68)	39,035	45.04 (7.62)	76,202	38.86 (8.53)
Direct Reading Assessment	3,100,220	50.99 (9.70)	37,583	41.78 (6.33)	68,330	38.57 (7.52)
Fifth Grade Achievement						
Direct Math Assessment	2,928,740	51.11 (9.61)	40,126	47.25 (7.35)	76,329	37.42 (7.41)
Direct Reading Assessment	2,920,902	51.16 (9.52)	40,126	42.44 (6.52)	74,066	38.03 (7.67)
Early Psychosocial Behaviors						
Teacher-Rated Approaches to Learning	3,136,565	3.15 (.67)	39,542	2.75 (.65)	75,632	2.41 (.66)
Teacher-Rated Self-Control	3,120,350	3.22 (.61)	39,542	3.15 (.60)	75,676	3.00 (.64)
Teacher-Rated Interpersonal	3,106,357	3.15 (.62)	39,542	3.01 (.58)	73,697	2.74 (.65)

Table 22 (cont'd)

Skills						
Teacher-Rated Externalizing	3,126,532	1.62 (.60)	39,202	1.69 (.67)	74,859	1.89 (.79)
Teacher-Rated Internalizing	3,104,368	1.55 (.50)	38,835	1.55 (.50)	75,158	1.78 (.58)
Fifth Grade						
Psychosocial						
Behavior						
Teacher-Rated Approaches to Learning	2,699,372	3.09 (.67)	38,937	2.78 (.63)	80,696	2.62 (.62)
Teacher-Rated Self-Control	2,672,205	3.25 (.59)	38,778	3.22 (.57)	80,379	3.00 (.56)
Teacher-Rated Interpersonal Skills	2,624,217	3.10 (.63)	38,469	2.97 (.67)	80,420	2.75 (.60)
Teacher-Rated Externalizing	2,674,614	1.64 (.58)	38,937	1.73 (.52)	80,513	1.82 (.62)
Teacher-Rated Internalizing	2,646,345	1.62 (.53)	38,729	1.72 (.52)	80,696	1.78 (.46)
Motivation						
Student-Rated School	2,928,388	2.72 (.64)	40,126	2.32 (.62)	76,392	2.74 (.82)

Table 23
Weighted Subpopulation Descriptive Statistics (Categorical Variables)

Variables	No Learning Disability		Reading Disability		Reading-Math Disability	
	N (%)	Mean (SD)	N (%)	Mean (SD)	N (%)	Mean (SD)
Parent Depression						
Felt bothered		1.60		1.63		1.55
Never	1678074 (52.9)	(.74)	21281 (54.2)	(.82)	45033 (56.7)	(.74)
Some Time	1149172 (36.2)		12973 (33.1)		27644 (34.8)	
Moderate Amount	270662 (8.5)		3189 (8.1)		4368 (5.5)	
Most of Time	74467 (2.3)		1788 (4.5)		2439 (3.1)	
Poor appetite		1.41		1.47		1.60
Never	2240349 (70.5)	(.74)	27085 (69.0)	(.83)	47969 (60.4)	(.85)
Some Time	680528 (21.4)		7942 (20.2)		18633 (23.4)	
Moderate Amount	139603 (4.4)		1998 (5.1)		9688 (12.2)	
Most of Time	115078 (3.6)		2205 (5.6)		3194 (4.0)	
Felt the "blues"		1.27		1.40		1.28
Never	2539143 (80.0)	(.61)	27359 (69.7)	(.72)	60537 (76.2)	(.56)
Some Time	487456 (15.4)		9278 (23.6)		16351 (20.6)	
Moderate Amount	82716 (2.6)		1242 (3.2)		1717 (2.2)	
Most of Time	64737 (2.0)		1352 (3.4)		879 (1.1)	
Trouble focusing		1.54		1.52		1.86
Never	1849482 (58.2)	(.75)	25503 (65.0)	(.83)	35286 (44.4)	(.98)
Some Time	1046561 (32.9)		8685 (22.1)		29654 (37.3)	
Moderate Amount	171109 (5.4)		3329 (8.5)		5300 (6.7)	
Most of Time	110021 (3.5)		1714 (4.4)		9244 (11.6)	

Table 23 (cont'd)

Felt depressed		1.36		1.35		1.42
Never	2306057 (72.6)	(.69)	29681 (75.7)	(.70)	54305 (68.3)	(.68)
Some Time	695835 (21.9)		6397 (16.3)		17984 (22.6)	
Moderate Amount	70261 (2.2)		2126 (5.4)		6523 (8.2)	
Most of Time	102708 (3.2)		1026 (2.6)		672 (0.8)	
Felt things were effortful		1.70 (.95)		1.65 (.98)		1.63 (.93)
Never	1730262 (54.6)		23877 (60.9)		46948 (57.6)	
Some Time	961967 (30.3)		9232 (23.5)		21374 (27.0)	
Moderate Amount	166363 (5.2)		2047 (5.2)		3903 (4.9)	
Most of Time	312837 (9.9)		4074 (10.4)		6983 (8.8)	
Felt fearful		1.20 (.52)		1.08 (.34)		1.46 (.95)
Never	2677019 (84.2)		36724 (93.6)		60313 (75.9)	
Some Time	403675 (12.7)		2238 (5.7)		9458 (11.9)	
Moderate Amount	54854 (1.7)		0 (0)		1723 (2.2)	
Most of Time	42146 (1.3)		269 (0.7)		7990 (10.1)	
Difficulty sleeping		1.78		1.67		1.92
Never	1520760 (47.9)	(.93)	19811 (50.5)	(.84)	35397 (44.5)	(1.06)
Some Time	1109936 (34.9)		14864 (37.9)		27723 (34.9)	
Moderate Amount	269732 (8.5)		2097 (5.3)		3725 (4.7)	
Most of Time	277753 (8.7)		2459 (6.3)		12639 (15.9)	
Talked less		1.27		1.37		1.45
Never	2550184 (80.2)	(.61)	30771 (78.4)	(.81)	58669 (73.8)	(.88)
Some Time	469415 (14.8)		4662 (11.9)		11672 (14.7)	

Table 23 (cont'd)

Moderate Amount	96061 (3.0)		1561 (3.9)		3351 (4.2)	
Most of Time	63820 (2.0)		2236 (5.7)		5793 (7.1)	
Felt lonely		1.27		1.28		1.32
Never	2549165 (80.3)	(.63)	31445 (80.2)	(.64)	59062 (74.3)	(.61)
Some Time	471399 (14.8)		5264 (13.4)		15895 (20.0)	
Moderate Amount	78789 (2.5)		1765 (4.4)		3659 (4.6)	
Most of Time	76233 (2.4)		757 (1.9)		867 (1.1)	
Felt sad		1.47		1.40		1.49
Never	1950599 (61.4)	(.68)	27359 (69.7)	(.68)	46296 (58.5)	(.66)
Some Time	1038623 (32.7)		8959 (22.8)		28258 (35.7)	
Moderate Amount	115544 (3.6)		2188 (5.6)		3292 (4.2)	
Most of Time	71723 (2.3)		724 (1.8)		1283 (1.6)	
Difficulty "to get going"		1.54 (.75)		1.68 (.96)		1.55 (.58)
Never	1832568 (57.7)		22447 (57.2)		38976 (49.0)	
Some Time	1073920 (33.8)		10604 (27.0)		37382 (47.0)	
Moderate Amount	152764 (4.8)		2458 (6.3)		2902 (3.7)	
Most of Time	116180 (3.7)		3722 (9.5)		224 (0.3)	
Parent School Involvement						
Attended open house		1.27		1.26		1.48
Yes	2348497 (72.8)	(.45)	28699 (74.2)	(.44)	42382 (52.0)	(.50)
No	877730 (27.2)		9985 (25.8)		39162 (48.0)	
Attended PTO		1.66		1.60		1.81
Yes	1111307 (34.4)	(.48)	15434 (39.9)	(.49)	15744 (19.3)	(.40)
No	2116551 (65.6)		23251 (60.1)		65800 (80.7)	

Table 23 (cont'd)

Attended parent group		1.92		1.91		1.92
Yes	270813 (8.4)	(.28)	3483 (8.7)	(.28)	6401 (7.8)	(.27)
No	2955952 (91.6)		36643 (91.3)		75143 (92.2)	
Attended teacher conference		1.16 (.37)		1.09 (.29)		1.12 (.32)
Yes	2706336 (83.8)		36524 (91.0)		71899 (88.2)	
No	522551 (16.2)		3601 (9.0)		9645 (11.8)	
Attended school event		1.34		1.27		1.31
Yes	2138755 (66.2)	(.47)	29154 (72.7)	(.45)	56138 (68.8)	(.46)
No	1090376 (33.8)		10972 (27.3)		25407 (31.2)	
Volunteered at school		1.52		1.56		1.65
Yes	1559005 (48.3)	(.50)	17532 (43.7)	(.50)	28883 (35.4)	(.48)
No	1670182 (51.7)		22594 (56.3)		52662 (64.6)	
Participated in fundraiser		1.40		1.48		1.53
Yes	1924517 (59.7)	(.49)	20860 (52.0)	(.50)	38488 (47.2)	(.50)
No	1301651 (40.3)		19266 (48.0)		43057 (52.8)	

Analyzing the Structural Model

Establishing Factors by Testing the Measurement Model. Prior to running the structural equation model (Figure 2 and Figure 3), Confirmatory Factor Analysis (CFA) was conducted to test the four-factor measurement model. The first latent factor, parent depression, was indicated by twelve observed variables. The second latent factor, parent school involvement, was indicated by seven observed variables. The third latent factor, early psychosocial behavior, was indicated by five observed variables. The fourth latent factor, fifth grade psychosocial behavior, was indicated by five observed variables. All factors were assumed to covary with one another and their associations were specified as unanalyzed in the measurement model (Kline, 2005).

The four-factor CFA fit the data adequately. Absolute fit indices included a RMSEA equal to .020 (CI = .019 -.021) and relative fit indices, CFI =.934, TLI=.927. The chi-square test of model fit was not available due to the use of WLSMV estimation and because sample weights were applied to the analyses (Muthen & Muthen, 2015). Modifications to the model were examined based on evaluation of factor loadings, modification indices, absolute fit indices, and theoretical considerations. Examination yielded removal of two variables in the parent school involvement construct, attending parent advisory group and attending parent-teacher conference. These variables had low communalities (<.10), and preliminary analyses revealed little variance in these variables across groups. Modifications improved the model fit. See Table 24 for unstandardized and standardized estimates of the individual factor loadings for the final measurement model. The final model fit the data adequately using weighted least square parameter estimates. Absolute fit indices included a RMSEA equal to .012 (CI = .011 -.013), and relative fit indices, CFI =.952, TLI=.947.

Measurement Invariance. Prior to running multi-group analyses, the final four-factor measurement model was tested for group invariance. Group invariance was tested by examining configural, metric, and scalar invariance models and comparing models across groups. Configural invariance was tested by not specifying any equality constraints across groups. Metric invariance was tested by constraining the factor loadings, but allowing intercepts to differ across groups (LD and no LD, and then again for RD, RD-MD, and no LD). Scalar invariance was tested by constraining the factor loadings and intercepts to be equal across groups. Scalar invariance implies that constructs are equal across groups, therefore allowing comparisons on latent variables to be made across groups. Cheung & Rensvold (2002) recommend a change in CFI between invariance models that is equal or less than .01 to indicate adequate fit across groups. Results indicated adequate fit for LD and no-LD groups (CFI = .962 for the configural model, CFI=.965 for the metric model, CFI=.958 for scalar the model, and ΔCFI=.007). Results also indicated adequate fit for the three-group analysis, RD, RD-MD, and no LD groups, (CFI = .956 for the configural model, CFI=.962 for the metric model, CFI=.956 for the scalar model, and ΔCFI=.006). Thus, the measurement model met requirements for scalar invariance thereby indicating that constructs are equal across groups.

Testing the Structural Latent Model. There are two main methods to analyze structural models using complex sample data in Mplus (Muthen & Muthen, 2015). The first method takes into account complex sampling design effects including stratification, clustering, and sampling weights. Given that the ECLS-K study used a multistage, stratified, clustered, equal probability systematic sampling design and provided stratification and clustering weights, in addition to application of sampling weights to account for missing data, this method was chosen to analyze the structural latent model. However, this method does not specify random

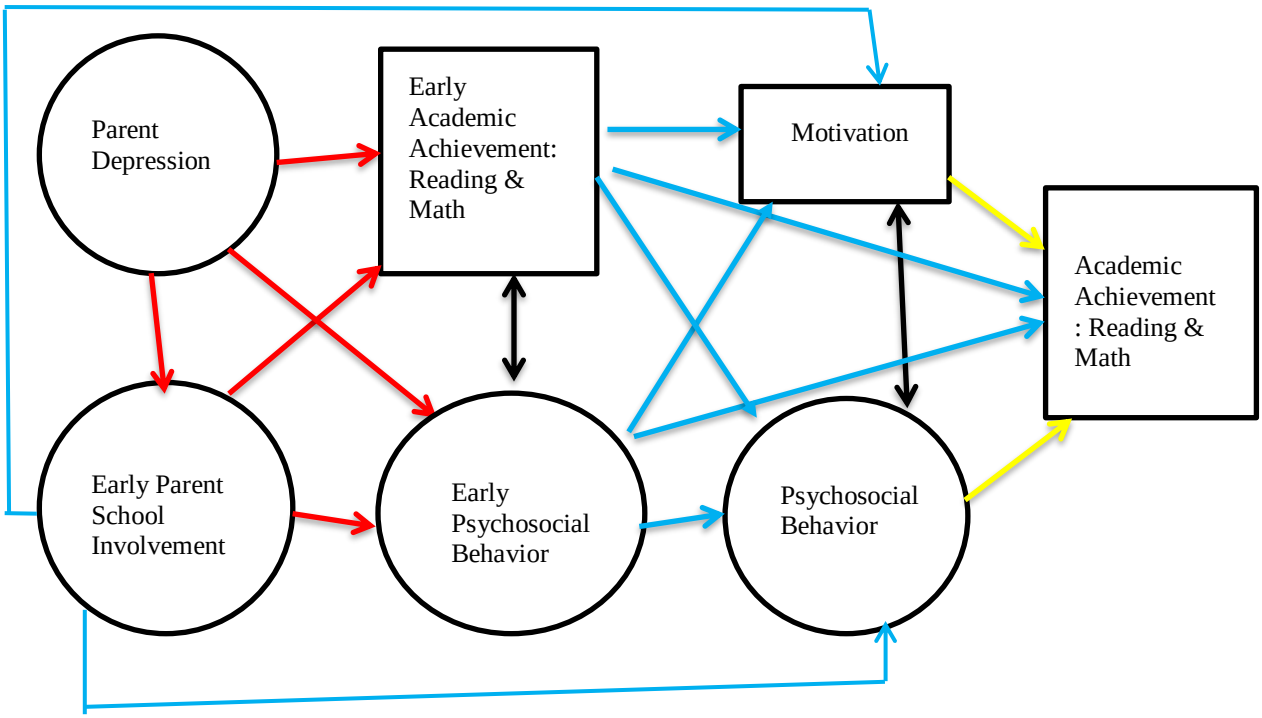
effects in a way that allows for analysis of interaction terms, such as in a moderation analysis. Thus, a second method that specifies random effects was also used to test interactions. However, there were significant limitations to analyzing both mediation and moderation (interaction) paths simultaneously using these methods. First, MLR is the given estimator for this analysis, however bootstrapping confidence intervals to test mediation effects is unavailable with this type of simultaneous analysis of separate mediation and moderation paths in complex samples (Muthen & Muthen, 2015). Second, traditional fit statistics such as chi-square, RMSEA, CFI, and TLI, are unavailable with analysis of moderation effects in complex samples. Instead AIC and BIC, predictive fit indices, are provided for researchers to compare alternative models to the proposed model. Models with smaller AIC values are considered more likely to be replicated in the population from which the sample is drawn. Third, multi-group analysis is unavailable when testing interactions using numerical integration in a complex sample. Instead, models run for each subset of the sample may be compared for goodness of fit using AIC/BIC.

The full structural model (Figure 2 and Figure 3) was tested specifying estimation of both complex sample design features and random slopes with covariates, including gender, child's race, SES, and child's age at kindergarten, allowed to freely predict parent depression, parent school involvement, academic achievement and psychosocial behaviors at both time points, and motivation in 5^{th} grade. Observed variables were centered to allow for interpretation of interaction effects. Bootstrapping of confidence intervals was unavailable with this type of analysis specified; bootstrapping is not available for complex sample design models with random slopes estimated using MLR without replicate weights (Muthen & Muthen, 2015). Overall, the full structural model did not converge when mediation paths, interaction paths, and covariates were all specified, nor when mediation paths and interaction terms were specified without

covariates. Attempts to diagnosis and fix convergence issues were unsuccessful, including addressing negative residual variances, rescaling the residual variances of four variables (kindergarten math and reading achievement t-scores and fifth grade math and reading achievement t-scores), increasing the number of iterations, freeing specific factor loadings and fixing factor variances, inputting different parameter starting values, and inputting covariates in a step-wise manner.

This led to a change in the structural equation paths that could be estimated simultaneously, while accounting for complex sample design and including covariate effects. Thus, indirect paths (mediation) related to research question 1a examining the effect of parent depression on early academic achievement and psychosocial behavior in kindergarten via school parent involvement were analyzed in the model without specifying interaction terms. Interaction paths (moderation) related to research question 1b examining the effect of children's academic achievement and psychosocial behavior as moderators on the relationship between parent school involvement in kindergarten on children's motivation and psychosocial behavior in fifth grade were tested without specifying indirect mediation paths. All other direct paths were kept constant. Figure 4 and Figure 5 display the final structural models.

Figure 4. Modified Structural Model (Mediation Paths in red).

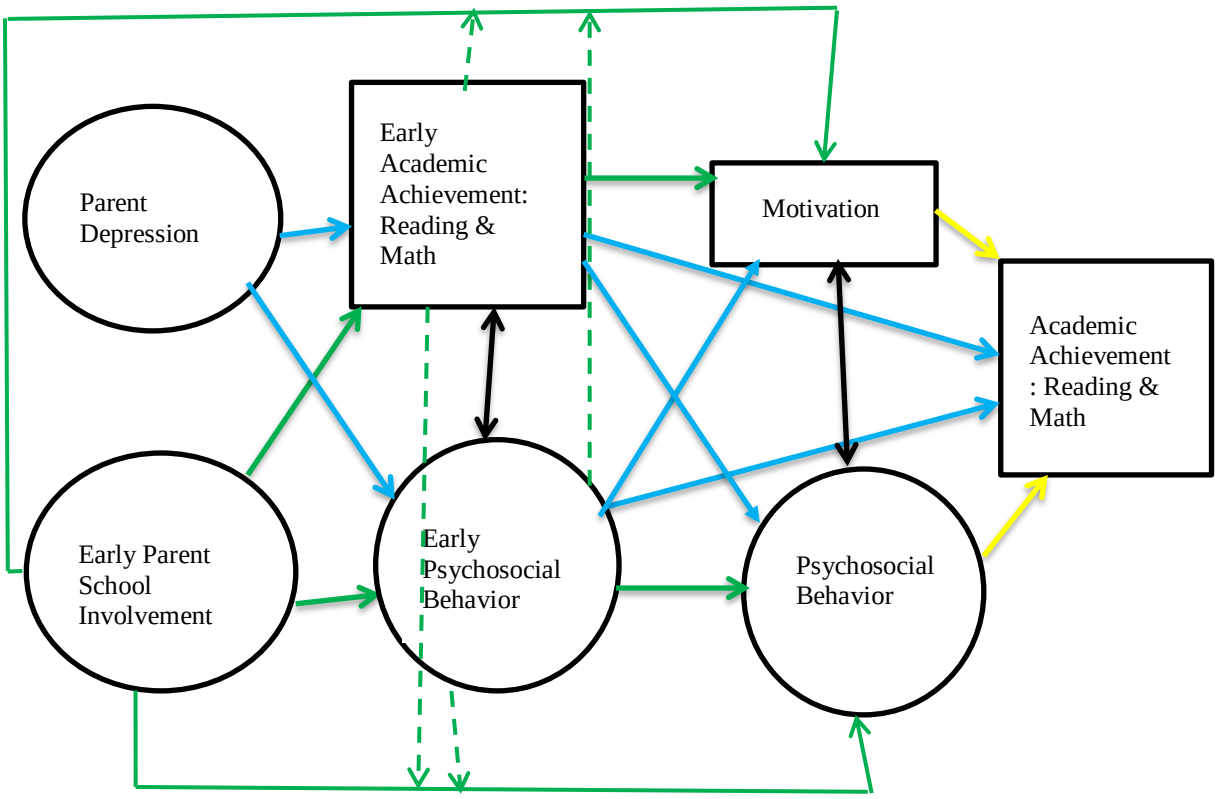


Note: Latent variables are shown in circles.

Covariates:

- Gender
- Race
- SES
- Age at Assessment

Figure 5. Modified Structural Model (Moderation Paths in green).



Note: Latent variables are shown in circles. The dashed lines represent the interaction between the exogenous variable (parent school involvement) and the moderator variables.

Covariates:

- Gender
- Race
- SES
- Age at Assessment

Research Question One: Influence of Parent Depression and Parent Involvement on Outcomes for All Children

The first research question sought to explore the relation between parent depression and parent school involvement on children's outcomes (academic achievement, psychosocial behavior, and motivation) in kindergarten, and the relation between kindergarten and fifth grade outcomes by testing a structural latent variable model using a sample of children with (*n*=10,220) and without LD (*n*=410) with age at kindergarten, gender, race, and SES as covariates in the model. It was hypothesized that the latent factor measurement model, along with the structural model, would be empirically supported as indicated by strong data fit indices.

Mediation Analysis. The structural model specifying indirect effects of parent depression on kindergarten achievement and psychosocial behavior and direct paths from kindergarten to fifth grade outcomes (Figure 4) was tested using estimator WLSMV. WLSMV is the preferred estimator when categorical and continuous latent variables are included in a model. Covariates were allowed to freely predict all variables, however the model did not converge. Covariates were then added to the model in a step-wise manner with all covariates allowed to freely predict outcome variables only (fifth grade achievement, fifth grade psychosocial behavior, fifth grade motivation, kindergarten psychosocial behavior, and kindergarten achievement). Then, covariates were allowed to freely predict exogenous variables (parent depression, parent school involvement). All non-significant covariate paths ($p<.01$) were removed and the modified structural model included only those covariates that uniquely contributed to the model. The model fit the data adequately, RMSEA = 0.012 (CI = .011 -.013), and relative fit indices, CFI =.923, TLI=.914. However, not all structural paths were significant ($p<.01$). Specifically, parent depression did not significantly predict parent school involvement

(β= -.024, p=.400), children's psychosocial behavior in kindergarten (β= -.044, p=.025), or children's math achievement in kindergarten (β= -0.054, p= .012), parent school involvement did not significantly predict children's motivation (β= -.009 , p=.797) or psychosocial behavior (β= -.087, p= .011) in fifth grade, children's psychosocial behavior in kindergarten did not significantly predict their fifth grade achievement in reading (β= .014, p=.544), children's reading achievement in kindergarten did not significantly predict their later psychosocial behavior (β= -.045, p=.107) or motivation in fifth grade (β=.081 , p=.012), children's math achievement in kindergarten did not significantly predict their motivation in fifth grade (β=.042 , p=.180), and children's motivation in fifth grade did not significantly predict their fifth grade reading achievement (β= .007, p=.637). Paths involved in the mediation analysis were kept in the model regardless of significance, as these paths were integral to answering research question 1a. However, all other paths that were not significant at the p<.01 level were removed, and the structural model was simplified. Table 25 displays the factor loadings and path estimates for the final structural model. The simplified structural model fit the data adequately, RMSEA = .012 (CI = .011 - .013), and relative fit indices, CFI = .922, TLI= .914. All structural paths were significant (p<.01) except for those that were intentionally not trimmed from the model to analyze research question 1a.

Research question 1a. Research question 1a sought to explore whether parent depression indirectly predicted early academic achievement and psychosocial behaviors in kindergarten via parent school involvement. Results did not support the hypothesized relationship that lower levels of parent depression would indirectly predict higher levels of academic achievement and more positive psychosocial behaviors in kindergarten via parent school involvement. Parent depression was not significantly related to parent school involvement (β= -.031, *SE*= .027, ns).

Thus, since parent school involvement was not related to parent depression, it did not serve as a mediator for any relationship between parent depression and child academic and psychosocial outcomes in kindergarten. As would be expected from these results, the indirect effects tested using biased corrected bootstrapped standard errors was also nonsignificant. The indirect effect from parent depression to early psychosocial behavior via parent school involvement was non-significant (β= .008, *SE*=.009, 95% CI= -.016-.031, ns). The indirect effect from parent depression to kindergarten reading achievement via parent school involvement was non-significant (β= .008, *SE*= .010, 95% CI= -.018-.039, ns). The indirect effect from parent depression to kindergarten math achievement via parent school involvement was non-significant (β= .008 *SE*= .010, 95% CI= -.019-.035, ns). These findings do not support the hypothesized mediational model.

Interestingly, there were significant direct effects from parent school involvement to kindergarten outcomes. Higher levels of parent school involvement were predictive of more positive early psychosocial behavior (β= -.255, p<.001), higher kindergarten math achievement (β= -0.276, p<.001), and higher kindergarten reading achievement (β= -0.257, p<.001). Additionally, lower levels of parent depression symptomology were directly related to higher kindergarten reading achievement (β= -0.068, p=.001).

Research question 1c. Research question 1c examined the direct effects of early academic achievement and psychosocial behavior on academic achievement in fifth grade. The model supported the hypothesis that higher levels of reading achievement in kindergarten were predictive of higher levels of reading achievement (β= .308, *SE*= .025, p<.001) and math achievement (β= .102, *SE*= .022, p<.001) in fifth grade. Likewise, higher levels of math achievement in kindergarten were predictive of higher levels of reading achievement (β= .293,

SE=.024, p<.001) and math achievement (β= .530, *SE*= .022, p<.001) in fifth grade. However, there was only partial support for the hypothesis that more positive psychosocial behaviors in kindergarten were predictive of higher levels of academic achievement in fifth grade. Specifically, more positive psychosocial behaviors in kindergarten were related to higher math achievement in fifth grade (β= 0.066, *SE*= .402, p<.001), but psychosocial behavior in kindergarten was not significantly related to reading achievement in fifth grade (β= -.026, p=.201).

Research question 1d. Research question 1d sought to explore whether student-rated motivation in school and psychosocial behaviors predicted academic achievement in fifth grade. The model supported the hypothesis that more positive psychosocial behavior in fifth grade was related to higher math achievement (β= .067, *SE*= .308, p=.001) and reading achievement (β= .127, *SE*= .277, p<.001) in fifth grade. However, there was only partial support for the influence of student-rated motivation. Student-rated motivation was predictive of higher math achievement (β= .089, *SE*= .238, p<.001), however it was not significantly predictive of reading achievement (β= -.008, p=.590).

Influence of covariates. Covariates, including SES, child's gender, age, and race, had effects on many of the study variables. First, there was an effect of family SES of parent depression, parent school involvement, and academic achievement at both time points. Lower family SES significantly predicted more depressive symptomology in parents (β= -.193, t>1.96) and lower levels of parent school involvement (β= -.523, t>1.96). Higher family SES significantly predicted higher kindergarten reading achievement (β= .218, t>1.96), higher kindergarten math achievement (β= .245, t>1.96), higher fifth grade reading achievement (β= .156, t>1.96), and higher fifth grade math achievement (β= .110, t>1.96). Older children at

kindergarten performed more positively on teacher-rated kindergarten psychosocial behavior (β= .012, t>1.96), however children's age at kindergarten did not have a significant effect on other study variables. Child gender significantly predicted kindergarten psychosocial behavior (β= .234, t>1.96), fifth grade psychosocial behavior (β= .185, t>1.96), and fifth grade math achievement (β= -.136, t>1.96). This finding suggested that females were more likely to have more positive teacher-ratings of psychosocial behavior at both time points, however, males were more likely to perform higher on fifth grade math achievement. Finally, child race/ethnicity significantly predicted parent school involvement, psychosocial behavior at both time points, and reading and math achievement at both time points. These findings suggest children of African-American/Black race/ethnicity (β= .195, t>1.96) and Hispanic race/ethnicity (β= .098, t>1.96) were more likely to have parents with lower levels of parent school involvement. Children of African-American/Black race/ethnicity were more likely to have less positive teacher-rated psychosocial behavior in kindergarten (β= -.130, t>1.96), less positive teacher-rated psychosocial behavior in fifth grade (β= -.100, t>1.96), lower kindergarten math achievement score (β= --.117, t>1.96), lower fifth grade math achievement score (β= -.107, t>1.96), and lower fifth grade reading achievement scores (β= -.082, t>1.96). Children of Asian race/ethnicity were more likely to have more positive teacher-rated psychosocial behavior in fifth grade (β= .072, t>1.96). Children of Hispanic-not otherwise specified race/ethnicity were more likely to have lower kindergarten reading achievement scores (β= -.074, t>1.96) and lower fifth grade reading achievement scores (β= -.076, t>1.96). Lastly, children of Native American race/ethnicity were more likely to have lower kindergarten math achievement scores (β= -.075, t>1.96).

Table 24
Final Confirmatory Factor Analysis for a Four-Factor Model

Items	Unstandardized	Standard Error (SE)	Standardized	R^2
Parent Depression				
Felt the "blues"	1.000	0.000	0.715	0.511
Felt depressed	1.120	0.031	0.712	0.506
Felt bothered	0.917	0.038	0.537	0.288
Poor appetite	0.890	0.034	0.520	0.271
Trouble focusing	1.030	0.043	0.590	0.348
Felt things were effortful	1.172	0.063	0.536	0.287
Felt fearful	0.578	0.021	0.467	0.219
Difficulty sleeping	1.105	0.058	0.515	0.266
Talked less	0.865	0.038	0.602	0.363
Felt lonely	0.841	0.030	0.585	0.342
Felt sad	1.068	0.037	0.688	0.473
Difficulty "to get going"	0.917	0.035	0.532	0.283
Parent School Involvement				
Volunteer at School	1.000	0.000	0.748	0.560
Attend Open House	0.872	0.064	0.653	0.426
Attend PTA/PTO	0.657	0.056	0.492	0.242
Attend School Event	0.707	0.053	0.529	0.280
Participate in School Fundraising	0.722	0.063	0.540	0.292
Early Psychosocial Behavior				
Self-Control	1.000	0.000	0.818	0.670
Interpersonal Skills	1.024	0.039	0.812	0.660
Approaches to Learning	1.056	0.047	0.779	0.607
Internalizing Behavior	0.361	0.033	0.359	0.129
Externalizing Behavior	0.975	0.031	0.801	0.642

Table 24 (cont'd)

Psychosocial Behavior				
Approaches to Learning	1.000	0.000	0.852	0.725
Interpersonal Skills	0.917	0.033	0.833	0.664
Self-Control	0.836	0.029	0.815	0.694
Internalizing Behavior	0.362	0.024	0.391	0.153
Externalizing Behavior	0.800	0.034	0.793	0.628

Note: All factor loadings were significant ($p<.001$).

Table 25

Parameter Estimates for a Four-Factor Structural Regression Model (Mediation Model)

Items	Unstandardized	Standard Error (SE)	Standardized	R^2
		Factor Loadings		
Parent Depression (PD)				
Felt the "blues"	1.000	0.000	0.728	0.530
Felt depressed	1.120	0.028	0.722	0.521
Felt bothered	0.927	0.035	0.543	0.295
Poor appetite	0.867	0.030	0.511	0.261
Trouble focusing	1.070	0.037	0.611	0.374
Felt things were effortful	1.101	0.059	0.520	0.271
Felt fearful	0.599	0.019	0.486	0.236
Difficulty sleeping	1.084	0.059	0.508	0.258
Talked less	0.849	0.035	0.596	0.355
Felt lonely	0.843	0.027	0.599	0.359
Felt sad	1.104	0.032	0.707	0.500
Difficulty "to get going"	0.925	0.033	0.545	0.297
Parent School Involvement (PSI)				
Volunteer at School	1.000	0.000	0.713	0.508
Attend Open House	0.939	0.068	0.677	0.459
Attend PTA/PTO	0.690	0.054	0.518	0.268
Attend School Event	0.709	0.056	0.530	0.281
Participate in School Fundraising	0.701	0.059	0.525	0.276
Early Psychosocial Behavior (EPB)				
Self-Control	1.000	0.000	0.734	0.539
Interpersonal Skills	1.152	0.039	0.811	0.657
Approaches to Learning	1.313	0.056	0.886	0.785
Internalizing Behavior	0.479	0.033	0.421	0.177
Externalizing Behavior	0.917	0.030	0.681	0.464
Fifth-grade Psychosocial Behavior (FPB)				
Approaches to Learning	1.000	0.000	0.910	0.828

Table 25 (cont'd)

Interpersonal Skills	0.851	0.030	0.814	0.662
Self-Control	0.737	0.025	0.757	0.573
Internalizing Behavior	0.399	0.026	0.445	0.198
Externalizing Behavior	0.711	0.030	0.747	0.558
		Direct Effects		
PD → EPB	-0.048	0.020 (ns)	-0.048	
PSI → EPB	-0.143	0.018	-0.255	
PD → PSI	-0.056	0.049 (ns)	-0.031	
EPB → FPB	0.520	0.047	0.384	
K Math → FPB	0.010	0.002	0.149	
PD → K Reading	-1.480	0.422	-0.068	
PSI → K Reading	-3.097	0.423	-0.257	
PD → K Math	-1.107	0.449 (ns)	-0.052	
PSI → K Math	-3.243	0.456	-0.276	
EPB → Motivation	0.268	0.040	0.186	
FPB → 5th Reading	2.001	0.277	0.127	
FPB → 5th Math	1.063	0.308*	0.067	
EPB → 5th Math	1.426	0.402	0.066	
K Reading → 5th Reading	0.306	0.025	0.308	
K Math → 5th Reading	0.298	0.024	0.293	
K Reading → 5th Math	0.102	0.022	0.102	
K Math → 5th Math	0.542	0.022	0.530	
Motivation → 5th Math	1.330	0.238	0.089	
		Indirect Effects		
PD → PSI → EPB	0.008	0.007 (ns)	0.008	
PD → PSI → K Reading	0.174	0.150 (ns)	0.008	
PD → PSI → K Math	0.182	1.131 (ns)	0.009	

Note: (ns) indicates paths were non-significant. * indicates paths were significant at ($p<.01$). All other structural paths were significant at ($p<.001$).

Moderation Analysis. The structural model specifying interactions between parent school involvement and kindergarten academic achievement and psychosocial behavior, along with direct paths from kindergarten to fifth grade outcomes (Figure 5) was tested using estimator MLR. MLR is the given estimator when interactions between categorical and continuous latent variables are included in a complex sample design model (Muthen & Muthen, 2015). As with the mediation model, covariates were allowed to freely predict all variables, however the model did not converge. Covariates were then added to the model in a step-wise manner with all covariates allowed to freely predict outcome variables only (fifth grade achievement, fifth grade psychosocial behavior, fifth grade motivation, kindergarten psychosocial behavior, and kindergarten achievement). Then, covariates were allowed to freely predict exogenous variables (parent depression, parent school involvement). All non-significant covariate paths ($p<.01$) were removed and the structural model included only those covariates that uniquely contributed to the model. Traditional model fit indices were unavailable as this was a non-nested model with MLR as the estimator (AIC = 476034.751, BIC = 477027.060). All paths that were significant in the mediation model maintained the same direction and significance.

Research question 1b. Research question 1b sought to explore whether parent school involvement in kindergarten predicted children's motivation and psychosocial behaviors in fifth grade as moderated by children's level of academic achievement and psychosocial behavior in kindergarten. It was hypothesized that as the level of academic achievement and psychosocial behaviors in kindergarten increases (e.g., more positive performance), higher levels of parent school involvement will predict higher levels of motivation and more positive psychosocial behaviors in fifth grade. Early academic achievement and psychosocial behaviors were moderating variables. However, the model did not support this hypothesis. Direct paths from

parent school involvement to fifth grade motivation (β= .016, *SE* = .088, p=.851), and parent school involvement to fifth grade psychosocial behavior (β= -.095, *SE* = .065, p=.143) were non-significant. As expected, interactions between parent school involvement and kindergarten psychosocial behavior (β= -.033, *SE* = .033, p=.312), parent school involvement and kindergarten reading achievement (β= .002, *SE* = .002, p=.302), and parent school involvement and kindergarten math achievement (β= -.003, *SE* = .002, p=.090) on fifth grade motivation were non-significant. Interactions between parent school involvement and kindergarten psychosocial behavior (β= -.015, *SE* = .021, p=.466), parent school involvement and kindergarten reading achievement (β= .001, *SE* = .001, p=.268), and parent school involvement and kindergarten math achievement (β= .000, *SE* = .001, p=.710) on fifth grade psychosocial behavior were also non-significant.

Research Question Two: Group Comparison Between Children with LD and Children Without LD

The second research question sought to explore whether the relation between parent depression and parent school involvement on academic achievement and psychosocial behavior in kindergarten, and academic achievement, psychosocial behavior, and motivation in fifth grade differed between children with LD (*n*=10,220) and children without LD (*n*=410) by testing the structural latent variable model in research question one across groups. Overall, results suggest the relations between the constructs and factor loadings specified in the model (tested in research question one) differ across children with and without LD. Specifically, there were several significant paths between parent school involvement and kindergarten child outcomes, kindergarten achievement and psychosocial behavior and fifth grade outcomes, and fifth grade psychosocial behavior on fifth grade achievement for children without LD. For children with

LD, fewer significant findings arose. Specifically, significant effects of kindergarten math achievement on fifth grade reading achievement, kindergarten psychosocial behavior on fifth grade psychosocial behavior, and children's school motivation in fifth grade on fifth grade math achievement were found for children with LD.

Testing the Model Separately for LD and non-LD Samples. The same structural model specifying mediation paths (Figure 4) was tested separately for each group. The same covariates, SES, gender, child race, that were significant in the model for research question one, were included in the multi-sample model. Results demonstrated that the model fit the data adequately with children without LD, RMSEA = .012 (CI = .011 - .013), and relative fit indices, CFI = .919, TLI= .911. However, the model fit was adequate based on an absolute fit index, but below adequate for children with LD based on relative fit indices, RMSEA = .026 (CI = .018 - .033), and relative fit indices, CFI = .765, TLI= .740.

Multi-group model. The same model tested above was used to specify a multi-sample model to test for equivalence across samples of children with LD and without LD.

Procedural steps. The structural paths and factor loadings in the multi-sample model were freely estimated across groups, exercising no constraints on the factor loadings or paths across groups (see Figure 4). The results of the model where the paths were freely estimated fit the data adequately, RMSEA = .012 (CI = .011 - .013), and relative fit indices, CFI = .914, TLI= .908. The results of this freely estimated model were compared to a model in which the factor loadings and all paths were constrained to be equal across groups. The fit of the model significantly worsened, based on the chi-square distribution for 40 degrees of freedom ($p<.001$), when the factor loadings, covariate estimates, and structural paths were all constrained to be

equal across groups, X^2 = 452.58, p = 0.0, df = 40, RMSEA = .013 (CI= .012 - .014), CFI = .884, TLI =.879. See Table 26 for group differences on factor loadings and path estimates.

Research question 1a for multi-group sample. In the freely estimated model, parent depression did not significantly predict kindergarten psychosocial behavior or academic achievement via parent school involvement for either group. Parent depression was not significantly related to parent school involvement for either group. Tests of indirect effects between parent depression, school involvement, and kindergarten variables were all non-significant for children without LD (β= -.002, p=.590 for the indirect effect on kindergarten psychosocial behavior, β= -.002, p=.594 for the indirect effect on kindergarten reading achievement, and β= -.002, p=.590 for the indirect effect on kindergarten math achievement). This finding held for children with LD (β= -.002, p=.592 for the indirect effect on kindergarten psychosocial behavior, β= -.003, p=.599 for the indirect effect on kindergarten reading achievement, and β= -.002, p=.592 for the indirect effect on kindergarten math achievement). Although these findings were not aligned with apriori hypotheses, these findings were not unexpected given the full sample model results.

Other interesting findings arose regarding the influence of parent variables on kindergarten outcomes. Parent school involvement significantly predicted early psychosocial behavior for children without LD (β= -0.254, t>1.96), however this relation was non-significant for children with LD. Likewise, parent school involvement significantly predicted kindergarten reading achievement (β= -.260, t>1.96) and math achievement (β= -.275, t>1.96) for children without LD, but did not significantly predict this relation in children with LD.

Research question 1c for multi-group sample. Paths between kindergarten achievement and psychosocial behavior to fifth grade achievement were examined within the

freely estimated model for each group. For children without LD, kindergarten reading achievement significantly predicted fifth grade achievement in math and reading; this relation did not hold for children with LD. Similarly, kindergarten math achievement significantly predicted fifth grade psychosocial behavior for children without LD, but not for children with LD. Kindergarten math achievement more strongly predicted fifth grade reading achievement for children with LD (β= 0.786, t>1.96) compared to children without LD (β= 0.279, t>1.96). However, the opposite was true for the magnitude of relation between kindergarten math achievement and fifth grade math achievement; this relation was stronger for children without LD (β= 0.519, t>1.96) as compared to children with LD (β= 0.345, t>1.96). More positive kindergarten psychosocial behavior significantly predicted higher levels of children's motivation in fifth grade and higher math achievement in fifth grade for children without LD, however these findings did not hold for children with LD. Interestingly, more positive kindergarten psychosocial behavior more strongly predicted more positive fifth grade psychosocial behavior for children with LD (β=.456, t>1.96) as compared to children without LD (β=.377, t>1.96).

Research question 1d for multi-group sample. Paths between fifth grade student-rated motivation and fifth grade teacher-rated psychosocial behavior to fifth grade achievement were examined within the freely estimated model for each group. Fifth grade psychosocial behavior significantly predicted reading and math achievement in fifth grade for children without LD, but not for children with LD. Student-ratings of motivation were significantly predictive of fifth grade math achievement for children with LD indicating that children with LD were more likely to rate themselves as highly motivated in school but receive lower math achievement scores (β= -.293, t>1.96). Conversely, for children without LD, higher student-ratings of motivation were significantly predictive of higher fifth grade math achievement (β= .113, t>1.96).

Influence of covariates. The same covariates, SES, gender, child race, that were significant in the model for research question one, were included in the multi-sample model. Several differences between children without LD and children with LD emerged. All covariate pathways specified in research question one remained significant for children without LD ($p<.001$, except the effect of gender on kindergarten psychosocial behavior and the effect of gender on fifth grade psychosocial behavior was significant at the $p<.01$ level). However, for children with LD, five covariate paths were significant. First, children's gender had a stronger influence on kindergarten psychosocial behavior for children with LD ($\beta= .253$, $p=.002$), than children without LD ($\beta=.228$, $p<.001$). This finding suggests that females with LD were more likely to have more positive psychosocial behavior than their male peers. Additionally, African-American/Black children with LD were more likely to have more negative psychosocial behavior ratings in kindergarten ($\beta= -.431$, $p=.001$) compared to their LD peers. Regarding effects of covariates on achievement variables, children with LD identified as Hispanic-not otherwise specified were more likely to have lower kindergarten reading achievement than their LD peers ($\beta=-.407$, $p<.001$), and this relationship was stronger for children with LD identified as Hispanic-not otherwise specified as compared to Hispanic-not otherwise specified children without LD ($\beta=-.073$, $p=.002$). Children with LD identified as Native American were also more likely to have lower kindergarten math achievement ($\beta=-.132$, $p=.001$). Finally, children with LD from families with higher SES were more likely to have higher fifth grade reading achievement ($\beta=.431$, $p<.001$) compared to children without LD from families with higher SES ($\beta=.159$, $p<.001$).

Table 26

Parameter Estimates for a Four-Factor Structural Regression Multi-group Model Across Children with and without Learning Disability

Items	Unstandardized	Standardized	Unstandardized	Standardized
	No Learning Disability		Learning Disability	
Parent Depression (PD)				
Felt the "blues"	1.000	0.726	1.000	0.771
Felt depressed	1.124	0.722	1.124	0.762
Felt bothered	0.926	0.541	0.926	0.558
Poor appetite	0.864	0.511	0.864	0.503
Trouble focusing	1.062	0.611	1.062	0.531
Felt things were effortful	1.104	0.520	1.104	0.550
Felt fearful	0.600	0.498	0.600	0.375
Difficulty sleeping	1.080	0.506	1.080	0.516
Talked less	0.844	0.601	0.844	0.473
Felt lonely	0.835	0.591	0.835	0.651
Felt sad	1.102	0.703	1.102	0.781
Difficulty "to get going"	0.919	0.539	0.919	0.596
Parent School Involvement (PSI)				
Volunteer at School	1.000	0.718	1.000	0.771
Attend Open House	0.924	0.672	0.924	0.809
Attend PTA/PTO	0.666	0.505	0.666	0.555
Attend School Event	0.728	0.547	0.728	0.571
Participate in School Fundraising	0.693	0.523	0.693	0.279
Early Psychosocial Behavior (EPB)				
Self-Control	1.000	0.745	1.000	0.779
Interpersonal Skills	1.133	0.811	1.133	0.848
Approaches to Learning	1.244	0.866	1.244	0.912
Internalizing Behavior	0.465	0.418	0.465	0.392
Externalizing Behavior	0.915	0.695	0.915	0.637
Fifth-grade Psychosocial Behavior (FPB)				
Approaches to	1.000	0.898	1.000	0.887

Table 26 (cont'd)

Learning				
Interpersonal Skills	0.874	0.820	0.874	0.763
Self-Control	0.766	0.771	0.766	0.730
Internalizing Behavior	0.398	0.433	0.398	0.444
Externalizing Behavior	0.736	0.758	0.736	0.705
	Direct Effects (No LD)		Direct Effects (LD)	
PD → EPB	-0.031(ns)	-0.030 (ns)	-0.031 (ns)	-0.030 (ns)
PSI → EPB	-0.143	-0.254	-0.143	-0.018 (ns)
PD → PSI	0.012 (ns)	0.006 (ns)	0.012 (ns)	0.089 (ns)
EPB → FPB	0.493	0.377	0.524	0.456
K Math → FPB	0.009	0.139	0.014 (ns)	0.192
PD → K Reading	-1.030 (ns)	-0.048 (ns)	-1.030 (ns)	-0.073 (ns)
PSI → K Reading	-3.049	-0.260	-3.049	-0.028 (ns)
PD → K Math	-0.873(ns)	-0.042 (ns)	-0.873 (ns)	-0.052 (ns)
PSI → K Math	-3.151	-0.275	-3.151	-0.025 (ns)
EPB → Motivation	0.247	0.176	0.351 (ns)	0.225 (ns)
FPB → 5th Reading	2.088	0.133	-0.305 (ns)	-0.020 (ns)
FPB → 5th Math	1.037*	0.066*	0.793 (ns)	0.051 (ns)
EPB → 5th Math	1.348	0.065	1.623 (ns)	0.092 (ns)
K Reading → 5th Reading	0.296	0.301	-0.658 (ns)	-0.515 (ns)
K Math → 5th Reading	0.281	0.279	0.850	0.786
K Reading → 5th Math	0.094	0.095	0.317 (ns)	0.247 (ns)
K Math → 5th Math	0.528	0.519	0.375	0.345*
Motivation → 5th Math	1.666	0.113	-3.320	-0.293
	Indirect Effects			
PD → PSI → EPB	-.002 (ns)	-.002 (ns)	-.002 (ns)	-.002 (ns)
PD → PSI → K Reading	-.035 (ns)	-.002 (ns)	-.035 (ns)	-.003 (ns)
PD → PSI → K Math	-.036 (ns)	-.002 (ns)	-.036 (ns)	-.002 (ns)

Note: (ns) indicates paths were non-significant. * indicates paths were significant at ($p<.01$). All other structural paths were significant at ($p<.001$).

Multi-group Moderation Analysis. Research question 2b sought to explore whether early academic achievement and psychosocial behavior moderated the relation between parent school involvement and children's motivation and psychosocial behavior in fifth grade differently for children with LD (*n*=410) as compared to children without LD (*n*=10,220) by testing the structural latent variable model in research question 1b across groups. Overall, results suggest that kindergarten academic achievement and psychosocial behavior do not moderate relations between parent school involvement and fifth grade outcomes for children with or without LD. Direct relations between parent school involvement and fifth grade outcomes, motivation and psychosocial behavior, were non-significant for both groups. Specifically, parent school involvement did not significantly predict fifth grade motivation for children with LD (β= -.076, *SE* = .119, p=.521), or children without LD (β= .027, *SE* = .031, p=.391). Parent school involvement did not significantly predict fifth grade psychosocial behavior for children with LD (β= -.041, *SE* = .069, p=.559), or children without LD (β= -.027, *SE* = .021, p=.200). Additionally, interactions between parent school involvement and kindergarten psychosocial behavior (LD sample: β= .219, *SE* = .136, p=.108; No LD sample: β= -.053, *SE* = .031, p=.088), parent school involvement and kindergarten reading achievement (LD sample: β= .012, *SE* = .013, p=.362; No LD sample: β= .000, *SE* = .001, p=.835), and parent school involvement and kindergarten math achievement (LD sample: β= -.018, *SE* = .012, p=.138; No LD sample: β= -.001, *SE* = .001, p=.398) on fifth grade motivation where non-significant for children with LD and children without LD. Interactions between parent school involvement and kindergarten psychosocial behavior (LD sample: β= -.049, *SE* = .090, p=.586; No LD sample: β= -.012, *SE* = .022, p=.566), parent school involvement and kindergarten reading achievement (LD sample: β= .003, *SE* = .005, p=.501; No LD sample: β= .001, *SE* = .001, p=.238), and parent school

involvement and kindergarten math achievement (LD sample: β= -.005, *SE* = .004, p=.204; No LD sample: β= .000, *SE* = .001, p=.692) on fifth grade psychosocial behavior where non-significant for children with LD and children without LD.

Research Question Three: Group Comparison Between Subtypes of LD

The third research question sought to explore whether the relation between parent depression and parent school involvement on academic achievement and psychosocial behavior in kindergarten, and academic achievement, psychosocial behavior, and motivation in fifth grade by testing a structural latent variable model in research question one differed between children with RD (*n*=180), RD-MD (*n*=230), and children without LD (*n*=10,220). Overall, results suggest that the theoretical model outlined and tested in research question 1 does not fit the data for subtypes of LD including children with RD and children with RD-MD in this study. Multi-group analysis to examine the difference in model fit, and differences in construct factor loadings and paths was unable to be computed.

Testing the Mediation Model Separately for LD Subtype Samples. The same structural model specifying mediation paths (Figure 4) was tested separately for each group. The same covariates, SES, gender, child race, that were significant in the model for research question one, were included in the multi-sample model. Results demonstrated that the model fit the data adequately with children without LD, RMSEA = .012 (CI = .011 - .013), and relative fit indices, CFI = .919, TLI= .911. However, the model did not fit the data well for children with RD, RMSEA = .034 (CI = .017 - .046), and relative fit indices, CFI = .673, TLI= .638. Lastly, the model did not converge for children with RD-MD. Attempts to correct convergence issues were unsuccessful, including addressing negative residual variances, rescaling the residual variances of variables with a value larger than 10, increasing the number of iterations, and freeing specific

factor loadings and fixing factor variances. Given that the model had poor fit for one subtype of LD sample, and the aim of this study research question was to examine the fit of the same apriori specified theoretical model across three subtypes of LD, specific changes to the model in research question 1 (e.g., removing non-significant paths) were not completed.

Testing the Moderation Model Separately for LD Subtype Samples. To explore whether early academic achievement and psychosocial behavior moderated the relation between parent school involvement and children's motivation and psychosocial behavior in fifth grade differently for children with RD (*n*=180), children with RD-MD (*n*=230), and children without LD (*n*=10,220) the same structural model specifying moderation paths (Figure 5) was tested separately for each group. The same covariates, SES, gender, child race, that were significant in the model for research question 1b, were included in the multi-sample model. Results demonstrated that the model fit the data for children without LD, as well as for children with RD. As in the LD and no-LD analysis in research question 2b, neither direct paths between parent school involvement and fifth grade motivation or psychosocial behavior or hypothesized moderated paths between parent school involvement, kindergarten achievement, and kindergarten psychosocial behavior were significant for either group. The model was not identified for children with RD-MD. Multi-group analysis across subtypes of LD was not completed due to lack of model fit with all groups and non-significant findings in the full sample and dichotomous LD-no LD sample.

CHAPTER 5

DISCUSSION

This study aimed to understand patterns in academic achievement, psychosocial behaviors, and motivation in kindergarten and fifth grade for children with and without learning disability (LD), as well as across subtypes of LD, by testing a theoretical, developmental model of learning and behavior. Given the complexities of identifying LD and categorizing subtypes of LD, many studies have not attempted to address possible group differences, particularly in relation to psychosocial behavior and motivation. However, there is evidence to support that differences in learning and behavioral outcomes do exist across subtypes of LD (Auerbach, Gross-Tsur, Manor, & Shalev, 2008; Morgan, Farkas, & Wu, 2009; Scarborough & Parker, 2003; Willcutt et al., 2013). Moreover, research and clinical practice have focused on the effectiveness of academic interventions in school to target learning deficits for children with LD, however relatively less is known about the effects of parent variables, including parent depression and parent school involvement, on short- and long-term outcomes for children with LD. Latent variable structural equation modeling allowed for testing predictive pathways between parent variables and children's outcomes in kindergarten and fifth grade within a nationally representative sample of children entering kindergarten in 1998.

This study examined the relations between symptoms of parent depression and parent school involvement in kindergarten on academic achievement in reading and math and psychosocial behavior in kindergarten, as well as student psychosocial behavior and student motivation in fifth grade. This study also examined direct effects of kindergarten achievement and psychosocial behavior on student's academic achievement, psychosocial behavior, and

school motivation in fifth grade. Finally, this study compared these relations across groups of students with and without LD's.

The hypothesized model was only partially supported by the data. Results indicated that symptoms of parent depression did not predict parents' school involvement as defined by behaviors within the school setting, however parent school involvement was directly related to more positive kindergarten outcomes for children. LD status did not moderate this relationship, suggesting that parent school involvement was a statistically significant factor in promoting more positive kindergarten outcomes for children without LD only. Additionally, parent school involvement in kindergarten had little long-term effect on student's motivation or psychosocial behaviors in fifth grade. This suggests that this type of parent engagement may confer more short-term benefits for some students and other factors, such as kindergarten achievement and psychosocial behaviors, have stronger effects on later outcomes. Thus, hypotheses involving parent school involvement as a mediator of parent depression on kindergarten outcomes were not supported, nor were effects of parent school involvement on later outcomes across children with and without LD.

Additionally, complex relations between kindergarten and fifth grade outcomes arose. Specifically, kindergarten math and reading achievement was predictive of fifth grade math and reading achievement for children without LD, however for children with LD only kindergarten math achievement was predictive of later reading and math performance. The hypothesis that direct relations between kindergarten and fifth grade outcomes would be stronger for children with LD and multiple LD's was not fully supported. In fact, most relations between kindergarten and fifth grade achievement were stronger for children without LD, with the exception of the relation between kindergarten math achievement and fifth grade reading achievement. These

results suggest an important role for developing math proficiency early on, particularly for children with learning disabilities, as higher math proficiency appears to result in long-term academic benefits for all children. Additionally, these results suggest that other factors including, biologically-driven neuropsychological factors and the potential compound effects of long-term academic delays, may have a strong influence the developmental trajectory and later outcomes for children with LD. Furthermore, kindergarten psychosocial behavior was predictive of fifth grade psychosocial behavior for all students in the study sample, as well as fifth grade math achievement and school motivation for children without LD. Thus, efforts to develop student's non-academic skills including interpersonal skills, executive functioning skills (attention, task persistence, and organization), and social-emotional functioning early in childhood have lasting effects on these behaviors in late-elementary school and resulting academic functioning.

Finally, hypotheses regarding the relation between fifth grade psychosocial behaviors, student motivation, and academic achievement were only partially supported, and hypotheses regarding the differential magnitude of these relations being greatest for children with multiple LD's or single LD were not supported. Psychosocial behavior in fifth grade was related to fifth grade math and reading achievement for children without LD. Moreover, student motivation was predictive of fifth grade math achievement for children with and without LD, however the direction of this relation was opposite for children with LD and children without LD, such that children with LD who rated themselves as more motivated in school were more likely to have lower fifth grade math achievement. Thus, these findings provide counter evidence to previous studies that indicate children with LD demonstrate clinically significantly lower school motivation compared to their peers.

This study provides unique contributions to the literature regarding early parent variables and academic and psychosocial outcomes for children with LD as compared to children without LD, and controlled for various demographic variables that affect children's outcomes using a nationally representative data set and weights to allow results to generalize for the broader population of children entering kindergarten in 1998. The following sections review the study results in detail.

Parent Depression and School Involvement as Predictors of Kindergarten Outcomes

It was originally hypothesized that higher symptoms of parent depression would predict lower academic achievement and less positive psychosocial behaviors in kindergarten via lower levels of parent school involvement. However, the results of this study did not support this mediational effect for children with or without LD. At the individual item level, children with LD were more likely to have parents who reported worse appetite, feeling "blue," trouble focusing, feeling depressed, feeling fearful, and talking less compared to children without LD. At the subgroup level, fewer significant differences arose; children with RD or RD-MD had parents who endorsed more problems related to appetite, feeling fearful, and feeling "blue." These results indicated that parents of children with LD or multiple LD's may endorse more depressive symptoms. This novel finding contributes significantly to the literature as no other studies have explicitly examined symptoms of depression in parents of children with LD. Additionally, this finding is in line with other studies that have found higher rates of parent psychopathology, including symptoms of anxiety and higher parental stress, in parents of children with LD (Antshel & Joseph, 2006; Karande, Kumbhare, Kulkarni, & Shah, 2009) and other chronic conditions such as, ADHD (National Research Council and Institute of Medicine, 2009). Similarly, parents with lower SES also reported more problematic symptoms of depression. This

finding is not surprising given the overwhelming research evidence that poverty is associated with higher rates of depression (Belle, 1990; Carlson & Corcoran, 2001; Johnson & Flake, 2007; McLoyd, 1990; Pachter et al., 2006). It is likely that factors including family SES, and other variables not accounted for in this study such as preschool enrollment, academic intervention, and other home and school characteristics, contribute more significantly to the academic and psychosocial outcomes in kindergarten for children with LD.

Despite significant group differences in symptoms of parent depression, hypothesized relations between symptoms of parent depression and kindergarten psychosocial behaviors were not significant. This finding is contrary to research indicating higher parental depression is associated with more psychosocial problems in children in kindergarten and first grade (Ashman, Dawson, & Panagiotides, 2008; Kurstjens & Wolke, 2001). Similarly, parent depression did not significantly predict kindergarten math achievement for children without LD or math or reading achievement for children with LD. These findings were contrary to original study hypotheses as research suggests parental depression is linked to increased psychosocial problems and lower academic achievement in children (Champion et al., 2009; Cortes et al., 2009; Goosby, 2007; Gross, Shaw, Moilanen, Dishion, & Wilson, 2008; Martins & Gaffan, 2000; Mazza et al., 2009; Rice, Lifford, Thomas, & Thapar, 2007). It may be that other demographic factors such as, SES, play a more significant role in predicting early academic achievement and psychosocial behavior. Likewise, factors not included in this study including, school and teacher variables and parent engagement practices at home and in the community, may serve as protective factors buffering children from possible negative influences associated with parent depression.

Interestingly, one exception was noted; higher rates of parent depression predicted lower kindergarten reading achievement for children without LD. This finding aligns with research

suggesting that increased parent depression is related to poorer academic outcomes for typically developing children. Extant literature suggests that more depressed parents, mothers particularly, may have fewer positive interactions with their child and read less frequently and for shorter duration to their children, which may lead to reduced exposure to language and written text (Bigatti, Cronan, & Anaya, 2001; Sohr-Preston & Scaramella, 2006). This significant finding did not hold true for the LD sample. In this study children with LD represented students with persistent academic difficulties as they either continued to demonstrate academic problems into fifth grade despite potential intervention efforts. This group of students with persistent, severe LD likely demonstrate significant neuropsychological deficits that impair their reading skills and abilities (Pennington & Bishop, 2009), and it is likely that these neurobiological factors are strong predictors of reading achievement in addition to or above and beyond some parenting variables such as, parent depression. This is the first study known to the author to examine parent depression on child outcomes specifically for children with LD and highlights the important role of factors such as, SES and neuropsychological vulnerabilities, in predicting student achievement and behavior.

Regarding parent school involvement, group differences emerged between children with LD and children without LD. Parents with children without LD were more likely to attend open houses, PTO meetings, volunteer at school, and participate in school fundraisers. Additionally, parents of children with RD-MD engaged in these activities significantly less than parents of children without LD, and participated in fundraising events and open house events significantly less than parents of children with RD only. Despite group mean differences parent school involvement did not significantly predict kindergarten outcomes for children with LD. Thus, parent school involvement does not serve as a significant protective factor against academic

underachievement as originally hypothesized. As with parent depression, the current study is one of few to examine the influence of parent school involvement on outcomes for children with LD. Prior studies (Hill et al., 2004; McLoughlin, Edge, & Strenecky, 1978) have suggested that interactions between families and school staff allow for exchange of important information about children's development, encourage communication between settings, foster the relationship between families and schools, and lead to more positive outcomes. However, the current findings suggest that parent school involvement as defined by participation in various school events may not be the only, or most significant, avenue by which parents of children with LD engage with their child's educational milieu. This finding does not suggest that parent school involvement is not important in the larger context of child development nor that the potential additive effects of parent school involvement along with other protective factors (e.g., parent engagement at home, school resources, positive teacher factors, parent belief's about their child's education) have a more profound influence on achievement and psychosocial behavior, but rather that parent school involvement as narrowly defined in this study is only a small component of the larger "puzzle" of child development.

In contrast to the null findings for children with LD, parent school involvement significantly predicted higher math and reading achievement and more positive psychosocial behavior in kindergarten for children without LD. This finding is consistent with research that highlights the positive relations between parent involvement and early academic skills, psychosocial behaviors and motivation (Christenson, Rounds, & Gorney, 1992; Dickinson & DeTemple, 1998; Gauvain, Savage, & McCollum, 2000; Jeynes 2005, 2007). Parent involvement in school-based activities may help children transition more smoothly from home to school environments and may provide more opportunities for parents and teachers to develop rapport

and communicate. Moreover, this finding supports research that suggests that parent participation in school activities is related to children's engagement in school, particularly in kindergarten (Izzo, Weissberg, Kasprow, & Fendrich, 1999). Although the body of literature on parent's involvement in their child's education as it relates to various learning outcomes is far from conclusive, the current study provides some support for the positive effects of fostering opportunities for parents to engage in school-based activities on children's learning outcomes. As noted in regards to the null effects of parent depression on outcomes for children with LD, the differential findings between children with and without LD may be due in part to the role of neuropsychological deficits in children with LD as a strong driver of outcomes in addition to environmental factors highlighting the complex and powerful role of biological predispositions (Geary et al., 2007; Pennington & Gilger, 1996).

In addition to understanding the influence of parent school involvement on kindergarten outcomes, this study explored whether parent school involvement in kindergarten had lasting effects on children's psychosocial behavior and motivation in fifth grade. The data did not support study hypotheses that higher levels of parent school involvement would predict more positive outcomes in fifth grade as moderated by levels of children's academic and psychosocial behavior in kindergarten. Parent school involvement was not directly related to children's psychosocial behavior or motivation in fifth grade for any subset of the sample. Thus, early parent school involvement may serve as a protective factor to promote children's outcomes in the short-term, however it is likely that complex interactions between other factors, such as continued parental support at home and school, academic achievement, social-emotional development, various home and school characteristics, and neuropsychological deficits,

throughout a child's elementary experience mitigate the academic and psychosocial trajectory for students long-term.

Finally, studies have indicated that differences in parent school involvement, defined by participation in school-based activities, and children's academic and psychosocial outcomes across socio-demographic characteristics as well (Hill & Craft, 2003). These claims were supported by the current study's results for the typically developing sample as family SES, race, and gender did not significantly contribute to parent school involvement for the LD sample. In this study, parents of typically developing children with higher SES were more involved in school based activities. This finding aligns with previous research suggesting that family SES was a stronger predictor of parent's involvement in school and at home (Grolnick et al., 1997), and suggests that families with lower SES do not access schools in the same way that families with higher SES do. For example, families with lower SES may lack adequate transportation to attend school functions, may have less flexibility in work hours, and may not have access to childcare for other children, among other potential barriers. Schools that provide multiple modes of communication (e.g., sending home memos regarding important school events, providing information via phone, internet, and in writing), demonstrate more flexibility in accommodating parent's various needs (e.g., scheduling day and evening meetings, incorporating weekday and weekend open houses, etc.), and support parent's efforts to develop relationships with educators and other parents in various ways (e.g., PTA/PTO, online parent groups, community-based activities) will likely not only be more successful in promoting parent school involvement across families from all SES's, but may also promote the academic achievement and psychosocial functioning of all students.

Differences in parent school involvement and academic achievement across racial groups also arose. Parents of African-American/Black children and Hispanic children were more likely to be less involved in school-based activities across the full sample. This finding supports some research that suggests African-American parents may be less involved in direct school activities compared to other parents (Kohl et al., 2000; Reynolds, Weissberg, & Kasprow, 1992) despite other research indicating no differences across racial groups (Harris, Kagey, & Ross, 1987). Research, including this study, examining ethnic/cultural differences is often confounded by socioeconomic variables (Hill & Craft, 2003), thus, it may be that some parents of African-American or Hispanic children have lower SES and the effects of poverty lead to barriers to parent school involvement (e.g., transportation, access to childcare, work hours, access to information via internet or other communication modes). Additionally, different cultural values and beliefs may drive parent's school involvement behavior. For example, Hill and Craft (2003) note that African American parents may place a higher value on monitoring their children's school performance and behavior and intervening within the home context, but not intervening within the school context directly via school-based events. Research suggests that parent school involvement in related to improved achievement for African-American/Black students (Hill et al., 2004), however further research is needed to examine cultural variables that influence parent's school involvement behaviors across ethnic/cultural groups.

In regards to early academic achievement, children identified as African-American/Black and Native American had lower kindergarten math scores, and children identified as Hispanic had lower kindergarten reading scores. For Native American and Hispanic children with LD, these relations were stronger as compared to their non-LD peers. Children from higher SES households had higher achievement in kindergarten and fifth grade. These differences highlight

deeply saddening and inequitable economic and racial disparities in student achievement from a young age that have been highlighted in the research for more than thirty years (Reardon & Galindo, 2009). Schools that implement policies and procedures to understand and address the barriers that parents face in accessing school-based activities and practices that promote achievement for disadvantaged youth (e.g., early childhood education opportunities), particularly historically marginalized minorities, may be more successful at closing the racial disparity gap and improving outcomes for all children.

Kindergarten Achievement and Psychosocial Behavior as Predictors of Fifth Grade Outcomes

Kindergarten Academic Achievement. A third aim of the current study was to examine the longitudinal effect of kindergarten achievement and psychosocial behavior on fifth grade outcomes for children with and without LD. Basic group differences emerged. As expected, children with one LD had lower kindergarten academic achievement than children without LD, and children with multiple LD's had the lowest academic achievement. The effect sizes for these group differences was large and reflects the core nature of LD; difficulty in academic learning and achievement.

Interestingly, kindergarten reading achievement predicted fifth grade academic achievement only for children without LD. However, kindergarten math achievement predicted fifth grade achievement for children with and without LD. The magnitude of the relationship between kindergarten math achievement and fifth grade reading achievement was stronger for children with LD. This finding provides evidence to support the importance of developing reading and math skills early on and is in line with previous research demonstrating the predictive value of kindergarten achievement on later academic achievement (Claessens,

Duncan, & Engel, 2009; Duncan et al., 2007; Claessens & Engel, 2013; Jordan, Kaplan, Ramineni, & Locuniak, 2009). However, this finding also suggests a unique role that early mathematics learning and proficiency plays in predicting and promoting children's long-term achievement, particularly for children with or at-risk of developing LD. Several education advocacy groups have put forth position statements espousing the importance of early mathematics learning for long-term academic attainment (National Association for the Education of Young Children; NAEYC, 2002; National Council of Teachers of Mathematics; NCTM; 2007; National Mathematics Advisory Panel; NMAP, 2008). Moreover, researchers have theorized about mechanisms by which early mathematics learning contributes to children's improved learning disposition overall. For example, children with higher levels of math skills may receive more reinforcement from the teacher. In turn, this may lead to more individual instruction time and/or grouping with higher ability students (Claessens & Engel, 2013). Furthermore, research suggests an uncoupling of intellectual functioning and reading performance such that children with LD possess generally intact cognitive functioning, however demonstrate marked difficulties in reading (Ferrer, Shaywitz, Holahan, Marchione, & Shaywitz, 2010). Thus, it is likely that reading performance in kindergarten does not predict future academic performance, particularly in the LD sample, due to an uncoupling in general cognitive skills that have greater predictive value on future academic performance. Given that a majority of children with LD in this sample had an RD, this effect may be even more pronounced in this study. Similarly, mathematics ability may serve as a proxy for general cognitive functioning (i.e., IQ) and thus may retain predictive value in estimating future academic performance. Higher math skills may foster development of basic neuropsychological abilities that also serve

development of reading skills such as sustained attention, working memory, and problem-solving skills (Geary, 2004; Geary 2006).

Finally, early reading skills taught and emphasized in kindergarten tend to encompass more associative learning processes as opposed to more assembled learning processes required for many early math skills. For example, in kindergarten children are expected to memorize the orthographic symbols associated with each letter in the alphabet, make associations between the orthographic symbol and sound of a letter, and begin to blend and parse letter sounds. These skills involve the ability to retrieve information from semantic memory and create associations, or associative processing. In contrast, while basic learned math facts also involve associative learning, early mathematics skills such as mentally representing a finite set of objects, counting objects, and comparing quantities require abstract numerical representations requiring assembled learning processes (Dennis, Landry, Barnes, & Fletcher, 2006). Thus, in kindergarten children at risk for persistent learning difficulties may not be as readily differentiated from their peers without learning difficulties in terms of reading ability due to the more basic nature of the reading task. Moreover, the degree of associative learning required to be a proficient reader in kindergarten may not have the same predictive weight on long-term learning outcomes as more assembled learning processes. Assembled learning processes that are required for many early math skills and support higher-order learning in reading and math (e.g., reading comprehension, arithmetic, etc.) likely do differentiate children with and without learning disabilities earlier in their schooling trajectory and thus are more predicative of long-term academic achievement. Thus, it is especially important to bolster young student's math skills, in addition to reading skills, that may target neuropsychological processes that are involved in assembled learning

processes to promote their long-term achievement, particularly for those students who have or are at-risk of developing an LD in the future.

In regards to fifth grade psychosocial outcomes, higher kindergarten math achievement in children without LD was predictive of more positive fifth grade psychosocial behavior, as defined by children's approaches to learning, interpersonal skills, self-control, and externalizing and internalizing problem behaviors. This finding supports previous studies that suggest early academic performance affects children's interpersonal skills, mood, and behavior (Fleming, Harachi, Cortes, Abbott, & Catalano, 2004; Lane, Beebe-Frankenberger, Lambros, & Pierson, 2001; Morgan, Farkas, & Wu, 2012; Wehby, Falk, Barton-Arwood, Lane, & Cooley, 2003). Unexpectedly, the results of this current study did not indicate that academic performance in kindergarten was predictive of later psychosocial behavior for children with or at-risk of developing LD. Although children with LD demonstrated lower psychosocial behavior in fifth grade compared to their non-LD peers in this study, the effect sizes were small for most components of psychosocial behavior (interpersonal skills, self-control, externalizing and internalizing behavior), except for approaches to learning (large effect size). There is some research to suggest that children with LD are more vulnerable to psychosocial problems (Gadeyne, Ghesquiere, & Onghena, 2004; La Greca & Stone, 1990; Maughan, Pickles, Hagell, Rutter, & Yule, 1996; Ochoa & Palmer, 1995). For example, it is established that many children with RD meet criteria for at least one behavioral or emotional disorder such as, ADHD (Goldstone et al., 2007, Maughan et al., 2003). However, in this study, children with co-morbid LD and ADHD were removed resulting in a "pure" LD sample. It may be that for children with or at-risk of developing an LD other factors, such as co-morbid ADHD and increasing academic demands throughout elementary school, mediate the relation between early academic

performance and later psychosocial behaviors. Additionally, children with or at-risk of LD may have lower approaches to learning (attention, task engagement, organization) and lower academic achievement in kindergarten, however it may be the compound effects of repeated academic underachievement from first grade through fifth grade that mediates the outcome of psychosocial behaviors in fifth grade, rather than solely their baseline performance in kindergarten.

Kindergarten Psychosocial Behavior. Children with or at-risk of developing LD performed lower on all components of kindergarten psychosocial behavior compared to their non-LD peers, however effect sizes were small except for approaches to learning (large effect size) and interpersonal skills (medium effect size). Only small effect sizes were found in terms of differences in psychosocial behavior between subtypes of LD, such that children with RD performed higher on approaches to learning and lower on internalizing problem behaviors compared to children with RD-MD. As noted above, this finding is aligned with extant literature suggesting that children with or at-risk of LD demonstrate lower levels of task engagement, attention, organization, and interpersonal skills compared to their non-LD peers (Goldston et al., 2007; Martinez & Semrud-Clikeman, 2004; Willcutt et al., 2011), and indicate the importance of and need for interventions targeted at improving executive functioning and social skills in children with LD. Moreover, kindergarten psychosocial behavior predicted fifth grade psychosocial behavior for children with and without LD. This finding suggests that there is a long-term effect of early psychosocial behaviors, and fostering children's ability to attend and engage in academic content, as well as work alongside other children is equally important to promote more positive long-term outcomes for all students.

Despite the positive direct influence of kindergarten psychosocial behavior on fifth grade psychosocial behavior, kindergarten psychosocial behavior only predicted fifth grade math achievement and student-rated motivation for children without LD in fifth grade. For typically developing children, this finding suggests that more positive kindergarten psychosocial behaviors lead to more positive fifth math achievement, and ability beliefs and intrinsic motivation in school. This finding is expected given the established support for long-term effects of psychosocial behavior on later academic achievement and motivation (Moore, Lippman, & Ryberg, 2015; Pintrich, 2000; Pintrich & De Groot, 1990; Pintrich & Zusho, 2002), and provides support for initiatives that focus on developing positive psychosocial behaviors early on.

As with other null findings in the LD-only sample, it may be that other factors not accounted for by this study, such as academic underachievement in first through fourth grade, teacher, classroom, and school variables, level of academic remediation throughout elementary school, presence of co-morbid conditions (e.g., ADHD), and measures of friendship and social support, are more predictive of the relation between kindergarten psychosocial behavior and fifth grade achievement and motivation for children with LD. Moreover, academic expectations and psychosocial behavior expectations increase over time; in kindergarten children may be expected to attend to short lessons, have less materials to remember and organize, and are often guided through many social situations, whereas in mid-to-late elementary school the psychosocial demands are much greater (e.g., managing multiple classrooms and teachers, higher cognitive load, greater social demands). Thus, children at-risk of developing or with an LD may be rated by their teachers as having kindergarten psychosocial skills that are highly related with their academic achievement in kindergarten, however the developmental trajectory of psychosocial behaviors and academic achievement may become uncoupled over time such that teacher's

perceptions of student's psychosocial behaviors in kindergarten are not predictive of fifth grade achievement due to the changing nature of academic expectations and psychosocial demands.

Finally, several demographic patterns related to levels of kindergarten psychosocial behavior appeared in this study. First, children's age at kindergarten entry significantly predicted psychosocial behavior, such that older children had higher levels of psychosocial behavior. This finding suggests that age-related maturation plays a strong role in children's attention, school engagement, organizational skills, interpersonal skills, self-control, and lower externalizing and internalizing problems. Moreover, female students were more likely to have higher levels of psychosocial behavior, and the magnitude of this relation was stronger for children with LD compared to children without LD. There is evidence to suggest that gender differences in psychosocial behavior exist (Duckworth & Seligman, 2006; Matthews, Ponitz, & Morrison, 2009; Nowell & Hedges, 1998; Weaver-Hightower, 2003). Given that psychosocial behavior was based on teacher ratings, rater bias effects may also influence these findings. For example, teachers are more likely to rate males as having higher externalizing behaviors. Additionally, children identified as African-American/Black had lower levels of psychosocial behavior compared to their peers (the magnitude of this relationship was even stronger for African-American/Black children with or at-risk of developing LD). The racial disparity in teacher-rated psychosocial behaviors may also be due in part to rater bias (Wright, 2015), but also parallels previous research suggesting that a racial gap in academic achievement exists between minority students, particularly African-American/Black students, and their peers. This finding highlights several important considerations that should continue to be the subject of future research and educational system policy including understanding the implicit bias in teacher-ratings of minority student's psychosocial behaviors (Gilliam, Maupin, Reyes, Accavitti, & Shic, 2016),

the relation between early academic problems and early psychosocial behaviors in African-American/Black children, and the dire need for teacher training programs and schools to better understand the factors behind racial achievement gaps and to intervene early to promote student's psychosocial behaviors, particularly for minority students.

Fifth Grade Psychosocial Behavior and Motivation as Predictors of Academic Achievement

The fourth and final aim of this study was to examine the relation between fifth grade psychosocial behavior and student-rated motivation on fifth grade achievement for children with and without LD. Not surprisingly, children with LD had significantly lower academic achievement compared to their non-LD peers in fifth grade. Children with LD also had lower psychosocial behavior compared to non-LD peers, however the effect size was small for most components except approaches to learning (large effect size) and there were no significant differences between subtypes of LD as compared to children without LD. Interestingly, more positive fifth grade psychosocial behavior predicted higher academic achievement in reading and math for children without LD only. This finding is unique in that this study suggests that effects of fifth grade psychosocial behavior on achievement operate differentially for children with and without LD. Again, part of this variation may be explained by rater effects and little variation in psychosocial behaviors across children with and without LD, as compared to great variation in academic achievement between the two sample groups. In other words, teachers did not rate students with LD as having significantly lower psychosocial behaviors in most areas compared to their non-LD peers therefore psychosocial behaviors may explain relatively little to no variance in achievement above and beyond the core nature of LD (i.e., academic difficulty due to neuropsychological deficits). Additionally, other research has found that only approaches to learning significantly predicts later academic achievement (Morgan, Farkas, Tufis, & Sperling,

2008), thus it may be that only specific components of psychosocial behavior contribute to academic achievement.

Regarding motivation, children with LD reported lower motivation in school compared to their non-LD peers however effect sizes were small. Higher levels of self-reported motivation, as defined by ability beliefs and intrinsic motivation, were predictive of higher fifth grade math for children without LD. However, the opposite was true for children with LD, such that higher levels of self-reported motivation were predictive of lower levels of math achievement in fifth grade. These findings may suggest several phenomena. First, there may be issues related to reliability of self-report measures in children that require caution when interpreting the relation between student's motivational beliefs and their academic outcomes (Fulmer & Frijters, 2009). Second, children with LD may accurately perceive themselves as hard workers, and in many cases potentially work harder in some academic subjects than their non-LD peers, and thus may view themselves as highly intrinsically motivated in school and capable of completing the work despite difficulties associated with their learning disability and lower academic grades/achievement. Finally, it may be that children with LD with the greatest academic underachievement endorse more positive ability beliefs and intrinsic motivation if they wish to project to others that that they are highly motivated in school and have a high level of self-efficacy despite significant academic struggles. Overall, these findings support prior research suggesting that children with LD do not demonstrate significantly lower intrinsic motivation or more negative ability beliefs compared to their non-LD peers (Wilson & David, 1994; Zisimopoulos & Galanaki, 2009). Efforts to continue to maintain student's motivation in school despite academic underachievement are warranted; these results are encouraging in the sense that

children whom experience academic underachievement do not necessarily experience low school motivation.

Finally, differences in fifth grade academic achievement and psychosocial behaviors emerged across socio-demographic groups. The relation between higher SES and higher fifth grade reading achievement was stronger for children with LD compared to children without LD, and paralleled findings between higher SES and higher kindergarten achievement. This finding indicates that the effects of poverty continue to affect children's academic achievement in later elementary school and contribute to a stable economic gap in achievement without our schools. Similarly, differences in academic achievement and psychosocial across racial groups persisted in fifth grade. Specifically, Hispanic students had lower reading achievement, African-American/Black students had lower math achievement and lower psychosocial behavior, and Asian students had higher psychosocial behavior. Interestingly, research suggests that similar mechanisms involved in rater bias that lead African-American/Black, Hispanic, and Native American students with lower teacher-rated psychosocial behaviors, also contribute to higher teacher-rated psychosocial behaviors across Asian students (Chang & Demyan, 2007). Again, these findings suggest that parity has not been achieved across all racial and SES groups in terms of academic and psychosocial outcomes in early and late elementary school and highlights the need for greater attention to issues of diversity and equity within educational systems. Finally, a significant effect of gender was found for fifth grade math achievement, as males were more likely to have higher math achievement compared to females. These findings suggest gender differences in math are present for typically developing children in fifth grade and align with research suggesting females are at-risk for lower math achievement compared to their male peers (Fryer & Levitt, 2010; Jordan, Kaplan, Nabor Olah, & Locuniak, 2006). As with racial and

economic disparities, this finding is disheartening and confirms the need for further research to examine the factors that may contribute to this difference in late elementary school. For example, so research indicates that female students may internalize societal messages that discourage them from pursuing mathematics education and activities which has led to a surge of efforts to engage females in science, math, and technology programs at earlier ages (Hyde, Lindberg, Linn, Ellis, & Williams, 2008).

Conclusions and Clinical Implications

Conclusions about the predictive nature of parent variables on kindergarten outcomes for children with or at-risk of developing LD, as well as effects of kindergarten and fifth grade achievement and psychosocial behavior on fifth grade achievement for children with and without LD were established. Although, parent depression did not affect parents school involvement, parent depression was related to kindergarten reading achievement suggesting an important role for intact parental mental health in supporting children's achievement. Clinically, school and mental health professionals involved in the community should be alert for symptoms of parent depression and offer resources and support early on. Additionally, while parent school involvement was not directly related to fifth grade psychosocial behavior and motivation, it was related to children's psychosocial behavior and achievement for children without LD. School policies and procedures that address barriers to parents involvement in school-based activities, and provide additional opportunities for parents to connect and communicate with their children's teachers and school staff outside traditional school activities would likely benefit more students across socio-demographic groups, and potentially for parents of children with disabilities, including LD. For children without LD, it appears that kindergarten math and reading achievement and early psychosocial behaviors effect later outcomes, however for

children with LD it appears that kindergarten math achievement has a particularly strong predictive value on later achievement. Programs that focus on increasing early math skills, as well as early psychosocial behavior, and interventions that target the core neuropsychological deficits that characterize a child's LD will likely support the greatest academic and psychosocial outcomes for children with LD.

Limitations and Future Research

There are several limitations of this study due, in part, to the non-experimental nature of the data. First, no causal inferences can be made about parent involvement in school or parental depression on academic or psychosocial outcomes because an experimental design is necessary to establish the extent to which altering early parent involvement, treating parent's psychological problems, or intervening in early academic achievement would influence child outcomes in fifth grade. A second limitation is that although the ECLS-K began with a representative sample of students, due to missing data, the representativeness of the final sample may have been affected. A third limitation involves identification of students as LD. Since information about how the LD was diagnosed (e.g., assessment procedures and data points) are not available, there may be students who are inaccurately identified as LD or represent higher or lower functioning within the heterogeneous spectrum of students with LD. However, the purpose of this study was to examine whether students identified with LD in school, and presumably receiving services for the LD and having awareness of their LD label, differed from students without LD in terms of motivation, psychosocial behavior, and achievement, as well as early parent variables, and not necessarily the validity of the method used to diagnose the student's LD. Finally, there are limitations involved in teacher and self-report of behaviors, cognitions, and moods, such as rater bias and developmental limitations on metacognition and accuracy of self-reflection.

Given that the long-term effects of kindergarten achievement and psychosocial behavior on fifth grade outcomes was mixed for children with LD particularly, future research should examine interim time points (e.g., first grade, third grade) to examine if there are pivotal time points at which children who have or are at-risk of developing LD begin to show marked decreases in skills. This type of research may inform the timing of interventions to mitigate the negative effects of early academic underachievement and lower psychosocial behavior on future outcomes. Additionally, future research should examine other aspects of home and school environments that may play an important role in predicting achievement and psychosocial outcomes for children with LD. These factors may include home literacy, enrollment in preschool, type and effect of school academic intervention, and social support/relationship variables. Finally, children with LD are a heterogeneous group, and although this study was unable to examine the predictive pathways between kindergarten and fifth outcomes for subtypes of children with LD, future studies should continue to examine differences in predicting variables and outcomes for children across children with subtypes of LD.

APPENDIX

MICHIGAN STATE
UNIVERSITY

Initial IRB Application Determination *Exempt*

December 9, 2015

To: Jodene Fine
440 Erickson Hall

Re: **IRB# x15-1316e** Category: Exempt 4
Approval Date: December 9, 2015

Title: Parenting and Child Outcomes in Children with and without Learning Disabilities

The Institutional Review Board has completed their review of your project. I am pleased to advise you that **your project has been deemed as exempt** in accordance with federal regulations.

The IRB has found that your research project meets the criteria for exempt status and the criteria for the protection of human subjects in exempt research. **Under our exempt policy the Principal Investigator assumes the responsibilities for the protection of human subjects** in this project as outlined in the assurance letter and exempt educational material. The IRB office has received your signed assurance for exempt research. A copy of this signed agreement is appended for your information and records.

Renewals: Exempt protocols do not need to be renewed. If the project is completed, please submit an ***Application for Permanent Closure***.

Revisions: Exempt protocols do not require revisions. However, if changes are made to a protocol that may no longer meet the exempt criteria, a new initial application will be required.

Problems: If issues should arise during the conduct of the research, such as unanticipated problems, adverse events, or any problem that may increase the risk to the human subjects and change the category of review, notify the IRB office promptly. Any complaints from participants regarding the risk and benefits of the project must be reported to the IRB.

Follow-up: If your exempt project is not completed and closed after three years, the IRB office will contact you regarding the status of the project and to verify that no changes have occurred that may affect exempt status.

Please use the IRB number listed above on any forms submitted which relate to this project, or on any correspondence with the IRB office.

Good luck in your research. If we can be of further assistance, please contact us at 517-355-2180 or via email at IRB@msu.edu. Thank you for your cooperation.

Sincerely,

H. McGee

Harry McGee, MPH
SIRB Chair

c: Seema Mahdavi

Office of Regulatory Affairs
Human Research Protection Programs

Biomedical & Health Institutional Review Board (BIRB)

Community Research Institutional Review Board (CRIRB)

Social Science Behavioral/Education Institutional Review Board (SIRB)

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