SOCIOEMOTIONAL COMPETENCE AND ACADEMIC PROFILES OF YOUNG CHILDREN WITH LEARNING DIFFICULTIES

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ABSTRACT

CARRIE MILLS: Socioemotional Competence and Academic Profiles of Young Children with Learning Difficulties
(Under the direction of Rune Simeonsson)

Given the significance of healthy socioemotional functioning for positive developmental and educational outcomes, identifying relationships between children's academic achievement and associated social skills deficits is critical. While mounting evidence describes the neuropsychological and academic profiles associated with three specific subtypes of learning disabilities, the degree of socioemotional competence associated with each subtype is less clear. This study utilizes data from the Early Childhood Longitudinal Study - Kindergarten (ECLS-K) to examine socioemotional competence, as defined by social skill ratings, among kindergarten through fifth grade students with learning difficulties who demonstrate academic profiles indicative of underlying academic subtypes. The effect of gender and correlated influences of socioeconomic status and home environment characteristics, including parent-child communication and home learning activities, were examined. Partial support was obtained for the first hypothesis which found differences among initial social skill ratings by teachers for kindergartners identified as having specific subtypes of learning difficulties by the third or fifth grade, compared to children without learning difficulties. Children later identified as having difficulties in reading and math consistently received the lowest teacher ratings of social skills in kindergarten while children with reading

difficulties or math difficulties received less consistent ratings depending on the model. No support was found for the second hypothesis in that there were no differences among the growth trajectories of children's social skills from kindergarten through the fifth grade for children later identified as having different subtypes of learning difficulties. This research clarifies and extends current knowledge and provides direction for future intervention and research efforts.

DEDICATION

To my family for their consistent encouragement, support, and prayers.

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LIST OF ABBREVIATIONS AND SYMBOLS

Abbreviation/ Symbol	*Definition*
AA	Average-achieving
AD	Arithmetic disability
BPPD	Basic phonological processing disorder
CFI	Comparative fit index
HA	High-achieving
df	Degree of freedom
F	Fisher's *F* ratio
LA	Low-achieving
LD	Learning disability, Learning disabilities
LGC	Latent growth curve
M	Mean (arithmetic average)
MD	Math difficulty
ML	Maximum Likelihood
MLR	Maximum Likelihood Robust Estimator
n	Number in a subsample
N	Total number in a sample
NICHD	National Institutes of Child & Human Development
NLD	Non-verbal learning disability
p	Probability
P	Percentage, percentile
R^2	Multiple correlation squared; variance

RD	Reading difficulty
RMD	Reading and math difficulty
RMSEA	Root mean square error of approximation
SD	Standard deviation
SE	Standard error (of measurement)
SES	Socioeconomic status
SRMR	Standardized root mean square residual
SPSS	Statistical Package for the Social Sciences
SRS	Social Rating Scale
SSRS	Social Skill Rating System
t	Computed value of *t* test
VLD	Verbal learning disability
ζ	Zeta; Variance
μ	Mu; Latent mean
γ	Gamma; Coefficient
ε	Eta; Error variance
χ^2	Computed value of a chi-square test

CHAPTER 1

Introduction

In 2002, the Presidential Commission on Excellence in Special Education indicated that research on learning disabilities, including areas other than reading, should be established as a national research priority (U.S. Department of Education, 2002). Five percent of all children in school, or approximately one half of all students with disabilities are identified as having a learning disability, a figure that has increased approximately 150% since the passage of Public Law 94-142 in 1975 (U.S. Department of Education, 1998). While a universal characteristic shared by this large, heterogeneous, and rapidly growing segment of the school-age population is academic underachievement, studies show that children with learning disabilities also demonstrate an increased prevalence of socioemotional difficulties (Bauer, Keefe, & Shea, 2001; Rock, Fessler, & Church, 1997) and lower social status when compared to non-disabled students using sociometric methods (Ochoa & Olivarez, 1995). According to a meta-analysis of 152 studies, approximately 75% of students with learning disabilities have social skill deficits (Kavale & Forness, 1996). Students with co-occurring learning disabilities and socioemotional problems tend to "(a) experience the poorest outcomes from special education services, (b) be at the highest risk for leaving school, and (c) exhibit significantly poorer outcomes as adults" (Bauer et al., p. 5).

Despite the strong support for comorbidity among learning and socioemotional difficulties, other studies have failed to find an increased prevalence of socioemotional difficulties associated with the presence of a learning disability (Bender, Rosenkrans, & Crane, 1999; Greenham, 1999; Hall & Haws, 1989; Newcomer, Barenbaum, & Pearson, 1995). Variability among these findings highlights the limitations of two-group designs in reliably measuring differences among socioemotional competence, measured by social skill ratings, for children with and without learning disabilities (LD). Speculation as to the factors that may account for these discrepancies include gender (Heath & Ross, 2000), degree of academic success (Bender, Rosenkrans, & Crane, 1999), and type of learning disability (Pelletier, Ahmad, & Rourke, 2001). Thus, the failure to account for subtypes of LD or other variables likely contributes to the variability among findings. In addition, the majority of studies are plagued by methodological flaws, including non-typical samples, lack of a control groups, or broad age ranges (see Durrant, 1995 or Heath, 1996 for review). Given these weaknesses, a more parsimonious explanation may result from an exploration of the specific socioemotional deficits among students with specific subtypes or academic profiles of learning difficulties.

A few studies suggest that particular subtypes of LD tend to be associated with an increased prevalence of poor psychological and social outcomes (Fuerst, Fisk, & Rourke, 1990; Silver, Elder & DeBolt, 1999). In addition, a review of the literature suggests that the social skill development of children with particular subtypes of LD may change at different rates, result in different outcomes, or be associated with different risk and protective factors when compared to each other or to typically developing children. This study examined whether specific patterns of academic difficulties (i.e., reading deficits,

mathematics deficits, or deficits in both reading and mathematics) were associated with differences among initial social skill ratings and social skill development over time for a nationally representative cohort of children followed from kindergarten through the fifth grade.

The longitudinal design of this study allowed for exploration of the onset, course, and variability of social skill deficits among children with learning difficulties based on particular patterns of academic achievement. In addition to three different subtypes of achievement, a sample of average-achieving students was included to provide a reference group to compare social skill ratings over time. Social skills were assessed through teacher report and examined with respect to corresponding profiles of academic achievement, which is measured through teacher report as well as direct assessment of children's performance. Additional variables, including socioeconomic status, presence of an Individualized Education Plan (all eligibility categories included), parent-report of any childhood disability, and public or private school attendance, were also considered. Structural Equation Modeling was used to examine the longitudinal patterns of social skill ratings from kindergarten through the fifth grade for children in the sample given particular subtypes, or patterns, of academic achievement.

This study draws upon and integrates findings from several areas of research to examine the development of socioemotional competence in children with learning difficulties over time. Increased understanding of this relationship may be helpful in facilitating effective prevention, developing early identification procedures, and guiding intervention efforts to mediate the pernicious effects of these difficulties on child outcome.

CHAPTER 2

Literature Review

To establish a foundation for the primary research questions, the following literature review begins with an overview of socioemotional outcomes associated with significant learning difficulties, namely learning disabilities, to support the importance of this endeavor. Next, current theories at the intersection of LD and social skill development are introduced to provide a contextual framework. Following this review, possible explanations for variability among findings in this area are presented, highlighting the role of subtyping methodology to identify underlying neuropsychological profiles and corresponding academic profiles. To further support the use of profiles in the present investigation, the limited research findings on the social and psychological outcomes of children with these various subtypes of LD are reviewed. Next, findings related to demographic characteristics influential among LD and socioemotional outcomes research are presented, including gender and socioeconomic status. In the concluding sections, additional background is provided in support of using social skill ratings to measure socioemotional competence and finally, the influence of environmental factors is considered.

Learning Disabilities and Related Outcomes

Although professional consensus surrounding the definition of a learning disability has remained elusive and controversial (Kavale & Forness, 2000), several

theories, definitions, and methods for determining eligibility have emerged (Durrant, 1994; Scruggs & Mastropieri, 2002). As cited by Hammill (1990), the most widely accepted definition of learning disabilities is by the National Joint Committee on Learning Disabilities in 1987:

> Learning disabilities is a general term that refers to a heterogeneous group of disorders manifested by significant difficulties in the acquisition and use of listening, speaking, reading, writing, reasoning or mathematical abilities. These disorders are intrinsic to the individual, presumed to be due to central nervous system dysfunction, and may occur across the life-span. Problems in self-regulatory behaviors, social perception, and social interaction may exist with learning disabilities but do not by themselves constitute a learning disability (p.1).

While a fundamental premise of most definitions appears to be "unexpected underachievement", the criteria to identify and determine eligibility for students with learning disabilities are controversial (Aaron, 1997; Dean & Burns, 2002; Hale, Naglieri, Kaufman, & Kavale, 2004; MacMillan & Speece, 1999) and have included ability-achievement discrepancies (Stuebing, Fletcher, LeDoux, Lyon, Shaywitz & Shaywitz, 2002), processing deficits (Torgeson, 2001) or failure to respond to empirically-supported interventions (Fuchs & Fuchs, 1998). A previous definition offered by The Interagency Committee on Learning Disabilities (1987) included social skill disorders in the definition of LD as an integral part of the disorder. Currently, a renewed emphasis on the difficulties surrounding definition, identification, and treatment of children with learning disabilities has emerged with the recent revision of the Individuals with Disabilities Education Act (IDEA; Public Law 108-446, 2004). Lyon and Moats (1993) commented that learning disabilities "remains one of the least understood yet most debated disabling conditions in the United States" (p.1).

Regardless of the inability of the field to reach consensus as to the nature of learning disabilities, the importance of this process is evident when considering not only the associated difficulties encountered during childhood and adolescence, but also long-term adjustment and related outcomes. Some difficulties experienced by children with learning difficulties tend to persist into adolescence and adulthood (Goldberg, Higgins, Raskind, & Herman, 2003; Raskind, Gerber, Goldberg, Higgins, & Herman, 1999) and can result in impairment in the areas of education and employment (Murray, Goldstein, Nourse, & Edgar, 2000; Witte, Philips, & Kakela, 1998), as well as in social and interpersonal domains (Rieff, Hatzes, Bramel, & Gibbon, 2001; Ryan, Nolan, Keim, Madsen, 1999; Valas, 1999).

On the whole, the relationship between learning disabilities and socioemotional or social skill deficits is unclear. Several studies found that students with learning disabilities tend to have poorer social outcomes, including lower ratings of acceptance by their peers and a greater prevalence of social skill deficits (Kavale & Forness, 1996; Kravetz, Faust, Lipshitz, & Shalhav, 1999; Nowicki, 2003; Pearl, Donahue & Bryan, 1986; Swanson & Malone, 1992; Tur-Kaspa & Bryan, 1995). However, this association has not been consistently supported in the literature (Bender, Rosenkrans, & Crane, 1999; Greenham, 1999; Hall & Haws, 1989; Newcomer, Barenbaum, & Pearson, 1995; San Miguel, Forness, & Kavale, 1996). Therefore, this issue continues to be a significant challenge facing the field, encouraging examination of factors that may account for such variability in the findings, including methodological or sampling differences, confounding variables, or unexplored subgroups within the population.

Theories and Models of Comorbidity

Given the importance of socioemotional competence for long-term adjustment and outcomes (Greenham, 1999; Parker & Asher, 1987; Raskind, Goldberg, Higgins & Herman, 1999), temporal relationships or "directionality" between academic achievement and social, emotional, and behavioral development continues to be a research priority (Chen, Rubin, & Li, 1997, Hinshaw, 1992; Malecki, & Elliott, 2002; Welsh, Parke, Widaman, & O'Neil, 2001). Despite considerable interest in the relationship between LD and socioemotional competence, no consensus has not reached on its nature, with some researchers arguing a correlational (Greenham, 1999; Gresham, 1992) or concomitant relationship (Swanson & Malone, 1992), while others maintain a causal relationship involving neurological dysfunction (Rourke, 2000) or psychiatric comorbidity (San Miguel, Forness & Kavale, 1996). Correct identification of the nature of the theoretical relationship is important considering that prevention and intervention efforts are often predicated on accurate identification and understanding of the possible mechanisms of action.

There are three main theoretical arguments supported by recent studies. In the simplest model, Gresham (1992) and Greenham (1999) have suggested that the relationship between LD and socioemotional competence, typically measured by social skill deficits, is merely correlational (Figure 1a). Specifically, these authors indicate that enough support does not exist to argue that a causal relationship exists between LD and social skill deficits. This theory suggests that children with socioemotional problems frequently exhibit learning difficulties and similarly, children with learning difficulties often display socioemotional difficulties. Recent studies of social information processing

and social cognition among children with LD have identified specific differences between children with and without LD in the processes such as encoding, interpreting, and acting on social cues (Bauminger, Edelsztein, & Morash, 2005; Tur-Kaspa & Bryan, 1994); however, these studies rarely provide a clear model for the etiology of these deficits. Attempts to support or refute the above theories and describe or explain variability among this population have typically involved contrasting-group designs with relatively minimal use of longitudinal research. While this model is relatively conservative, advances in statistical methods, interventions, and large-scale data sets will allow for further exploration of these relationships.

Others researchers have suggested that the presence of a learning disability exposes students to specific stressors, including a greater likelihood of school failure (Vaughn & Haager, 1994a), negative effects of "labeling" (Vaughn, Hogan, Kouzekanani, & Shapiro, 1990), fewer opportunities for social interaction (Gresham & Elliott, 1989) and decreased interpersonal understanding (Kravetz, Faust, Lipshitz, & Shalhav, 1999). These stressors may increase the risk of poor self-esteem, peer rejection, and negative teacher evaluation and place the student at higher risk for socioemotional difficulties (Figure 1b). To test this model, researchers have identified other groups of non-LD students with similar characteristics to isolate the factors that appear to influence this relationship.

Investigations of the relationship between academic functioning and social skill ratings have found similarities among children with LD and low-achieving (LA) students without LD (Elliott & McKinnie, 1994; Gresham, MacMillan, & Bocian, 1996; Haager & Vaughn, 1995; Nowicki, 2003; Tur-Kaspa & Bryan, 1995; Vaughn & Haager, 1994a;

Vaughn, Zaragoza, Hogan, & Walker, 1993). For example, a longitudinal study of social skills and behavior problems in kindergarten through the third grade found that LA students and students with LD consistently exhibited significantly lower social skills and higher levels of behavior problems than their average achieving (AA) or high achieving (HA) peers (Vaughn et al., 1993). However, other studies have found significant differences among the LA and LD groups (La Greca & Stone, 1990; Maughan, Pickles, Hagell, Rutter, & Yule, 1996). Tur-Kaspa and Bryan (1995) replicated the finding that LD and LA students were more likely to have social skill deficits than AA students, yet concluded that the LD and LA groups differed in relative risk. Specifically, 36% of students with LD were considered "high risk" for social competence and school adjustment problems (defined as 1.5 standard deviations below the norm on the Walker-McConnell Scale of Social Competence and School Adjustment), while only 13% of LA students fell within this risk category. Thus, LD and LA students both experience low achievement, school failure, and low teacher acceptance; however, these similarities end when considering the increased risk and rate of later social difficulties of students with LD.

To further explore these apparent differences between the LD and LA populations, Vaughn et al. (1990) considered that special education classification and labeling may function as a contributor to impairment in socioemotional competence. In this study, multiple ratings of social skills were gathered from peers, teachers, and student's self-report for LA, AA, and HA students over time. Analyses revealed that even *prior* to identification, kindergartners later identified with LD differed significantly from their peers on socioemotional variables as early as eight weeks after school started.

Initially, low achieving students received the lowest rating of social skills by teachers; however, six months after starting school, teachers rated LD students (prior to identification) as having the lowest social skills.

Thus, comparing children with and without learning disabilities in a two-group design or even children with LD as compared to children demonstrating other levels of academic achievement (e.g., LA, AA, HA), appears to be insufficient to adequately characterize the behaviors and outcomes for children demonstrating specific levels of achievement and provides limited detail about the underlying pathways to academic and social competence. Efforts to understand these discrepancies between academic performance and socioemotional impairment have increasingly been directed towards identifying additional mediating and moderating factors. Researchers have hypothesized that the variability in the findings comparing students with and without learning disabilities may be due, in part, to the heterogeneity of the groups (Doris, 1993; Haager & Vaughn, 1995, Little, 1993). Therefore, efforts to improve our understanding of this population have increasingly involved consideration of subtypes of learning disabilities, or corresponding academic patterns of achievement, to increase homogeneity through the establishment of meaningful groups.

In the third and final model presented, Rourke (2000) outlined specific neuropsychological deficits among children with various subtypes of LD. He proposed that the neuropsychological deficits that define subtypes of learning disabilities are the *same* deficits that contribute to poor socioemotional functioning (Figure 1c). In other words, neuropsychological deficits are responsible for both the LD and the socioemotional problems. Gresham and Elliott (1989) have termed this model a

"primary-cause hypothesis", as both difficulties result from neurological dysfunction, while the previous model suggests a "secondary-cause hypothesis" in which difficulties associated with social skills and academic performance can be associated with a third, intervening variable such as low self-esteem. A similar model, presented by Kershner (1990) and expanded upon by Spafford and Grosser (1993), integrates central nervous system dysfunction, impaired communication, and social misperception with "secondary causes" of self-concept, self-efficacy, and self-esteem along with school failure. In expansions of the primary-cause model, Rourke noted changes among children's socioemotional functioning for specific subtypes from childhood to adolescence, suggesting an interaction among specific deficits and development. This model provides the framework used in the current study and therefore, a more detailed presentation of subtyping, along with a review of the findings documenting the prevalence of psychological difficulties associated with these subtypes, are presented in the following section.

While subtyping methodology continues to sacrifice some individual characteristics, this research design promotes further research, improves identification techniques, and informs intervention development. Thus, the use of patterns of academic performance, representing particular subtypes of learning difficulties, may facilitate understanding of the socioemotional competence of this vulnerable population.

Subtypes of Learning Disabilities

Subtyping has long been considered as a conceptual and methodological approach to address the variability among children with LD, but despite a long history, remains relatively uncommon within the LD research literature. Johnson and Myklebust (1967)

are credited with being the first investigators to note a specific cluster of behaviors within the LD population, namely a constellation of features later known as "nonverbal learning disability". Several others have continued this trend (Feagans & McKinney, 1991; Hooper & Willis, 1989) and recent efforts have extended this significant body of research on particular subtypes to include studies of specific perceptual or processing characteristics and longitudinal investigations (Greenham, Stelmack, & van der Vlugt, 2003; Jordan, Hanich, & Kaplan, 2003; Lyon, Fletcher, & Barnes, 2003; Petti, Voelker, Shore, & Hayman-Abello, 2003). Subtyping methodologies allow researchers to define groups based on individual differences through comparisons among achievement and cognitive/neuropsychological profiles (Fletcher, Morris, & Lyon, 2003).

Most theories regarding the etiology of learning disabilities, including subtypes of LD, implicate dysfunction or impairment in the executive or regulatory systems (Hynd, Clinton, & Hiemenz, 1999; Spafford & Grosser, 1993; Teeter & Semrud-Clikeman, 1997). "Social deficits, reading deficits, writing deficits and the like do not have a direct effect in central nervous system dysfunction, rather, these are dependent variables that are thought to arise from basic neuropsychological deficits, which in turn result in the specific manifestations of different subtypes of learning disabilities" (Rourke & Fuerst, 1992, p. 361). Consistent with this perspective, research and observation over the past decade have reliably distinguished three primary subtypes of learning disabilities. These subtypes are supported by research and corresponding academic profiles have been documented. Each subtype is associated with specific deficits in either: 1) auditory or linguistic skills, also known as Verbal Learning Disabilities (VLD) or Basic Phonological Processing Disorder (BPPD), 2) visuoperceptual-visuomotor skills, also known as

Nonverbal Learning Disability (NLD) or Arithmetic Disability (AD), or 3) a mixed pattern of deficits (Feagans & McKinney, 1991). These findings provide the basis upon which the hypotheses for the current study are formed.

The two primary subtypes of learning disabilities, heretofore referred to as Verbal Learning Disability (VLD) and Nonverbal Learning Disability (NLD), are manifested in two distinct cognitive and achievement profiles. Discrimination between these two subtypes relies on a growing body of evidence describing the assets and deficits associated with each profile. For example, children with NLD demonstrate verbal strengths with primary weaknesses in tactile perception, visual perception, psychomotor skills, interpreting novel situations, and reading nonverbal cues (Rourke et al., 2002; Silver, Pennett, Black, Fair, & Balise, 1999). In a reversed pattern of strengths and weaknesses compared to students with NLD, individuals with VLD tend to exhibit achievement profiles consistent with relative weaknesses in the area of reading and spelling and a relative strength in arithmetic. Children with VLD tend to display an academic profile characterized by difficulties with early reading generally associated with a variety of phonological deficits (Lyon et al., 2001; Moats & Lyon, 1993; Padget, 1998). A third profile, a mixed type, manifested by significant weaknesses in both reading and arithmetic, has also been established in the literature (Pelletier et al., 2001; Tsatsanis, Fuerst, & Rourke, 1997). Continued disregard of these patterns within the LD population may contribute to the promulgation of inconsistent findings in the literature base and potentially ineffective service delivery through a “one-size-fits-all” approach. Therefore, a more thorough consideration of these subtypes, along with the corresponding academic profiles, is warranted.

Using these cognitive and achievement profiles as a classification system, children with these subtypes of learning disabilities demonstrate specific patterns of strengths and weaknesses (Rourke, 2000) validated through empirical and observational data. Rourke (1991) identified three distinct subtypes of learning difficulties among children with LD, specifically VLD, NLD, and a mixed type. These patterns have been found to be valid across adolescent and adult populations (Shafrir & Siegel, 1994). Historically, VLD and NLD are defined on the basis of discrepancies between verbal and nonverbal scores on cognitive assessments (Fuerst, Fisk, & Rourke, 1990), but have also been established using the associated deficits in reading/spelling and arithmetic achievement (Pelletier et al., 2001; White, Moffitt, & Silva, 1992).

Few estimates of the prevalence and incidence of these subtypes or patterns of learning difficulties are available. An epidemiological study by Lewis, Hitch, and Walker (1994) examined patterns of academic performance and found that out of 9- and 10-year-olds, 1.3% of the sample showed patterns consistent with mathematics disabilities, 3.9% were consistent with reading disabilities, and 2.3% were consistent with reading and mathematics disabilities. Estimates of the prevalence of mathematic learning disabilities using specific measures rather than standardized achievement identify between 5-8% of school-age children, however, these estimates do not eliminate children with comorbid reading or attention difficulties (Geary, 2004). Prevalence rates of reading disability range from approximately 5-10% among school- or clinic-identified samples and up to 17.5% in population-based samples (Shaywitz, 1998). Among children in special education programs for learning disabilities, approximately 80% are diagnosed with a reading disorder (Aaron, 1997).

Socioemotional outcomes and subtypes of LD

For children with LD, patterns of cognitive performance are related to patterns of social and psychological functioning (Fuerst, Fisk, & Rourke, 1990). Specifically, children with well-developed language-related skills compared to visual-spatial-organizational skills were represented at higher frequencies on scales of internalized and externalized psychopathology when compared to children with equally developed or opposite patterns of cognitive development. One study found that children with NLD were twice as likely as those with VLD to be diagnosed as having an internalizing disorder (Petti, Voelker, Shore, & Hayman-Abello, 2003). Consistent with this neuropsychological perspective, children with VLD profiles have been found to exhibit relatively "normal" patterns of social and psychological functioning (Greenham, 1999; Pelletier et al., 2001), while children identified as NLD tend to have significant impairment in this area (Rourke, 1998). Furthermore, children with NLD are significantly more likely to have counseling services as part of their Individualized Education Program (IEP) than students with VLD (Davis, Parr, & Lan, 1997). For children with NLD, "psychosocial deficits, primarily of the externalized variety, often are seen early in development; psychosocial disturbances, primarily of the internalized variety, are usually evident by late childhood and adolescence and into adulthood" (p.311).

Isolated arithmetic disabilities, a defining feature of NLD, has been used as a proxy to identify and assess the cognitive, educational, neuropsychological and socioemotional behaviors of young children. When compared to their normally achieving age matched classmates, Silver, Elder, and DeBolt (1999) found that teachers and parents of children with isolated arithmetic disabilities rated them significantly lower on social

skills using the Social Skills Rating System (SSRS; Gresham & Elliott, 1990a). In addition, significant discrepancies between self-report ratings and ratings of adult observers (teachers and parents) of the social skills of children with arithmetic disabilities were also found (Silver, Elder, et al.). In studies comparing children with reading disabilities and children with arithmetic disabilities, children with arithmetic disabilities demonstrated a higher proportion of internalizing symptomatology than children from general (White, Moffitt, & Silva, 1992) or psychiatric populations (Cleaver & Whitman, 1998).

According to Rourke (1998):

> It would appear that the profile of neuropsychological assets and deficits…that constitutes the NLD syndrome is a sufficient condition for the development of some sort of psychosocial disturbance that tends to remain stable or worsen over time, whereas the profile of central processing assets and deficits… exhibited by the BPPD [Basic Phonological Processing Disorder] or VLD subtype does not constitute the same sufficient basis for such an outcome (p. 150).

On the other hand, some studies have either failed to find or found inconsistent differences in the socioemotional functioning among children with various subtypes of learning disabilities (Forrest, 2004; Greenham, 1999; Little, 1993; Loveland, Fletcher, & Bailey, 1990; Petti et al., 2003). Similarly, other studies of children with reading problems compared to children without reading problems have also found elevations in externalizing (Adams, Snowling, Hennessy, & Kind, 1999; Beitchman & Young, 1997; Gadeyne, Ghesquiere, & Onghena, 2004; Hinshaw, 1992) and internalizing disorders (Boetsch, Green, & Pennington, 1996; Smart, Sanson, & Prior, 1996) or both disorders through an interaction with gender (Willcutt & Pennington, 2000). Reading achievement has been found to be more strongly linked with behavior problems than mathematics achievement (Adams et al.) and differentially associated with aggression and prosocial

behavior over time (Miles & Stipek, 2006). A recent study found that children with VLD were significantly more likely to display externalizing behaviors than children without LD, a pattern that was not found for children with NLD or for internalizing behaviors for either group (Yu, Buka, McCormick, Fitzmaurice, & Indurkhya, 2006).

Further, White and colleagues (1992) found that children with concomitant disabilities in the areas of reading and arithmetic demonstrated significantly more socioemotional disturbances than children with either reading or arithmetic disabilities alone. Inconsistent findings on the prevalence of socioemotional difficulties among children with LD combined with the documented importance of social competence (Meisels, Atkins-Burnett, & Nicholson, 1996) on the quality and success of children's school experiences suggest that further exploration of such difficulties is warranted.

In addition to academic subtypes, one child characteristic in particular, gender, has been found to be an important factor in learning disabilities. Reading disorders were thought to be more prevalent in boys; however, recent estimates suggest that referral bias in clinic and school settings may result in the overreferral of males due to increased behavior and attention problems (Shaywitz, Shaywitz, Fletcher, & Escobar, 1990; Willcutt & Pennington, 2000). Current prevalence estimates suggest that reading disabilities occur at a rate consistent with gender ratios within the general population, with similar rates among girls and boys (Flynn & Rahbar, 1994; Shaywitz et al., 1990). Likewise, there do not appear to be gender differences in the prevalence of math disabilities (Shalev, Auerbach, Manor, & Gross-Tur, 2000). Given the relatively similar rates of learning disabilities in males and females, consideration of symptomatology suggests that the expression of and associated features of learning disabilities may differ

depending on gender. Willcutt and Pennington (2000) found that RD and internalizing symptomatology were generally restricted to females, while the association between RD and externalizing symptomatology was stronger for males. In a meta-analysis of social skills and LD by Swanson and Malone (1992), gender did not significantly contribute to variance in effect size; however, they noted that very few of the studies they reviewed included gender as a study variable.

Low socioeconomic status (SES) can also have significant deleterious effects on cognitive and social outcomes in child development (McLoyd, 1998). Children from low SES backgrounds are more likely to be identified as LD than their higher SES counterparts (Blair & Scott, 2002). In addition, socioeconomic status for children with LD tends to be significantly lower than for children without LD (Willcutt & Pennington, 2000). These findings suggest that SES constitutes a risk factor for children with and without LD, however, information regarding socioeconomic status among children with particular subtypes of LD was not found in reviews of the literature. Considering the variation in findings from previous studies examining the relationship between subtypes of learning difficulties and social outcomes, further exploration is needed.

Exploring social competence: A skill-based approach

Social skills have been defined and measured in many ways (see Cavell, 1990). Sheridan, Hungelmann, and Maughan (1999) outlined the differences in terminology between *social skills* and *social competence*. While *social skills* often refer to discrete, learned behaviors demonstrated for the purpose of performing a specific task (Sheridan & Walker, 1999), *social competence* refers to evaluative judgments made by others (Gresham, 1986). Social skills, often developed through task analytic procedures, tend to

be observable, measurable, and concrete while social competence tends to refer to more global measures of functioning. Sheridan and Walker proposed a blended definition of social skills as "goal-directed, learned behaviors that allow one to interact and function effectively in a variety of social contexts" (p. 687). However, preliminary evidence suggests that ratings of social skills may be context-specific (Chan, Ramey, Ramey, & Schmitt, 2000). In 1990, Vaughn and Hogan proposed a model of social competence that consisted of four components: positive relations with others, accurate/age-appropriate social cognition, absence of maladaptive behaviors, and effective social skills. Although research endeavors often isolate the interrelationships of factors within this concept, the authors noted that the fullest understanding of social competence takes into consideration all the factors.

Merrell (2001; 1999) defined six primary methods of assessing socioemotional development in children and youth, including behavioral observation, behavior rating scales, interviewing, self-report measures, projective-expressive techniques and sociometric techniques. While specific strengths accompany each of these approaches, each method also has unique disadvantages. In a review of these methods, Merrell suggested that naturalistic behavior observations and behavior rating scales should be used as a "first line" of assessment when considering the viability of effective social skill assessment. He proposed, "their ecological and social validity, coupled with the practical considerations in conducting a good assessment, clearly makes some combination of the two approaches the most defensible for both research and clinical applications" (Merrell, 2001, p.17). While naturalistic behavioral observation is considered ecologically valid (Elliott & Gresham, 1987), behavior rating scales are the most widely used methods and

are supported by a substantial body of empirical evidence (Merrell & Gimpel, 1998). The advantages of behavior rating scales are outlined by Merrell (1999) and include cost-efficiency, the ability to capture low-frequency behavior, and utilization of judgments and observations of those familiar with the child across settings.

However, proponents of contextualized approaches (Sheridan & Walker, 1999; Haring, 1992) maintain that task analytic approaches to social skill assessment may only capture decontextualized social behavior, artificially divorcing antecedents and responses from meaningful contexts (Haring, 1992). While a combination of methodologies, including sociometrics, would likely be the most valid, time and financial resources typically limit the use of such an approach outside research endeavors. Thus, practical considerations, along with the relative ease of incorporating such methods into the classroom environment, advocate for the continued use of a skill-based approach to measuring socioemotional competence.

Despite criticisms of using a social skills approach to measure socioemotional behavior, ratings of social skills have demonstrated significant relationships with child outcomes (Agostin & Bain, 1997; Malecki & Elliott, 2002; Teo, Carlson, Mathieu, Egeland, & Sroufe, 1996; Wentzel, 1993) and continue to be used in studies to evaluate the behavior from early childhood through adolescence. Several recent studies have utilized the teacher ratings on the Social Skills Rating System (SSRS; Gresham & Elliott, 1990a) to evaluate the social skills of children with and without learning difficulties (Bramlett, Scott, Rowell, 2000; Haager & Vaughn, 1995; Jones & Gullo, 1999; Malecki & Elliott, 2002; Silver et al., 1999; Vaughn & Hogan, 1994; Vaughn, Zaragoza, Hogan, & Walker, 1993).

With few exceptions (e.g.,Vaughn et al., 1990), the majority of studies examining the social skills of children with learning disabilities occur following identification of a learning disability. This practice restricts the discovery and identification of key indicators of future difficulties and as a result, hinders the development of prevention and early intervention efforts. Therefore, researchers are increasingly engaged in efforts to model temporal relationships between learning difficulties and social behavior (Welsh, Parke, Widaman, & O'Neil, 2001; Chen, Rubin, & Li, 1997, Malecki, & Elliott, 2002). These studies tend to move beyond contrasting two-group design and seek to account for contextual influences and interaction effects.

Environmental Influences on Learning and Social Development

Multiple, reciprocal transactions between a child and his or her proximal environment allow for healthy growth and adaptation (Sameroff, 1993; Sameroff & Haith, 1996). Logically, modifications to these interactions or to the broader social ecology change the context in which a child develops. Therefore, a process-context approach aids understanding of factors that enhance support for children's learning and social development (Bronfenbrenner & Morris, 1998). For example, consideration of interpersonal relationships or quality of the home environment can be critical to the development of effective prevention and intervention efforts. To this end, several characteristics of children's home and school environments are associated with greater academic achievement and positive social outcomes. Although little research exists on the family relationships and environments of children with LD (Wiener, 2003), two areas have been increasingly recognized as important factors in children's academic and socioemotional development.

Parents provide opportunities to learn and practice communication and emotion regulation skills from infancy to adulthood and influence children's subsequent peer relationships (Parke & Ladd, 1992). These parent-child interactions shape social behavior and skills that generalize from the home to the school environment (Pianta, Nimetz, & Bennett, 1997) as well as shape children's self-regulatory abilities (Grolnick, Kurowski, & Gurland, 1999). A recent model of emotion socialization indicates that emotion-related parenting practices affect social behavior and social competence through a child's processing of information (Eisenberg, Spinrad, & Cumberland, 1998). In children with learning difficulties and social skill deficits, information processing has been a key area of interest and hypothesized mediator of performance. Among children with LD, sustained emotional support has been identified as a protective factor through longitudinal research (Werner & Smith, 2001). One way that parents can provide emotional support is to facilitate the discussion of affective content among everyday experiences. A recent longitudinal study indicated that sensitive maternal behavior was the strongest predictor of social and academic outcomes in the early school period (NICHD, 2002), with studies also finding effects extending into the middle school years (Morrison, Rimm-Kauffman, & Pianta, 2003). Thus, consideration of parent-child communication in the home, particularly of affect-laden content, may be an important factor influencing the socioemotional competence of children across both the home and school environments.

Another characteristic of children's home environments found to have positive effects on developmental outcomes includes the degree to which families provide activities for children that are rich in learning opportunities. Home learning activities

offer another opportunity for interpersonal interactions at home. These activities, particularly surrounding literacy activities, are related to children's future academic performance and social adjustment (Foster, Lambert, Abott-Shim, McCarty, & Franze, 2005; Payne, Whitehurst & Angell, 1994; West, Denton & Reaney, 2000). Although providing educational and cultural experiences outside the home may also contribute to children's development, these activities are more likely to be influenced by socioeconomic factors or neighborhood variables (Elder, Eccles, Ardelt & Lord, 1995). Thus, interactions between the parent and child and opportunities for learning in the home environment appear to have significant, positive effects for children's achievement and social development.

CHAPTER 3

Research Study

Given the significance of healthy socioemotional functioning for positive developmental outcomes, defining the relationships between patterns of academic achievement and associated deficits in social functioning will guide future research in the areas of education, psychology, and child development. Bender, Rosenkrans, and Crane (1999) recommended, "developmental designs-either cross-sectional or longitudinal- that focus on the social-emotional development of students with learning disabilities are necessary" (p.153). A framework of children's development and schooling that emphasizes the interactions between the child, family, school and community guided the design of the Early Childhood Longitudinal Study-Kindergarten (ECLS-K). The longitudinal nature of the ECLS-K allows researchers to explore developmental trajectories, or growth and changes that occur through school experiences during early and middle childhood.

Examining change over time in socioemotional competence, relative to patterns of learning difficulties, will aid in understanding whether these conditions develop simultaneously, or with one preceding the other. The importance of longitudinal designs in documenting typical development and deviations in development can improve theoretical understanding as well as guide intervention efforts to enhance resiliency and promote successful outcomes (Werner, 1999). Children with learning difficulties who do

not develop socioemotional deficits may possess protective factors or coping mechanisms that buffer them against the development of further psychopathology. In addition, Lyon (1999) noted:

> Longitudinal studies also provide a scientific platform to develop early predictors to different types of LD, map the developmental course of specific types of LD, identify commonly co-occurring disorders and secondary behavioral characteristics that develop in response to school failure, and assess the efficacy of different treatments and teaching methods for different types of LD (p.264).

Recent evidence suggests that learning problems are more easily remediated at younger ages (Fletcher & Foorman, 1994); however, recent methods of identification typically rely on observable academic failure or "wait to fail" models (Lyon et al., 2001) and as a result, lose valuable time for intervention. Although early intervention has demonstrated relative success, traditional special education programs appear to be relatively ineffective (Kavale & Forness, 1999). Little (1993) suggested that the limited effectiveness of special education may be due, in part, to a failure to discriminate, and differentially treat, subtypes within the diverse population of students with learning disabilities. Subtyping, as a strategy to deal with the significant heterogeneity within this population, has also been recommended by Doris (1993).

Therefore, identifying and documenting the factors that contribute to the positive development of young children with learning difficulties will provide direction for early intervention efforts to improve outcomes for young children with academic and socioemotional difficulties. Preventative, remedial, or compensatory strategies may include direct instruction in social skills, self-regulation strategies, or an increase in environmental or family supports to improve child functioning. A longitudinal perspective may indicate when these interventions are likely to be needed and most

effective. In addition to significant implications for policy and service delivery, this study may improve the socioemotional health of young children with learning difficulties by informing prevention, assessment, identification, and rehabilitation efforts.

This study utilized longitudinal data to investigate relative changes among social skills for children with particular profiles of learning difficulties during kindergarten through the fifth grade, with data collection during the fall of kindergarten and the spring of kindergarten, first, third and fifth grades. Inconsistencies in the literature suggest that consideration of subtypes of learning difficulties may be an important yet under investigated area of research and may help to account for much of the variability in the literature. In addition, using patterns of learning difficulties enhances generalization of findings to broader contexts and may be less influenced by the changing criteria to assess, identify, and treat children with specific learning disabilities. This study is a significant endeavor due to the lack of well-developed models of social development among children with learning difficulties. Through this contextualized approach to the measurement of social skills, two primary research questions were posed to address some of the limitations of prior research and extend the knowledge base in these areas.

Research Hypotheses

Based on findings from prior research regarding differences among these academic subtypes, the following research hypotheses were advanced for this study:

1. With regard to subtypes of learning difficulties, it was hypothesized that during kindergarten: a) children with reading difficulties (RD) would have social skill ratings comparable to children without learning difficulties (AA); b) children with math difficulties (MD) would have significantly lower social skill ratings than children in the

RD or AA groups, and c) children with a mixed profile of reading and mathematics difficulties (RMD) would have significantly lower social skill ratings than children in the other three groups (RD, MD or AA).

2. With regard to subtypes of learning difficulties, it was hypothesized that between kindergarten and fifth grade: a) children with reading difficulties (RD) would have social skill development comparable to children without learning difficulties (AA); b) children with math difficulties (MD), as compared to children in the RD or AA groups, would have significantly slower social skill development over time, and c) children with a mixed profile of reading and mathematics difficulties (RMD) would have significantly slower social skill development than children in the other three groups (RD, MD or AA).

Methods

Participants

Data for this study were accessed through the Early Childhood Longitudinal Study- Kindergarten Class of 1998-1999 (ECLS-K) public-use data file, derived from a federally funded study focused on early school experiences of children from kindergarten through the fifth grade. This longitudinal multistage stratified sampling design followed a national representative cohort of approximately 22,000 kindergarten children throughout the nation. Procedures for selecting the sample are described in the ECLS-K Users Manual (National Center for Education Statistics, 2006).

Of the 17,565 students available in the ECLS Kindergarten-5th grade database, 10,438 cases demonstrated correspondence between teacher ratings of academic performance and/or child assessment using fifth grade data, or if missing, third grade data and were assigned to the appropriate learning difficulty category (see Selection

Procedures and Table 1 for additional details). Using a significance value equal to or less than 0.01, students without agreement between these two sources of data (n = 7,127) differed from students with agreement (n = 10,438) based on gender, χ^2 (1, N = 17,554) = 6.62, p = .01, and SES, χ^2 (4, N = 16,782) = 346.35, p < .01. Students without agreement were more likely to be male and among the lower SES quintiles. Of these 10,438 students with agreement, 8,011 were included after both third or fifth grade teacher ratings and child assessment scores indicated classification into the same learning difficulty category. If either child assessment scores or teacher ratings at fifth grade were missing for students, they were still included if third and fifth grade teacher ratings or third and fifth grade child assessment scores indicated the same learning difficulty category (n= 1,977).

Out of these 10,438 students, 9,988 students had social skill ratings for at least 3 out of the 5 occasions. Students with incomplete social skill information (n = 450) did not differ from students with complete social skill information (n = 9,988) based on gender, χ^2 (1, N = 10,438) = 3.82, p = .05. In the final sample, missing data were examined for each scale over time and ranged from 3-18% of possible values. Rates of missing vales did not differ by scale but increased slightly over time. The final sample did not significantly differ by gender, χ^2 (1, N = 9,988) = 2.66, p = .10, based on whether a combination of child assessment and teacher ratings were used versus either two child assessments or two teacher ratings were used to identify group membership.

Out of 9,988 complete cases, another 1,893 children were eliminated from the sample due to reporting a primary language other than English (n = 1242), parent-report of a diagnosed hearing difficulty (n = 35), or parent-report of a diagnosed vision problem (n = 616). Of these 9,988 students, 50% were male, 62% were white, non-Hispanic, 11%

black/African American, non-Hispanic, 7% Asian, 1% Native Hawaiian/Other Pacific Islander, 2% American Indian or Alaskan Native, and 3% identified more than one race, non-Hispanic. In addition to those who identified themselves as Hispanic (8%), another 8% indicated Hispanic, race not specified. Eighty-four percent of these students were first-time kindergarteners and 13% had a disability according to parent report during the kindergarten year. Families with the highest level of socioeconomic status were represented with greater frequency than families of lower socioeconomic status, with the rest of the groups relatively evenly distributed across quintiles, with values 15%, 17%, 20%, 22%, and 26%.

In the final sample, several students were retained, with 4 students in the second grade, 33 in the third grade, and 552 in the fourth grade. Twelve students were promoted to the sixth grade and 7 were in ungraded classrooms. Students not in a fifth grade classroom differed by gender, χ^2 (1, N = 8,095) = 25.62, $p < .01$ and by learning difficulty category, χ^2 (3, N = 8,095) = 523.27, $p < .01$, from students in the fifth grade. Students not in the fifth grade were more likely to be male and in the reading and math difficulty group. All students were retained in the sample as they may represent an important segment of the target population for this investigation, for example, children with learning difficulties and social delays. Demographic information describing the full sample (n=8095) and each learning group is presented in Table 2. Descriptive information reported during the kindergarten year includes gender, parent-reported first-time kindergartener status, parent-reported childhood disability (unspecified), public vs. private school status, socioeconomic status, presence of IEP in 3rd grade, mean scores for

the direct child assessment, mean teacher ratings for achievement, and finally mean scores for the home variables.

Materials

Information was gathered from direct assessments of the children, as well as through questionnaires of parents, teachers, other school personnel and school records, beginning in the fall of 1998. Areas assessed included child and family health and characteristics, community structure and support, early childhood experiences, school characteristics, and academic outcomes. This study was sponsored by the U.S. Department of Education, National Center for Education Statistics (NCES) and was conducted in collaboration with Westat, the Survey Research Center, and the School of Education at the University of Michigan, as well as Educational Testing Services. Copies and detailed descriptions of almost all measures used in this study are publicly available through the ECLS-K website at http://nces.ed.gov. The only exception is the Social Rating Scale (SRS), or measure of social skills, which is restricted due to copyright protections.

For the current study, a subset of the data was analyzed based upon the selection criteria described in Procedures. While most demographic and contextual information was gathered in the fall of 1998, assessments of achievement and social skills were obtained during the spring of the kindergarten, first, third, and fifth grade years. Given the representative nature of the sample on variables such as gender, race, and socioeconomic status, bias error was minimized, while a large sample size reduced the effects of random error. Maturation was not a significant threat to internal validity as the

research questions specifically targeted the development of children's academic achievement and social skills.

Child Characteristics and Demographics. The ECLS-K assessment batteries were designed to assess skills and knowledge reflective of those taught in classrooms across the nation and the items "sample typical and important elements of the curriculum with particular emphasis on content and process areas that are critical to growth and can be expected to reflect growth on the same scale over time" (National Center for Education Statistics, 2000, p. 10). A key variable of interest for this study, subtype of learning difficulties, was defined by a specific pattern of academic achievement calculated through a combination of direct and indirect measures of academic performance. Academic achievement was defined by child performance on an individually-administered direct assessment in reading and mathematics as well as teacher-report of child performance in each of these areas. Profiles were created using the criteria outlined in Table 1 and in the section entitled "selection procedures" below. The inclusion of direct assessment is consistent with the recommendation by Lyon and colleagues (2001) who suggested that underachievement should be based on "performance on tasks assessing skills directly related to the academic domain in question" (p.276). The direct assessments were conducted in two-stages, with the initial administration of a routing test to determine the appropriate level of difficulty, and then a second test to reduce the overall length of the assessment.

The direct assessment for reading measured vocabulary comprehension, listening and reading comprehension, and basic sight skills (e.g., knowledge of the alphabet, phonetics, print recognition and orientation, and sight vocabulary). The items included in

the mathematics section measured children's quantitative and analytic skills, including recognizing numbers, counting, comparing and ordering numbers, and solving word problems as well as the interpretation of picture graphs. The reliability of the estimates of overall reading ability (IRT-based theta) and overall mathematics ability (IRT-based theta) were over .90 (National Center for Education Statistics, 2000). These items were developed after extensive field-testing, analyses of psychometric properties, and consideration of content relevance. The ECLS-K data files contain normative estimates of performance on the direct assessment, as well as non-normative estimates of child performance on the direct assessment, using the same rating scale so growth can be measured over time.

Parent interviews provided information about child characteristics, including demographics and information related to early development. Family variables were drawn from the parent interview conducted in the fall of the kindergarten year and included items about the child's date of birth, gender, ethnicity, and child health status (e.g., vision and hearing difficulties), as well as information related to the family's socioeconomic status. Gender, a time-invariant variable, was coded as Males = 0 and Females = 1. Socioeconomic status was considered a time-invariant categorical variable in this study and based primarily on family income with respect to federal poverty guidelines. Higher values on this variable indicated higher socioeconomic status of the family.

Teacher Ratings. Teachers' judgments of their students' reading abilities and later reading performance of the student are often highly correlated (Hecht & Greenfield, 2001, 2002; Hoge & Caladarci, 1989). Compared to parent ratings, teacher ratings have

been identified as better predictors of classroom behavior and academic success in school (Bramlett, Scott, & Rowell, 2000). In addition, a study by Gresham, MacMillan, and Bocian (1997) found that teachers could accurately rate students who were having learning difficulties in their classroom. Demaray and Elliott (1998) found that teacher ratings for first through fourth grade students demonstrated moderately high levels of agreement (using mean percent agreement) with student performance on an achievement test. However, best practice suggests that teacher ratings should be used to supplement the information obtained from direct assessment (Glascoe, 2001). In the ECLS-K data set, teachers provided ratings of the child's academic performance. Student performance, relative to other children, was rated in the global areas of Language and Literacy and Mathematics skills. The same teacher rated performance on both domains for all occasions except for fifth grade, when separate reading and math teachers provided ratings. Performance was rated using a five-point Likert scale ranging from "far below average" to "far above average".

Teachers rated the social skills of children using an adapted version of the Social Skills Rating System (SSRS; Gresham and Elliott, 1990a) and the Elementary Scale A ("How Often?" Gresham & Elliott, 1990b). A review of six published rating scales concluded that the SSRS was the most comprehensive instrument based on the multi-source approach and intervention linkages (Demaray et al., 1995) and is considered to be a reliable and valid measure of children's social development. The teacher form of the Social Rating Scale (SRS) consists of twenty-four items and includes five subscales: Approaches to Learning Scale, Self-Control, Interpersonal Skills, Externalizing Problem

Behaviors, and Internalizing Problem Behaviors. Brief descriptive phrases for each item arranged by subscale are presented in Figure 2.

Unlike many other social skills rating scales (Vaughn & Haager, 1994b), the SSRS distinguishes between school-related social skills (e.g., following directions) and social skills related to social functioning in general (e.g., peer interactions). In addition, differences between internalizing and externalizing disorders were important to consider given the previous use of such distinctions when investigating learning and social difficulties (Beitchman & Young, 1997; Boetsch, Green, & Pennington, 1996; Hinshaw, 1992; Petti et al., 2003; Segrin, 2000; Smart, Sanson, & Prior, 1996). Teacher ratings of social skills were provided as non-normative estimates of child performance on the same scale to allow for measurement of change over time. Although this measure is not intended to assess proficiency, or a developmentally ordered progression through discrete skills, the SRS captures teacher ratings of individual children relative to their peers. This allowed for analysis of the relative standing of an individual child as well as a group of children, in this case, four groups of children, in terms of the frequency with which they demonstrated socially appropriate skills. Response categories for the SRS-Teacher version asked the teacher to rate how frequently the behavior was exhibited and ranged from Never (1) to Very Often (4). According to figures presented in the ECLS-K Manual (National Center for Education Statistics, 2006), the Social Rating Scale (Teacher version) has been found to be a reliable (split half reliability coefficients ranging from 0.78-0.90) and valid measure.

Characteristics of the Home Environment. Given the conceptual link with children's learning and social development, two characteristics of the home environment

were included in this study, parent-child affective communication and home learning activities. The measure for parent-child communication consisted of six items administered during the Parent Interview conducted in the spring of the first grade year. The items and response choices are presented in Figure 3. Responses indicate how often parents engaged in the following behavior, rated on a scale from Never (1) to Very Often (4). Although the section consisted of six items, only four were used in the present study in order to maximize conceptual similarity and clarity. The content of the selected items included encouraging their child to share troubles, talking about friends and activities, and expressing their opinions, as well as asking the parents how often they made time to talk to their child. Parent ratings were available at the item level and higher scores indicated greater frequency of parent-child affective-related communication.

Home learning activities, in other words, the frequency with which families provided and participated in home activities to promote children's development, were assessed using nine items from the Parent Interview conducted in the spring first grade. The nine items are presented in Figure 4. Parents reflected on a typical week and rated the frequency of each activity on a scale from Not at All (1) to Every Day (4). These items included a variety of activities, such as literacy activities and other cognitively-oriented or creative activities, physical activities, and chores. Parent ratings were available for each item and higher scores indicated greater frequency of participation or involvement between family members and the child in the home environment.

Procedures

Approval by Human Subjects Committee. This study complies with the ethical issues and standards set forth by the American Psychological Association and The

University of North Carolina at Chapel Hill. Prior to conducting analyses on the public-use data set, the research protocol was approved by the Institutional Review Board of The University of North Carolina at Chapel Hill.

Selection Procedures. Considering the difficulties inherent in using school-identified learning disabilities (Forness et al., 1998) and the lack of clear differences between low-achieving (LA) and LD populations (Gresham, MacMillan, & Bocian, 1996), children with learning difficulties were identified for inclusion in this study, regardless of school-identified LD classification. Peterson & Shinn (2002) recommend a relative achievement discrepancy model, which was found to account for more school-identified learning disabilities than either ability-achievement or severe low achievement models alone. This ecologically-oriented model suggests that identification of children with learning disabilities should be based on severe achievement discrepancies *in light* of the achievement levels of peers in the school or school district. Several potential advantages of this contextualized approach were proposed, particularly the ability to identify children that may benefit from early, needs-based problem-solving interventions.

In this study, children were categorized into three distinct achievement profiles. Specific criteria were applied to two measures of academic achievement collected during the fifth grade (or third grade if fifth grade data was unavailable) to create three distinct groups of children with learning difficulties: 1.) a subtype exhibiting a relative strength in reading and relative weakness in math (MD); 2.) a subtype exhibiting a relative strength in math and a relative weakness in reading (RD); and 3.) a subtype of combined weakness in the areas of math and reading (RMD). Another group with average performance in math and reading (AA) was also selected as a comparison group. The

selection procedures, or specific criteria, used to determine group membership are outlined in Table 1. Several studies have used similar selection criteria to study the academic profiles and subtypes among children with LD, supporting the acceptability of these selection procedures (Cleaver & Whitman, 1998; Geary, Harrison, & Hoard, 2000; Jordan, Hanich, & Kaplan, 2003; Prior, Smart, Sanson, & Oberklaid, 1999; Shafrir & Siegel, 1994: White, Moffitt, & Silva, 1992).

Children with vision or hearing impairments or children for whom English was not the primary language in the home were excluded from the entire sample to limit the influence of confounding variables. Students not identified as having one of the three profiles of learning difficulties formed a comparison group of students without learning difficulties. Identical selection criteria were used (e.g., no vision or hearing problems and English as a first language) to select the comparison group. Kaplan and George (1995) found that with unequal sample sizes, power in multiple group structural equation models varied significantly, even in situations of factorial invariance. Considering that establishing equal sample sizes would significantly reduce additional information available from including all eligible students, and that power in each group is considered adequate (Kreft, 1996), all cases were retained in the final analysis.

Effects associated with the nested design of the original ECLS-K data collection procedures (e.g., students in the same state, school, or classroom) were expected to be non-significant due to the various selection techniques and regrouping procedures. Current methodologies available and appropriate for nested structures that change over time (e.g., classrooms) are limited. Listwise deletion as a strategy to eliminate all nested data would be extreme. Therefore, analyses were conducted with the full, nested

structure; however, exploratory analyses of model fit were also examined for a smaller, non-nested sample (e.g., random selection of only one eligible student per classroom) with equivalent-sized learning difficulty groups. In addition, while it was possible for individual students to receive multiple treatments or services (e.g., special education, private tutoring) with varying degrees of effectiveness, it was assumed that these effects were distributed throughout the sample and a natural confound of learning difficulties.

The ECLS-K public-use data set provided weighting procedures that can be applied to enhance the representativeness of the data by estimating and correcting for the effects of likelihood of selection and nonresponse. Kindergartners from private schools and students identified as Asian Pacific Islanders were oversampled. ECLS is a nationally representative sample of kindergarten students based on U.S. population statistics during the fall of 1998. While the application of sampling weights is desirable when generalizing study findings to a national level, the goal of the current study was to compare groups identified within the current sample using specific research criteria outlined in the Procedures section. Descriptive data from the weighted and non-weighted samples did not indicate significant discrepancies in any of the key areas targeted for correction by the weighting procedures (e.g., gender). In a similar analysis of longitudinal achievement data, a clear difference between analyses of weighted and unweighted data failed to emerge (Kam & Wagstaff, 2001), providing evidence in support of this decision.

Statistical Analyses

Missing data

Attrition is a significant problem in any study in which participants are repeatedly assessed. Given the expected correlation among the repeated measures for each

individual child, missing data were partially recovered from data collected at previous time points (Schafer & Graham, 2002). Full Information Maximum Likelihood (FIML; Muthen & Muthen, 2004) estimation procedures were used to deal with incomplete data as this procedure is relatively robust to violations of non-normality among variables and is a recommended method for dealing with missing data (Schafer & Graham, 2002).

Longitudinal Growth Analysis

Multiple-group latent growth curve (LGC) analyses using structural equation modeling were employed to examine the repeated measures design, including estimation of change over time by modeling the intercept and slope of social skill ratings for children of differing academic profiles. One advantage offered by LGC analyses is that factor means as well as variances can be accounted for, while procedures such as repeated-measures Analysis of Variance account only for factor means (Duncan, Duncan, & Strycker, 2006). LGC analyses are ideal for modeling growth as they capture intra- as well as inter-individual variability in the outcome variable. To conduct LGC analyses, several conditions must be met (Willett & Sayer, 1994). First, multiple observations must occur over time with a continuous outcome variable. Second, there must be approximately equal time lags between assessment periods (depending on the software used for analysis). Finally, data must be available for each individual on at least three occasions. Three key assumptions of LGC using Structural Equation Modeling were considered, whether: (1) the individual trajectories are linear or non-linear over time, (2) the error variances are independent of the outcome variables, and (3) the error variances are homoscedastic (Byrne & Crombie, 2003).

In addition to modeling social skill ratings, gender and socioeconomic status were added to the model as time-invariant predictors. Two additional variables, parent-child communication and home learning activities, were assessed during the spring of first grade and also included as time-invariant latent variables. These characteristics of the home environment were included due to their logical relations with the outcome variable, social skill development.

The first step in model estimation was to explore the shape of the trajectory through visual analysis of mean scores and individual scores. The most parsimonious model with adequate fit indices was selected. Next, the selected model was calculated for each possible combination of dummy variables to obtain unique factor loadings for each group. The covariates were then added to the model and lastly, relations with nonsignficant or small (defined in the Results section) loadings were eliminated and the final model was recalculated. The proposed analytic model is presented in Figure 6 with modified notation to clarify visual presentation of the information**.** The model is overidentified, with a greater number of observations than free parameters (Kline, 1998). The Mplus software Version 3.0 (Muthen & Muthen, 2006) was used to fit the structural equation models. Hypotheses 1 and 2 were examined using structural equation models.

Test of Hypothesis 1. With regard to subtypes of learning difficulties, it was hypothesized that during kindergarten: a) children with a reading difficulties (RD) would have social skill ratings comparable to children without learning difficulties (AA); b) children with math difficulties (MD) would have significantly lower social skill ratings than children in the RD or AA groups, and c) children with a mixed profile of reading and mathematics difficulties (RMD)

would have significantly lower social skill ratings than children in the other three groups (RD, MD or AA).

To test this hypothesis, the intercept terms estimated by structural equation models were examined to indicate the average teacher-rated social skills at kindergarten for each of the four groups.

Test of Hypothesis 2. With regard to subtypes of learning difficulties, it was hypothesized that between kindergarten and fifth grade: a) children with reading difficulties (RD) would have social skill development comparable to children without learning difficulties (AA); b) children with math difficulties (MD), as compared to children in the RD or AA groups, would have significantly slower social skill development over time, and c) children with a mixed profile of reading and mathematics difficulties (RMD) would be expected to have significantly slower social skill development than children in the other three groups (RD, MD or AA).

To test this hypothesis, the slope terms were estimated by structural equation models to examine the rate of teacher-rated social skill development for each of the four groups between kindergarten and fifth grade.

CHAPTER 4

Results

Data Screening and Preparation

Visual analysis of the degree of linearity for mean subscale scores was conducted, along with examination of scatterplots, P-P Plots and other measures that characterize the distribution of scores. Univariate outliers were located using z-scores above or below 3.29 standard deviations; however these were not recoded or deleted as large sample sizes are more likely to have outliers than smaller samples. Multivariate outliers were located using Mahalanobis distance calculations. For each subscale, cases were identified as outliers with $p < .001$ and removed (Approaches to Learning = 13, Self-Control = 15, Interpersonal Skills = 7, Externalizing Behavior = 157, and Internalizing Behavior = 166). Deleted cases tended to have extreme ratings at opposite ends of the scale on adjacent measurement occasions, suggesting unusual patterns of teacher ratings. All descriptive analyses for the unweighted data were calculated using the Statistical Package for the Social Sciences (SPSS) Version 14.0.

Relatively high levels of skewness, ranging from 0.25 (*SE* = 1.33) to 1.33 (*SE*. = 0.03), and kurtosis, ranging from -0.27 (*SE*. = 0.05) to 2.30 (*SE* = 0.05), were evident among the social skills subscales. Although skewed and kurtotic features tend to decrease with large sample sizes, logarithmic transformations were attempted. Since the data still remained kurtotic and the underlying construct theoretically could be non-normal (e.g.,

internalizing problems), MLR estimation procedures were used during the analyses in lieu of transformations to account for non-normality. Skewness and kurtosis for other variables are presented, along with means and standard deviations, in Table 3.

Finally, Pearson product moment, Spearman's Rho, and Point-Biserial correlations were calculated, as appropriate, to provide information on the nature and strength of the relationship between the covariates (Table 3). Scores for each subscale were highly, positively correlated with a Cronbach's alpha of .81 for Approaches to Learning, .72 for Self-Control, .70 for Interpersonal Skills, and .81 for Externalizing Behavior. Internalizing Behavior was only moderately correlated, with an alpha of .58. Intercorrelations among social skill subscales at each occasion were less than 0.85, ranging from -.72 to .82, and therefore, did not indicate significant multicollinearity.

Although the chi-square difference test is often used as an indicator of improvement in fit between the estimated population and sample covariance matrices, this indicator is affected by sample size, non-normality, and assumptions of independence (Ullman, 2001). While a sample size of 200 is often cited as an adequate number for small or medium models, this number increases with larger and more complex models. Since estimation procedures robust to non-normality were used (Maximum Likelihood Robust; MLR), standard chi-square difference tests were not accurate (Satorra, 2000, Satorra & Bentler, 1999). A scaled chi-square has been developed for use in these situations and was calculated to compare nested models. Finally, all scores for outcome variables, parent-child communication, and home learning were multiplied by 10 to increase the variance during analysis but returned to the original scale for data

presentation. Standard ML procedures for estimating missing data were used in cases where at least 3 out of the 5 time points were available.

Although five measurement occasions were available for analysis, visual inspection of the observed mean scores for each subscale by time suggested higher scores at the second time point, spring of kindergarten. Given that the same teachers reported for the fall and spring of kindergarten but that different teachers reported on child behavior at the other measurement occasions, this increase may reflect a different growth process than captured by the other scores. In other words, these teachers likely considered the child's behavior in the fall as a reference point for the spring rating, while the other teachers in subsequent years were asked to provide a rating at only one time point. In order to ensure similar reference points across occasions, ratings from the fall of the kindergarten year were eliminated from all subsequent analyses.

Although the original analytic plan for this proposal included modeling growth in social skills, a latent variable represented by several indicator variables (subscales) at each time point, the analytic plan was modified to analyze each subscale separately due to poor fit of prerequisite analyses. The first step in multiple indicator growth modeling, exploratory factor analyses, indicated that more than one factor was present at each occasion based on several eigenvalues greater than 1.00 and principal components analyses. This suggested that the existence of a unitary, underlying construct across time was not a feasible assumption. According to Muthen & Muthen (2003), adequate model fit at each step in the multiple indicator growth modeling process is necessary in order to proceed. Due to the poor fit of the exploratory factor analysis, multiple indicator modeling was deemed inappropriate. Instead, each subscale was modeled separately,

using multiple group latent variable growth analysis to more accurately examine the developmental process and factor structure of each subscale.

Home Learning Activities and Parent-Child Communication

Home learning activities (Home 1) and parent-child communication items (Home 2) were analyzed using latent variable analysis. Intercorrelations for individual items are presented in Table 4 and unstandardized factor loadings and residual errors are presented in Figure 7. Following model fit, chi-square significantly decreased, χ^2 (56, N = 8,095) = 1445.66, $p < .01$, and fit indices were in the acceptable range (comparative fit index = 0.95, root-mean-square error of approximation = 0.06, and standardized root mean square residual = 0.05). In the SPSS program, Cronbach's alpha was calculated to obtain an estimate of intercorrelation between items on Home Learning (0.73, 10 items) and Parent-Child Communication (0.74, 4 items) subscales. Model modification indices suggested that how often parents listen to their child was also correlated with the home learning latent variable, but due to conceptual similarity, it was retained with the communication items.

Multiple Group Latent Growth Models

The nature of the intraindividual change is presented graphically for each subscale, by learning group, in Figures 8-12. Based on the inspection of individual trajectories, a no growth (intercept only) model was explored for each subscale, in addition to a growth model with a slope mean of zero (random effects only) and linear growth models. For all models, fit indices were considered to be adequate based on a comparative fit index (CFI) equal to or greater than 0.95 and root mean square error of approximation (RMSEA) equal to or less than 0.06, and standardized root mean square

residual (SRMR) equal to or less than 0.08 as suggested by Hu and Bentler (1999). Table 5 presents significant chi-square values, degrees of freedom, the scaling correction factor, and model fit statistics for each model. Significant chi-square values are indicated by an asterisk in Table 5. The means and variances for the intercepts and slopes and covariances between the intercept and slope, when applicable, are presented at the bottom of Table 5.

Dummy variables were created to represent the four learning groups: no learning difficulty, reading difficulty (RD), math difficulty (MD), and reading and math difficulty (RMD). In the dummy variable approach to multiple group analysis, all parameters of interest in this investigation, mean of the intercept (μ_0) and slope (μ_1), variance of the intercept (ζ_0) and slope (ζ_1), and covariance of the intercept and slope terms ($\zeta_0\zeta_1$) were allowed to vary across groups with the exception of the error variances. In these models, error variances (ε) were free to vary across time but constrained to be equal for a given time point across individuals. Dummy variables were entered such that each learning group served as the reference group to allow all possible comparisons between learning groups. The results are presented in each section as well as in Table 6. Coefficients are also presented for the expected effect on the intercept (γ_0) and slope (γ_1) for a one unit difference in the covariate or dummy variable.

Following estimation of the measurement model, covariates were added to the model. The remaining covariates included gender, socioeconomic status, the home learning latent variable, and the parent-child communication latent variable. Finally, models were re-estimated with only significant relationships included to estimate the most parsimonious model. Although statistical significance is provided for each main

effect of learning disability category, gender, SES, communication and home learning (Tables 7-11), the magnitude of the effect was often small (e.g., 0.01). Therefore, only meaningful changes in magnitude, defined as half a standard deviation of the pooled deviations across all time points of the subscale, were retained in the final models. Specifically, only main effects with a magnitude equal to or greater than 0.27 were retained for Approaches to Learning, 0.22 for Self-Control, 0.23 for Interpersonal Skills, 0.15 for Internalizing Behavior and 0.22 for Externalizing Behavior. The final models are presented in Figures 13-17.

Approaches to Learning. For Approaches to Learning, the model that best represented the data was a linear growth model. Model fit was adequate for the linear trajectory model (CFI = 0.98, RMSEA = 0.06, SRMR = 0.07). In the unconditional growth model, the intercept mean was 3.20 ($\zeta_0 = 2.54$). This indicated that the average initial starting point was a rating of 3.20 but that scores tended to vary around this value. The slope, or change over time, had a mean of -0.02 ($\zeta_1 = 0.04$), which indicates very slow, almost negligible, negative growth over time. A significant covariance of -0.07 between the intercept and slope terms indicated a negative relationship between the initial status and growth over time for Approaches to Learning.

When considering the dummy variables indicating learning difficulty group, the intercept terms, or initial kindergarten ratings for children in all three learning difficulty groups were significantly lower than the ratings for children without learning difficulties. The mean of RD group was -0.50 lower then compared to no learning difficulty group, the MD group was -0.43 lower, while the RMD group was -0.84 lower. In additional analyses, the intercepts for RD versus MD groups ($\gamma_0 = .06$) were not significantly

different, while RD versus RMD ($\gamma_0 = -.34$), and MD versus RMD ($\gamma_0 = -.40$) groups were significantly different. The slope, or growth term, was significantly different for children with reading difficulties ($\gamma_0 = -0.02$) and reading and math difficulties ($\gamma_0 = 0.01$) when compared to children without learning difficulties. Including only significant changes in magnitude, children in all three learning difficulty groups received significantly lower ratings on the Approaches to Learning subscale than children without learning difficulties. Also, children with reading and math difficulties were rated significantly lower than children with only reading difficulties and children with only math difficulties.

In the initial conditional growth model (Table 7), the intercept term, or initial rating on the Approaches to Learning subscale was significantly influenced by gender ($\gamma_0 = 0.28$) and socioeconomic status ($\gamma_0 = 0.03$) in addition to the learning difficulty groups. Parent-child communication and home learning were not significant in this model. For the final model (CFI = 0.98, RMSEA = 0.04, SRMR = 0.05), only learning group status and gender were retained in the model as presented in Figure 13. R-square (R^2) values for the final model were as follows for each successive occasion, .56, .53, .57, .62 and .47 for the intercept term. In sum, growth modeling of the Approaches to Learning subscale indicated that gender influenced only the initial ratings, but not changes in the mean of these ratings over time. For this subscale, students without learning difficulties received the highest rating, followed by students with reading difficulties, then students with math difficulties, and finally, reading and math difficulties received the lowest ratings. Even after considering the 0.27 criteria for a meaningful change, all groups remained significantly different from the no learning difficulty group, while students with either

reading or math difficulties were significantly different than students with reading and math difficulties. Gender was retained in the final model. The R^2 values indicated that 53% to 62% of the variation in the observed variables was explained by the random intercept term.

Self-Control. For the Self-Control subscale, the model that best represented the data was a no growth or intercept only model. Model fit was adequate (CFI = 0.98, RMSEA = 0.04, SRMR = 0.05). In the unconditional growth model, the intercept mean was 3.24 (ζ_0 = 1.49). Although there was significant variation around initial status on this measure, there was no clear change in growth with the exception of change in random slopes.

When compared to children without learning difficulties, the intercept terms or initial ratings for all three learning difficulty groups were significantly lower. The mean of the RD group was -0.28 lower, MD group was -0.20 lower, while RMD group was -0.40 lower. In additional analyses, the intercepts for the RD versus MD (γ_0 = 0.08), RD versus RMD (γ_0 = -0.12) and MD versus RMD (γ_0 = -0.20) groups were also significantly different. When considering changes of a meaningful magnitude, children with reading difficulties or reading and math difficulties were rated significantly lower on the Self-Control subscale when compared to children without learning difficulties.

In the initial conditional growth model (Table 8), gender (γ_0 = 0.21), socioeconomic status (γ_0 = 0.04), and parent-child communication (γ_0 = 0.01) significantly influenced the intercept term, or the initial rating on the Self-Control subscale. Home learning was not significant in this model. For the final model (CFI=0.98, RMSEA = 0.03, SRMR = 0.04), only two learning difficulty groups, MD and

RMD were retained in the model as presented in Figure 14. R-square (R^2) values for the final model were as follows for each successive occasion, .40, .42, .42, .41 and .14 for the intercept term. In sum, growth modeling of the Self-Control subscale indicated that gender, socioeconomic status and parent-child communication influenced the initial values for students; however, there was not a significant change over time for these ratings. For this subscale, students without learning difficulties received the highest rating, followed by students with math difficulties, reading difficulties, and finally, reading and math difficulties. All groups were significantly different from one another statistically; however, using the 0.22 criteria for a meaningful change, the reading difficulty and reading and math difficulty groups remained significantly different from the no learning difficulty group, with no differences between the three remaining learning difficulty subgroups. Gender was extremely close to inclusion in the final model (0.21). The R^2 values indicated that 40% to 42% of the variation in the observed variables was explained by the random intercept term.

Interpersonal Skills. For the Interpersonal Skills subscale, the model that best represented the data was a no growth model. Model fit was adequate (CFI = 0.96, RMSEA = 0.05, SRMR = 0.06). In the unconditional growth model, the intercept mean was 3.15 ($\zeta_0 = 1.58$). This indicated that there was significant variation in the initial ratings for Interpersonal Skills. When compared to children without learning difficulties, the intercept terms for all three learning difficulty groups were significantly different. The mean of the RD group was -0.31 lower, MD group was -0.24 lower, while RMD group was -0.46 lower. In additional analyses, the intercepts were also significant for RD versus MD ($\gamma_0 = 0.08$), RD versus RMD ($\gamma_0 = -0.15$), and MD versus RMD groups ($\gamma_0 = -$

0.23). When considering changes of a meaningful magnitude, all three groups were rated lower than children without learning difficulties on Interpersonal Skills. In addition, children with reading and math difficulties were rated lower than children with only math difficulties.

In the initial conditional growth model (Table 9), gender ($\gamma_0 = 0.26$), socioeconomic status ($\gamma_0 = 0.04$), and home learning activities ($\gamma_0 = 0.00$) significantly influenced the intercept term, or the initial rating on the Interpersonal Skills subscale. For the final model (CFI = 0.97, RMSEA = 0.04, SRMR = 0.05), only two learning difficulty groups, MD and RMD, and gender were retained in the model as presented in Figure 15. R-square (R^2) values for the final model were as follows for each successive occasion, .39, .40, .39, .39 and .28 for the intercept term. In sum, growth modeling of the Interpersonal Skills subscale indicated that gender, socioeconomic status and home learning activities influenced the initial values for students; however, there was not a significant change over time for these ratings. For this subscale, students without learning difficulties received the highest rating, followed by students with math difficulties, reading difficulties, and finally, students with reading and math difficulties. Even after considering the 0.23 criteria for meaningful change, all groups were significantly different from the no learning difficulty group; however, among the remaining three subgroups, only the math difficulty group was significantly different from the reading and math difficulty group. Gender was retained in the final model for this subscale. The R^2 values indicated that 39% to 40% of the variation in the observed variables was explained by the random intercept term.

Internalizing Behavior. For the Internalizing Behavior subscale, the initial model that best represented the data was a linear growth model. Model fit was adequate for the linear trajectory (CFI = 1.00, RMSEA = 0.02, SRMR = 0.02). In the unconditional growth model, the intercept mean was 1.51 ($\zeta_0 = 0.62$). The slope, or change over time, had a mean of 0.02 ($\zeta_1 = 0.02$), which indicates very slow, almost negligible, growth over time. A significant covariance of -0.02 between the intercept and slope terms indicated a negative relationship between the initial status and growth over time for Internalizing Behavior. For this scale, higher scores indicated greater levels of internalizing behavior or poorer social skills in that area.

When considering the dummy variables indicating learning difficulty status, children from all three learning difficulty groups received significantly lower intercept terms or initial kindergarten ratings, when compared to children without learning difficulties, with values of 0.15, 0.15 and 0.25 respectively. The slope, or growth term, was significantly lower for children with reading difficulties ($\gamma_0 = 0.02$) and children with reading and math difficulties ($\gamma_0 = 0.02$) when compared to children without learning difficulties. In additional analyses, the intercepts were also significant for the RD versus RMD ($\gamma_0 = 0.10$) and MD versus RMD groups ($\gamma_0 = 0.09$), but not between RD and MD groups. Using the meaningful change in magnitude (greater than 0.5 standard deviations), children without learning difficulties were rated significantly lower than children in the other three learning difficulty groups.

In the initial conditional growth model (Table 10), the intercept term, or initial kindergarten rating on the Internalizing Behavior subscale was significantly influenced by gender ($\gamma_0 = -0.04$) and socioeconomic status ($\gamma_0 = -0.02$) in addition to the learning

difficulty groups. Parent-child communication and home learning were not significant in this model. For the final model (CFI = 0.97, RMSEA = 0.04, SRMR = 0.05), only two learning difficulty groups, MD and RMD were retained in the model as presented in Figure 16. R-square (R^2) values were as follows for each successive occasion, .26, .26, .25, .24 and .19 for the intercept term. In sum, growth modeling of the Internalizing Behavior subscale indicated that gender and socioeconomic status influenced only the initial kindergarten ratings, but not changes in the mean of these ratings over time. For this subscale, students without learning difficulties received the highest rating, followed by equal ratings for students with reading difficulties or math difficulties, followed by students with reading and math difficulties. Even after considering the 0.15 criteria for meaningful change, all groups were significantly different from the no learning difficulty group; however, no significant differences remained among the three subgroups of RD, MD or RMD. The R^2 values indicated that 24% to 26% of the variation in the observed variables was explained by the intercept term.

Externalizing Behavior. For the Externalizing Behavior subscale, the model that best represented the data was an intercept only or no growth model. Model fit was adequate for the no growth trajectory (CFI = 0.96, RMSEA = 0.06, SRMR = 0.05). In the unconditional growth model, the intercept mean was significant at 1.62 ($\zeta_0 = 1.78$). When considering the dummy variables indicating learning difficulty status, the intercept term or initial ratings for all three learning difficulty groups were significantly different than ratings for the no learning difficulty group. Compared to children without learning difficulties, the mean of the RD group was 0.25 higher, the MD group was 0.16 higher, while the RMD group was 0.34 higher. In additional analyses, the intercepts were also

significant for RD versus MD ($\gamma_0 = -0.09$), RD versus RMD ($\gamma_0 = 0.08$), and MD versus RMD groups ($\gamma_0 = 0.18$). When using half of a standard deviation as a criterion for significance, children with reading difficulties and reading and math difficulties were rated significantly lower than children without learning difficulties or children with only math difficulties. For this scale, higher scores indicated greater levels of externalizing behavior or poorer social skills.

In the initial conditional growth model (Table 11), the intercept term or initial rating on the Externalizing Behavior subscale was significantly influenced by gender ($\gamma_0 = -0.24$), socioeconomic status ($\gamma_0 = -0.04$), and parent-child communication ($\gamma_0 = -0.01$) in addition to the learning difficulty groups. Home learning was not significant in this model. For the final model (CFI = 0.97, RMSEA = 0.03, SRMR = 0.02), only one learning difficulty group, RMD, and gender were retained in the model as presented in Figure 17. R-square (R^2) values were as follows for each successive occasion, .51, .52, .54, .53 and .16 for the intercept term. In sum, growth modeling of the Externalizing Skills subscale indicated that gender, socioeconomic status and parent-child communication influenced the initial values for students; however, there was not a significant change over time for these ratings. For this subscale, students without learning difficulties received the highest ratings, followed by students with math difficulties, reading difficulties, and finally, reading and math difficulties. After considering the 0.22 criteria for meaningful change, only the reading difficulty and reading and math difficulty groups were significantly different from the no learning difficulty group; however, no significant differences remained among the three learning difficulty groups. Gender was

retained in the final model for this subscale. The R^2 values indicated that 51% to 54% of the variation in the observed variables was explained by the intercept term.

To summarize the results, mean score graphs, graphs of randomly selected individual cases, goodness of fit indices, and the principle of parsimony indicate that all subscales were best represented by a linear trajectory without significant change in slope. One assumption of the dummy variable approach to multiple groups is that growth trajectories are equivalent across dummy variables or learning difficulty groups (Bollen & Curran, 2006). Although this assumption appears to generally hold true based on visual analysis of plotted mean scores by group, model fit was examined for each group separately. Fit statistics suggest minimal variation in the shape of the trajectories by learning difficulty group.

Graphical presentation of the mean scores by learning difficulty group indicated that children without learning difficulties received the most positive teacher ratings on social skills in kindergarten, followed by children with math difficulties, children with reading difficulties, and finally, children with reading and math difficulties. Prior to the addition covariates other than learning difficulty group status, initial kindergarten ratings for each learning difficulty group were significantly lower than ratings for children without learning difficulties, with the exception of ratings for children with math difficulties on the Self-Control and Externalizing Behavior subscales. No significant differences were found between the initial kindergarten ratings for children with reading difficulties when compared to children with math difficulties. Finally, children with reading and math difficulties were significantly lower on initial kindergarten ratings than children with reading difficulties or math difficulties on the Approaches to Learning

subscale and significantly lower than children with math difficulties on the Interpersonal Skills subscale.

Once covariates other than learning difficulty group were included in the final model, relative group differences indicated slightly different results. In these models, children with reading difficulties received significantly lower kindergarten ratings than children without learning difficulties on the Approaches to Learning subscale only. Children with math difficulties received significantly lower ratings than children without learning difficulties for all subscales except Externalizing Behavior. Finally, children with reading and math difficulties scored significantly lower than children without learning difficulties on all subscales.

CHAPTER 5

Discussion

The purpose of this study was to determine whether differences existed in the initial status or development of social skills among young children with three types of learning difficulties, reading difficulties, math difficulties, and reading and math difficulties, compared to children without learning difficulties. The results presented above provide limited support for the first hypothesis, but do not support the second hypothesis. The first hypothesis considered differences in social skills ratings among subgroups, specifically, that during kindergarten a) children with a reading difficulties (RD) would have social skills ratings comparable to children without learning difficulties (AA); b) children with math difficulties (MD) would have significantly lower social skill ratings than children in the RD or AA groups, and c) children with a mixed profile of reading and mathematics difficulties (RMD) would have significantly lower social skill ratings than children in the other three groups (RD, MD or AA).

In response to each of the hypothesized relationships (prior to the addition of covariates), a) students with reading difficulties had significantly lower kindergarten ratings than students without learning difficulties on all subscales, b) students with math difficulties had similar ratings to students with reading difficulties but lower ratings than students without learning difficulties on the Approaches to Learning, Interpersonal Skills and Internalizing Behavior subscales, and c) students with reading and math difficulties

had significantly lower social skill ratings than students without learning difficulties for all scales, from children with reading difficulties or math difficulties on the Approaches to Learning subscale, and from children with math difficulties on the Interpersonal Skills subscale. These results are reported for the models without additional covariates; however, these findings vary once gender is added in the model. Considering the second hypothesis, no support was found for significant and meaningful differences in the development of social skills across groups between kindergarten and the fifth grade.

Although specific hypotheses were not presented for the covariates, gender emerged as the child characteristic most influential in teacher ratings of social skills. The coefficients for gender indicated that females received significantly higher ratings in kindergarten on two of the positively-oriented scales, Approaches to Learning and Interpersonal Skills, while males received higher scores on the Externalizing subscale. In comparison to children without learning difficulties, all models indicated that students with reading difficulties received lower ratings than students with math difficulties, with the exception of Internalizing Behavior ratings which were relatively even across the groups. However, once gender was entered into the model, the relative standing of the groups changed. After gender was entered as a covariate, results for all models indicated that the scores for children with math difficulties were lower, compared to children without learning difficulties, than children with reading difficulties. The variables of socioeconomic status, parent-child communication, and home learning activities were also influential; however, these values were not considered meaningfully significant.

Several findings reported above are notable. First, there were distinct and significant differences among the initial status, or social skills ratings in the spring of

kindergarten, for children across the four learning groups. While some variation across subscales existed, children with reading difficulties and more consistently, children with reading and math difficulties, demonstrated the lowest levels of positively-oriented social skills starting in kindergarten and maintained this position though the fifth grade based on graphical presentation of mean score data. These findings were also replicated by the latent models in which children with both reading and math difficulties had the lowest scores on the Approaches to Learning, Self-Control, Interpersonal Skills subscales and the highest scores on the Internalizing and Externalizing Behavior subscales. Further, group differences appeared to vary based upon the subscale of interest. Specifically, the Approaches to Learning, Interpersonal Skills, and Internalizing Behavior subscales indicated differences among all three learning difficulty groups compared to children without learning difficulties, while the Self-Control and Externalizing Behavior subscales indicated group differences in the final model between children without learning difficulties and children with reading difficulties or reading and math difficulties.

This is an important finding in that, while poor social skills are not uncommon among children with learning difficulties, there is less information available about the nature of these social skill deficits. Information about the nature of social skill deficits faced by children with particular patterns of learning difficulties may guide the development of assessment, prevention and intervention efforts. For example, the current investigation suggests that children with math difficulties did not demonstrate internalizing behaviors at significantly higher rates than their peers with reading difficulties, a finding which has been inconsistently supported in the literature. Limited support was found for greater social skill deficits among children with math difficulties

when compared to children without learning difficulties (for three out of the five subscales), but not in comparison to children with reading difficulties. This study confirms the findings that children with multiple areas of learning difficulties seem to be at the greatest risk for social skills deficits as perceived by teachers. Further exploration of these patterns may reveal additional information about the possible reasons for these differential relationships among learning subtypes and particular patterns of social skill deficits.

It is notable that a very conservative approach was used in this investigation to select models with adequate fit and demonstrate significance. The large sample size increased the likelihood that statistically significant differences would be found, while the use of meaningful differences in social skills was used to provide a benchmark for interpreting findings and informing intervention protocols. However, the literature for evaluating this standard is not as developed in this area, particularly given that this is a relatively new, unpublished measure. For example, a similar study retained a statistically significant change on a 33-item, 3-point scale of externalizing behavior on the order of 0.02 ($p < .01$, $n = 405$; Keiley, Bates, Dodge, & Pettit, 2000). Variations among definitions of parsimony and criteria for constituting a "meaningful" or clinically relevant change should consider measurement properties as well as change in the indicator associated with outcomes of consequence.

The second important finding was the lack of substantial growth present in the models. Although graphs of the individual slopes indicated different trajectories (random effects), the mean slope terms did not indicate meaningful change or growth across any of the five subscales. Model fit indices indicated that significant slope or growth terms

were present for several of the models; however, the coefficients of these slopes indicated negligible values of change, generally less than 0.03. To obtain the most parsimonious model, growth terms were eliminated in the final models (except for Approaches to Learning and Internalizing Behavior), indicating a "no growth" process in social skill development overall. The mean slope terms for Approaches to Learning and Internalizing Behavior were minimal.

This is in contrast to another study that assessed social skill development over time and found a negative, linear trend for teacher-rated social skills (Chan et. al, 2000). Chan and colleagues used the original SSRS to model between-setting differences in social skills as rated by parents and teachers across kindergarten through third grade. Although the ideal scenario for detecting patterns of growth over time would be for the same rater to evaluate progress along a standard metric; the use of different raters, namely teachers, has been employed in other studies of longitudinal latent growth analysis (Chan et. al., 2000; Keiley, Bates, Dodge, & Pettit, 2000). While using different raters would contribute to greater, unexplained variation in the error term, the child's behavior is the primary focus, which is presumed to demonstrate relative continuity over time.

The lack of growth for scores on the Social Rating Scale may also be a function of the items used to assess social skills. The items may not continue to be developmentally appropriate as children age. For example, an item assessing how often a child stays seated may be a less appropriate indicator of self-control in fifth grade than in kindergarten. Further, the items selected for inclusion in the Social Rating Scale may not be sensitive enough to detect growth or change in child behavior.

Another reason for the lack of growth in social skill ratings may be that change in social skill teacher ratings over time may be less sensitive for children with low levels of problematic behavior. Campbell, Spieker, Burchinal, Poe and The NICHD Early Child Care Research Network (2006) examined trajectories of aggression for children ages 9-12. The teacher SSRS ratings for children in each of five different trajectories of aggression suggested that the magnitude of change for children with high-stable aggression moves from an average of 89.1 at age 9 to an average of 84.3 at age 12, but for children with very low aggression, the average ranges from 105.5 to 106.1 over the same time period. Therefore, children with more normative behavior may show less change over time, in addition to lower scores than children with more deviant behavior. The sensitivity of the SSRS is also supported by a dissertation finding that suggests that difficulty demonstrating change over time on this measure, particularly following intervention, may be a function of the type of measurement and other measurement related issues (Atkins-Burnett, 2001). For example, the teachers in the current study were asked to rate the students on a four-point scale on the SRS. A scale with a larger number of anchor points may capture greater variability in scores. Further item and scale level analyses should be conducted or reported by ECLS to allow for more complete understanding of the reliability and validity of this newly developed, unpublished instrument. The importance of establishing the metric, or that a one unit change reflects the same underlying phenomenon across the scale and over time, is an issue in both longitudinal, developmental models (Burchinal, Nelson, & Poe, 2006).

There was also significant variation in the degree of association between the initial status and covariates of gender, socioeconomic status, parent-child communication,

and home learning variables. Gender is the exogenous variable most consistently and significantly related to initial social skills ratings in the final models. The initial status for Approaches to Learning, Interpersonal Skills and Externalizing Behaviors varied significantly by gender. Male students were more likely to have higher teacher ratings on Externalizing Behavior, while female students tended to have higher ratings on the Approaches to Learning and Interpersonal Skills subscales. This finding is consistent with other studies that have documented increased rates of externalizing behavior among male students (e.g., NICHD Early Child Care Research Network, 2004; Bates, Pettit, Dodge, & Ridge, 1998).

When gender was entered into models with learning difficulty groups, the relative standing of children with reading difficulties and math difficulties, compared to children without learning difficulties, changed. When only the learning difficulty covariate was included in the growth models, children with reading difficulties received lower initial teacher ratings (except on the Internalizing scale) compared to children without learning difficulties. After gender was added to this model, the regression coefficients indicated lower initial teacher ratings for children with math difficulties. This finding suggests a possible moderation or interaction effect for learning difficulty group and gender; however, significant differences in the sizes of these groups may partially account for this change.

Although socioeconomic status, parent-child communication, and home learning activities were significantly related for some of the initial models, the relative contribution to the prediction of social skills was low and thus, these covariates were eliminated to produce the most parsimonious, final models. For most models, home

learning was not a significant predictor. Although home variables have been demonstrated to affect ratings of children's behavior in the school environment, recent research suggests that parent and teacher reports of social skills as measured by the SSRS exhibit different trajectories of growth and logically, may be influenced by different home and school variables (Chan et. al., 2000).

Finally, the social rating scale failed to demonstrate adequate fit using a multiple indicator modeling approach. Exploratory factor analyses indicated more than one underlying construct or factor at each time point. Since analyses indicated a multidimensional construct, the scales were modeled separately, a modification to the original analytic plan. The lack of a unidimensional social skills construct suggests that caution should be used when calculating a single social skill score in future analyses using the ECLS data set.

Limitations

Limitations of the ELCS data that may impact the current findings include the amount of missing data or attrition present in the sample. Limitations attributable to the design or procedures of the current study included the difference in sample characteristics between students with and without agreement among the teacher ratings and/or direct child performance. Following these selection procedures, possible bias or overrepresentation of males, children from lower socioeconomic status, and children in the reading and math learning difficulty group may affect generalizability of the findings. Beyond student demographics, students for whom there was not agreement between direct child assessment and teacher rating of academic performance may eliminate an important subset of students, possibly students 1.) who were overlooked by teachers as

having difficulties that actually were as evidenced by their poor performance on the child assessment, 2.) who received more negative teacher evaluations than warranted based on actual performance or finally, 3.) who had a third intervening variable, such as attention problems, that may have contributed to inconsistent performance and/or ratings. Another consideration is the use of teacher ratings to evaluate social skills. In most school environments, teachers continue to teach the same grade from year to year. As children are promoted, they move on to different teachers. Therefore, teachers are often unfamiliar with the prior social skills of the student and as a result, may have less information upon which to consider the development of social skills. Although the measure is designed to assess the frequency of a child's social behavior in comparison to a reference group of their peers, the measure may perform differently when raters compare current skill to previous skill levels. This is supported by the apparent jump in ratings from the fall to the spring of the kindergarten year, assuming the same teacher provided the rating at both time points. The use of multiple raters also introduced additional error into the model and may occlude true variation in social development. Further, children may also experience the majority of growth in social skills or socialization in kindergarten or even earlier.

Although not explicit in the instructions, another consideration is that teachers likely compared the participating student with the student's same-age classmates. In light of the fact that students with learning difficulties are more likely to be retained than their same-age peers (Barnett, Clarizio, & Payette, 1996; Jimerson, Pletcher, Graydon, Schnurr, Nickerson, & Kundert, 2006), teachers may have rated retained students in comparison to younger students as the reference group. Although children with learning difficulties tend to have lower social skills then their same-aged peers, they may actually

look more socially developed then children of younger ages in the lower grade classrooms (Gleason, Kwok, & Hughes, 2007).

Finally, students with disabilities or disorders such as attention problems in addition to learning difficulties may have lower social skill ratings than students with only learning problems. Accounting for the particular types of impairment may change the relationships among the key variables of interest. For example, children diagnosed with attention problems may be somewhat more likely to demonstrate reading difficulties than math difficulties (Frazier, Youngstrom, Glutting & Watkins, 2007). In another example, children with better verbal skills in kindergarten were rated as having higher social skills by teachers (Chan et. al., 2000). Thus, intervening variables may also account for some of the unexpected findings in the current study. Likewise, special education services were not included in this investigation beyond descriptive data for each learning group, but may represent an important consideration for future analyses.

Future research and potential application of findings

Future research should utilize latent class analyses to capture variation among children who show a relative increase or decrease in social skills. While the sample demonstrates minimal growth in social skills overall, this analytic technique may reveal specific characteristics and variation among these two groups. Second, considering the retention of gender and learning difficulty groups in the final models, further exploration could be conducted regarding interactions between the covariates in this model. In other words, interactions between gender and learning difficulty groups will be important to consider in future research. A third potential area focuses on identifying reasons for the minimal detection of growth detected by the SRS as compared to the Social Skills Rating

Scale (Chan et. al., 2000), other scales of learning related skills (McClelland, Acock & Morrison, 2006), or scales of internalizing and externalizing behaviors (Keiley, Bates, Dodge, & Pettit, 2000) used in prior studies to detect growth among these important constructs. Another possible approach would be to replicate analyses by McClelland and colleagues that assessed the relationship of learning-related skills, such as self-regulation and social competence in relation to the development of reading and math skills. This type of analysis would provide a different approach to obtain similar information about the relationships among social behavior and learning.

In addition, a recent review of social competence suggested consideration of a four way interaction among child, behavior, situation and judge to fully encompass development and change (Dirks, Treat, & Weersing, 2007). Given the significant amount of unexplained variation that remains (r^2) for each subscale, further investigation into possible sources of this error is warranted. The variation in social ratings could be further examined by environmental expectations and demands (e.g., teacher philosophy and classroom rules), rater characteristics (e.g., length of time as a teacher), or other child-specific or situation-specific variables. In fact, teacher's perspectives and characteristics have been found to influence ratings of student behavior (Rimm-Kaufman, Pianta & Cox, 2000). Furthermore, most social rating scales neglect to specify settings or situations in which behaviors are expected, but ask for global ratings of performance, decreasing explanatory power (Dirks et al.).

Another area for future exploration would be to conduct a similar study to limit the possible influence of teachers' awareness of student learning difficulties by including an observational measure of social behavior completed by an independent rater. It is

possible that teachers may have different interactions with children with learning difficulties, for example, more contact with parents, more concerns about performance, or more frequent interactions with the student that may affect their perceptions of the student's social behaviors. Further highlighting the importance of teacher perceptions, emerging evidence suggests that teachers differ in the value that they place on different social skills (Meier, DiPerna, & Oster, 2006).

In sum, findings from this study have significant implications for policy development and practice. The primary policy implication of this research is that, for children later identified as having learning difficulties in the third and/or fifth grade, detectable differences exist among children's social skills as early as the spring of kindergarten. Furthermore, these differences are not only evident early, but they are also stable over time. It is notable that even as more children received special education services, as indicated by the presence of an Individualized Education Plan, there was not a significant improvement in social skills as rated by teachers, further suggesting that social skills appear to be relatively stable over time.

Policies supporting the early detection of social deficits, as well as learning difficulties, would allow for early intervention and remediation efforts. Early learning environments should provide screening for social difficulties among children with learning difficulties. Assuming adequate measurement properties, the lack of growth during the study period may indicate that significant growth occurs in social skills prior to spring of kindergarten, again highlighting the importance of attention to social development in early learning environments.

In addition to screening, early learning environments should provide access to timely, remediation programs to build social skills and orchestrate environmental opportunities to reduce the negative impact that frequently results from early and enduring social difficulties. Given the established relationship among learning difficulties and social deficits and the likely bidirectional effects of impairment in either area, policies should recognize the importance of both domains. Although this study does not specifically evaluate whether learning difficulties are evident among the kindergarten children later identified in one of the three learning difficulty groups, it is possible that social deficits may either co-occur or even precede early learning difficulties and thus, early learning achievement should not be monitored to the exclusion of early social deficits.

Furthermore, there appears to be differential risk for social skills deficits based on learning subtypes identified in the third or fifth grade. This highlights a second implication for policy, specifically, that the type of learning difficulty a child experiences may place them at greater risk for social deficits. This finding suggests that greater resources should be directed ameliorating social skills difficulties, particularly among children with both reading and math difficulties. Specifically, children identified as having difficulties in reading and math should be evaluated for associated social deficits. Furthermore, relative to the frequency of each type of learning difficulty in the final sample, the number of children in each learning group with an Individualized Education Plan in fifth grade (regardless of eligibility category) suggests that children with math difficulties may be underidentified. In other words, children with only math difficulties may be less likely to be identified by school systems compared to children with only

reading difficulties or reading and math difficulties. While this may occur for a number of reasons, final models indicate that children with math difficulties have significantly lower social skills when compared to children without learning difficulties. Thus, these children may represent a segment of population of children with learning difficulties at risk for being "missed" by formal identification and intervention programs.

Given the significant differences between teacher ratings of social skills for children with and without learning difficulties, responsible assessment practices should include an evaluation of social skill deficits as part of the standard assessment protocol. This is particularly important for children identified as having reading and math difficulties. Further, existing intervention plans may need to be modified to remediate social deficits or prevent the development of social skills problems. Several reviews of social skill interventions are available and recommendations are provided (e.g., Gresham, 1998; Bullis, Walker, & Sprague, 2001); however, much work remains to be done to ensure the effectiveness of these interventions for all students (Gresham, 1998). For example, some evidence suggests that social skill training and interventions are most effective as a part of a larger, multi-method intervention (Spence, 2003). Furthermore, possible interactions among the covariates in this model suggest that particular groups may be at differential risk for poor social skills, such as male students with reading and math difficulties. Therefore, this information should be considered during the identification of students in need of additional assistance to enhance the social and academic outcomes for children.

Table 1

*Selection Criteria for Subtype Identification for Students with Learning Difficulties**

	Teacher Ratings of Academic Performance	Direct Child Assessment	Final classification
Criteria for learning difficulty for ratings or assessment	Reading ≤ Below Avg. Math ≥ Avg.	Reading ≤ 30th percentile Math ≥ 40th percentile	RD
	Reading ≥ Avg. Math ≤ Below Avg.	Reading ≥ 40th percentile Math ≤ 30th percentile	MD
	Reading ≤ Below Avg. Math ≤ Below Avg.	Reading ≤ 30th percentile Math ≤ 30th percentile	RMD

* Due to planned and unplanned missingness, two data sources at the same occasion, or two occasions from the same source were used to classify children into learning group categories.

Table 2

Descriptive information for the full sample and learning difficulty groups

	% of RD (N)	% of MD (N)	% of RMD (N)	% of None (N)	% of Full Sample (N)
N	4 (301)	4 (262)	16 (1287)	77 (6245)	100 (8095)
Male	75	31	51	50	51
1st time in Kindergarten	94	97	93	97	97
Disability	17	13	20	9	11
Public School	87	68	92	71	75
SES- 1st Quintile	17	13	36	6	11
SES- 2nd Quintile	26	20	27	15	17
SES- 3rd Quintile	33	27	19	21	21
SES- 4th Quintile	16	26	12	25	23
SES- 5th Quintile	8	14	6	34	28

IEP at 3rd grade	21		8		35		4		10	
	M	SD	M	SD	M	SD	M	SD	M	SD
DCA: Reading	41.56	3.62	51.21	4.02	37.63	6.52	56.91	6.84	53.15	9.88
DCA: Math	50.98	4.06	41.12	3.76	37.41	5.63	56.86	6.65	53.06	9.74
TR: Reading	2.22	0.66	2.98	0.58	1.97	0.69	3.68	0.74	3.33	0.98
TR: Math	2.96	0.57	2.37	0.72	1.96	0.71	3.63	0.71	3.31	0.94
Communication	3.42	0.54	3.57	0.48	3.51	0.53	3.57	0.45	3.56	0.47
Home Learning	2.77	0.43	2.78	0.42	2.75	0.50	2.73	0.44	2.74	0.45

Table 3

Intercorrelations and Descriptive Statistics for Key Variables for All Students (n=8095)

Variable	1	2	3	4	5	6	7	8
1. Gender	-	.00	.06*	-.10**	.09**	-.02	-.01	-.01
2. SES		-	.46**	.44**	.36**	.33**	.11**	.04**
3. DCA: Reading			-	.75**	.70**	.62**	.08**	-.02
4. DCA: Math				-	.64**	.69**	.06**	-.01
5. TR: Reading					-	.69**	.06**	-.01
6. TR: Rating						-	.04**	-.01
7. Communication							-	.29**
8. Home Learning								-
Mean	1.50	3.39	53.15	53.06	3.33	3.31	3.56	2.74
SD	0.50	1.34	9.88	9.74	0.98	0.94	0.47	0.45
Skewness (*SE*=0.03)	0.02	-0.33	-0.47	-0.45	-0.37	-0.36	-0.96	-0.06
Kurtosis (*SE*=0.06)	-2.00	-1.10	0.40	0.11	-0.23	-0.06	0.36	-0.20

* $p < .05$; ** $p < .01$, two-tailed.

Table 4

Intercorrelations between the Parent-Child Communication and Home Learning items

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1. Stories	-	.24	.28	.15	.25	.26	.23	.17	.23	.35	.16	.12	.14	.15
2. Sing		-	.25	.20	.20	.21	.14	.19	.22	.17	.13	.11	.14	.13
3. Help			-	.12	.29	.29	.29	.18	.18	.23	.13	.10	.10	.14
4. Chores				-	.19	.16	.13	.19	.26	.15	.11	.11	.11	.11
5. Games					-	.26	.32	.28	.21	.20	.14	.09	.11	.12
6. Nature						-	.30	.20	.16	.18	.14	.13	.15	.14
7. Build							-	.25	.15	.17	.12	.06	.07	.10
8. Sport								-	.19	.14	.12	.08	.10	.11
9. Write									-	.41	.14	.13	.13	.15
10. Read										-	.13	.10	.34	.37
11. Listen											-	.13	.34	.37
12. Trouble												-	.57	.54
13. Friend													-	.63
14. Opinion														-

Table 5

Chi-square Difference Test and Fit Indices** for Each Subscale*

Model (df)	Approaches to Learning		Self-Control		Interpersonal Skills		Internalizing Behavior		Externalizing Behavior	
	X2/ SCF^	CFI/ RMSEA /SRMR	X2/ SCF^	CFI/ RMSEA/ SRMR	X2/ SCF^	CFI/ RMSEA /SRMR	X2/ SCF^	CFI/ RMSEA /SRMR	X2/ SCF^	CFI/ RMSEA /SRMR
Baseline (6)	8096.70		4760.31		4485.90		1703.29		6547.36	
Intercept Only (8)	435.48*	0.95	105.73*	.98	194.78*	.96	242.28*	.86	247.60*	.96
	1.007	.08	1.032	.04	1.018	.05	1.114	.06	1.196	.06
		.11		.05		.06		.04		.05
Intercept, Random Slope (6)	309.51*	0.96	22.65*	1.00	121.74*	.97	176.97*	.90	142.58*	.98
	1.001	.08	1.022	.02	1.023	.05	1.074	.06	1.157	.05
		.08		.03		.04		.04		.03

Linear	173.14*	0.98	20.69	1.00	22.00*	1.00	25.23*	1.00	100.03*	.99
Growth (5)	(5)	.06	(5)	.02	(5)	.02	(5)	.02	(5)	.05
	0.997	.07	1.021	.02	1.026	.03	1.09	.02	1.176	.03

Initial Model	AL- Linear Growth	SC- Intercept Only	IS – Intercept Only	IB – Linear Growth	EB- Intercept Only
Mean I	3.20*	3.24*	3.15*	1.51*	1.62*
Variance I	2.54*	1.49*	1.58*	0.62*	1.78*
Mean S	-0.02*	-	-	0.02*	-
Variance S	0.04*	-	-	0.02*	-
I & S Cov.	-0.07*	-	-	-0.02	-

* When using MLR estimation, chi-square differences cannot be directly compared (Satorra, 2000; Satorra & Bentler, 1999).

** Good fit indicated by the following values: CFI ≤.95; RMSEA ≤ .06; SRMR ≤.08 (Hu & Bentler, 1999).

^ SCF= Scaling Correction Factor for nested, non-normal analysis (Satorra, 2000; Satorra & Bentler, 1999).

Table 6

Differences in initial ratings for each subscale by learning difficulty group

Subscale	Group^	No Learning Difficulty	Reading Difficulty	Math Difficulty
Approaches to Learning	RD	-.50*	-	-
	MD	-.43*	.06	-
	RMD	-.84*	-.34*	-.40*
Self-Control	RD	-.28*	-	-
	MD	-.20	.08	-
	RMD	-.40*	-.12	-.20
Interpersonal Skills	RD	-.31*	-	-
	MD	-.24*	.08	-
	RMD	-.46*	-.15	-.23*
Internalizing Behavior	RD	.15*	-	-
	MD	.15*	.00	-
	RMD	.25*	.10	.09
Externalizing Behavior	RD	.25*	-	-
	MD	.16	-.09	-
	RMD	.34*	.08	.18

^ For group, RD is "reading difficulty", MD is "math difficulty",

RMD is "reading and math difficulty".

* Indicates that this value reaches the level of meaningful magnitude change greater to the 0.5 s.d. for the subscale over time.

Table 7

Parameter estimates for the initial Approaches to Learning model

Parameter	Estimate	*SE*	t-Value
Mean level (μ_0)	2.83	.03	108.50*
Mean level (μ_1)	-0.05	.01	-6.73*
Variance level (ζ_0)	1.32	.05	27.36*
Variance level (ζ_1)	0.04	.00	9.21*
Covariance level	-0.06	.01	-5.50*
Unique variance (ε_1)	2.02	.05	39.23*
Unique variance (ε_2)	2.14	.05	47.31*
Unique variance (ε_3)	1.88	.04	47.74*
Unique variance (ε_4)	1.74	.06	27.41*
Model with covariates			
Gender ($\gamma_g \rightarrow \mu_0$)	.28^	.01	24.59*
SES ($\gamma_s \rightarrow \mu_0$)	.03	.00	6.37*
Parent-child communication ($\gamma_c \rightarrow \mu_0$)	.00	.00	1.83
Home learning ($\gamma_h \rightarrow \mu_0$)	.00	.00	.09
Reading difficulty ($\gamma_r \rightarrow \mu_0$)	-.40^	.03	-11.86*
Math difficulty ($\gamma_m \rightarrow \mu_0$)	-.47^	.03	-13.63*
Reading and math difficulty ($\gamma_{rm} \rightarrow \mu_0$)	-.79^	.02	-43.46*
Gender ($\gamma_g \rightarrow \mu_1$)	.01	.00	3.17*
SES ($\gamma_s \rightarrow \mu_1$)	.00	.00	2.63*
Parent-child communication ($\gamma_c \rightarrow \mu_1$)	.00	.00	1.10

Home learning ($\gamma_h \rightarrow \mu_1$)	-.00	.00	-1.68
Reading difficulty ($\gamma_r \rightarrow \mu_1$)	-.02	.01	-1.63
Math difficulty ($\gamma_m \rightarrow \mu_1$)	.01	.01	0.63
Reading and math difficulty ($\gamma_{rm} \rightarrow \mu_1$)	.02	.01	3.98*

* $p < .05$, one-tailed; ^ Coefficient greater than 0.5 standard deviation of subscale.

Table 8

Parameter estimates for the initial Self-Control model

Parameter	Estimate	*SE*	t-Value
Mean level (μ_0)	2.86	.02	134.44*
Variance level (ζ_0)	1.11	.03	38.47*
Unique variance (ε_1)	2.27	.04	54.85*
Unique variance (ε_2)	2.09	.04	51.13*
Unique variance (ε_3)	2.07	.04	49.54*
Unique variance (ε_4)	2.14	.04	49.05*
Model with covariates			
Gender (γ_g)	.21	.01	23.10*
SES (γ_s)	.04	.00	9.71*
Parent-child communication (γ_c)	.01	.00	3.22*
Home learning (γ_h)	.00	.00	0.26
Reading difficulty (γ_r)	-.19	.03	-7.01*
Math difficulty (γ_m)	-.22^	.03	-8.13*
Reading and math difficulty (γ_{rm})	-.35^	.02	-22.83*

* $p < .05$, one-tailed; ^ Coefficient greater than 0.5 standard deviation of subscale.

Table 9

Parameter estimates for the initial Interpersonal Skills model

Parameter	Estimate	*SE*	t-Value
Mean level (μ_0)	2.72	.02	127.09*
Variance level (ζ_0)	1.09	.03	37.85*
Unique variance (ε_1)	2.48	.04	55.96*
Unique variance (ε_2)	2.40	.04	54.00*
Unique variance (ε_3)	2.44	.04	54.47*
Unique variance (ε_4)	2.53	.05	52.50*
Model with covariates			
Gender (γ_g)	.26^	.01	27.11*
SES (γ_s)	.04	.00	9.95*
Parent-child communication (γ_c)	.01	.00	2.95*
Home learning (γ_h)	.00	.00	1.06
Reading difficulty (γ_r)	-.21	.03	-7.97*
Math difficulty (γ_m)	-.26^	.03	-9.76*
Reading and math difficulty (γ_{rm})	-.40^	.01	-27.22*

* $p < .05$, one-tailed; ^ Coefficient greater than 0.5 standard deviation of subscale.

Table 10

Parameter estimates for the initial Internalizing Behavior model

Parameter	Estimate	*SE*	t-Value
Mean level (μ_0)	1.58	.02	77.50*
Mean level (μ_1)	.51	.03	15.06*
Variance level (ζ_0)	.02	.01	3.09*
Variance level (ζ_1)	.02	.00	5.32*
Covariance level	-.02	.01	-2.60*
Unique variance (ε_1)	1.67	.05	34.55*
Unique variance (ε_2)	1.72	.05	35.92*
Unique variance (ε_3)	1.74	.05	37.39*
Unique variance (ε_4)	1.63	.07	24.85*
Model with covariates			
Gender ($\gamma_g \rightarrow \mu_0$)	-.04	.01	-4.29*
SES ($\gamma_s \rightarrow \mu_0$)	-.02	.00	-4.35*
Parent-child communication ($\gamma_c \rightarrow \mu_0$)	.00	.00	.03
Home learning ($\gamma_h \rightarrow \mu_0$)	-.00	.00	-1.06
Reading difficulty ($\gamma_r \rightarrow \mu_0$)	.13	.03	4.95*
Math difficulty ($\gamma_m \rightarrow \mu_0$)	.15^	.03	5.65*
Reading and math difficulty ($\gamma_{rm} \rightarrow \mu_0$)	.23^	.02	14.89*
Gender ($\gamma_g \rightarrow \mu_1$)	-.00	.00	-0.49
SES ($\gamma_s \rightarrow \mu_1$)	-.00	.00	-1.03
Parent-child communication ($\gamma_c \rightarrow \mu_1$)	.00	.02	0.27

Home learning ($\gamma_h \rightarrow \mu_1$)	-.00	.01	-1.06
Reading difficulty ($\gamma_r \rightarrow \mu_1$)	.02	.01	2.30*
Math difficulty ($\gamma_m \rightarrow \mu_1$)	.02	.01	1.73
Reading and math difficulty ($\gamma_{rm} \rightarrow \mu_1$)	.02	.01	4.21*

* $p < .05$, one-tailed; ^ Coefficient greater than 0.5 standard deviation of subscale.

Table 11

Parameter estimates for the initial Externalizing Behavior model

Parameter	Estimate	*SE*	t-Value
Mean level (μ_0)	2.05	.05	16.47*
Variance level (ζ_0)	1.45	.03	41.53*
Unique variance (ε_1)	1.74	.04	41.48*
Unique variance (ε_2)	1.67	.04	38.67*
Unique variance (ε_3)	1.50	.04	34.63*
Unique variance (ε_4)	1.57	.04	35.52*
Model with covariates			
Gender (γ_g)	-.24^	.01	-24.75*
SES (γ_s)	-.04	.01	-8.87*
Parent-child communication (γ_c)	-.01	.00	-2.43*
Home learning (γ_h)	.00	.00	.04
Reading difficulty (γ_r)	.15	.03	-8.87*
Math difficulty (γ_m)	.18	.03	5.10*
Reading and math difficulty (γ_{rm})	.28^	.02	6.09*

* $p < .05$, one-tailed; ^ Coefficient greater than 0.5 standard deviation of subscale.

Figure 1

Three models of the relationship between LD and social skill deficits.

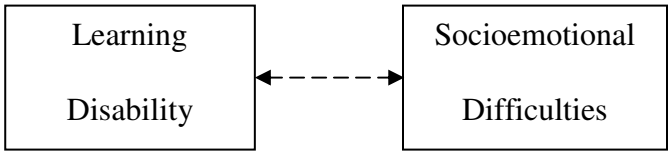

Figure 1a.

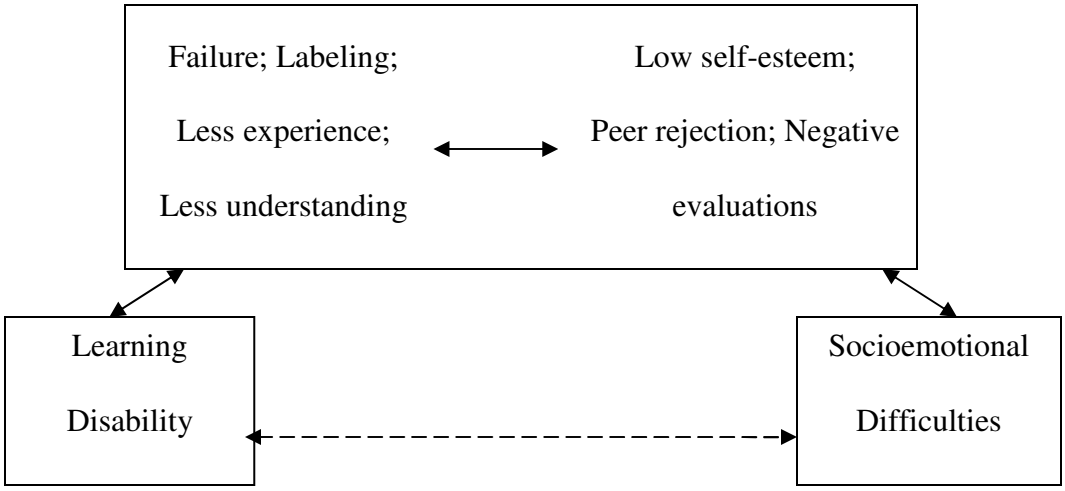

Figure 1b.

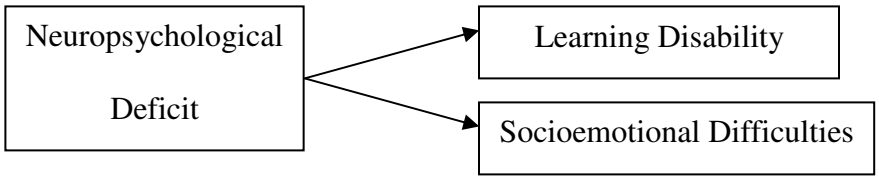

Figure 1c.

Figure 2

Subscales and Items of the Social Rating Scale of the ECLS.

Approaches to Learning

1. Attentiveness
2. Task persistence
3. Eagerness to learn
4. Learning independence
5. Flexibility
6. Organization

Self-Control

1. Respects property rights of others
2. Controlling temper
3. Accepts peer ideas for group activities
4. Responds appropriately to peer pressure

Interpersonal Skills

1. Forms and maintains friendships
2. Gets along with people who are different
3. Comforts/helps other children
4. Expresses ideas, feelings, or opinions in positive ways
5. Shows sensitivity to feelings of others

Externalizing Problem Behaviors

1. Argues
2. Fights
3. Gets angry
4. Acts impulsively
5. Disturbs ongoing activities

Internalizing Problem Behaviors

1. Anxiety
2. Loneliness
3. Low self-esteem
4. Sadness

Figure 3

Items on the Parent-Child Affective Communication Scale.

The following items are rated on a scale of 1=Never, 2= Sometimes, 3=Often, 4=Very Often, 7= Refused and 9=Don't Know.

a. Even if I am really busy, I make time to listen to {CHILD}. Would you say it's never true, sometimes true, often true, or very often true?
b. I encourage {CHILD} to talk about {his/her} troubles.
c. I encourage {CHILD} to tell me about {his/her} about {his/her} friends and activities.
d. I encourage {CHILD} to express {his/her} opinions.

Figure 4

Items on the Home Learning Activities Scale.

Parents were asked to respond to the following item: “In a typical week, how often do you or any other family member do the following things with {CHILD}?”

a. Practice reading, writing or working with numbers?
b. Tell stories to {CHILD}? Would you say not at all, once or twice, 3-6 times, or every day?
c. Sing songs with {CHILD}?
d. Help {CHILD} to do arts and crafts?
e. Involve {CHILD} in household chores, like cooking, cleaning, setting the table, or caring for pets?
f. Play games or do puzzles with {CHILD}?
g. Talk about nature or do science projects with {CHILD}?
h. Build something or play with construction toys with {CHILD}?
i. Play a sport or exercise together?
j. Read books to {CHILD}?

Figure 5

Conceptual Framework of the Research Design.

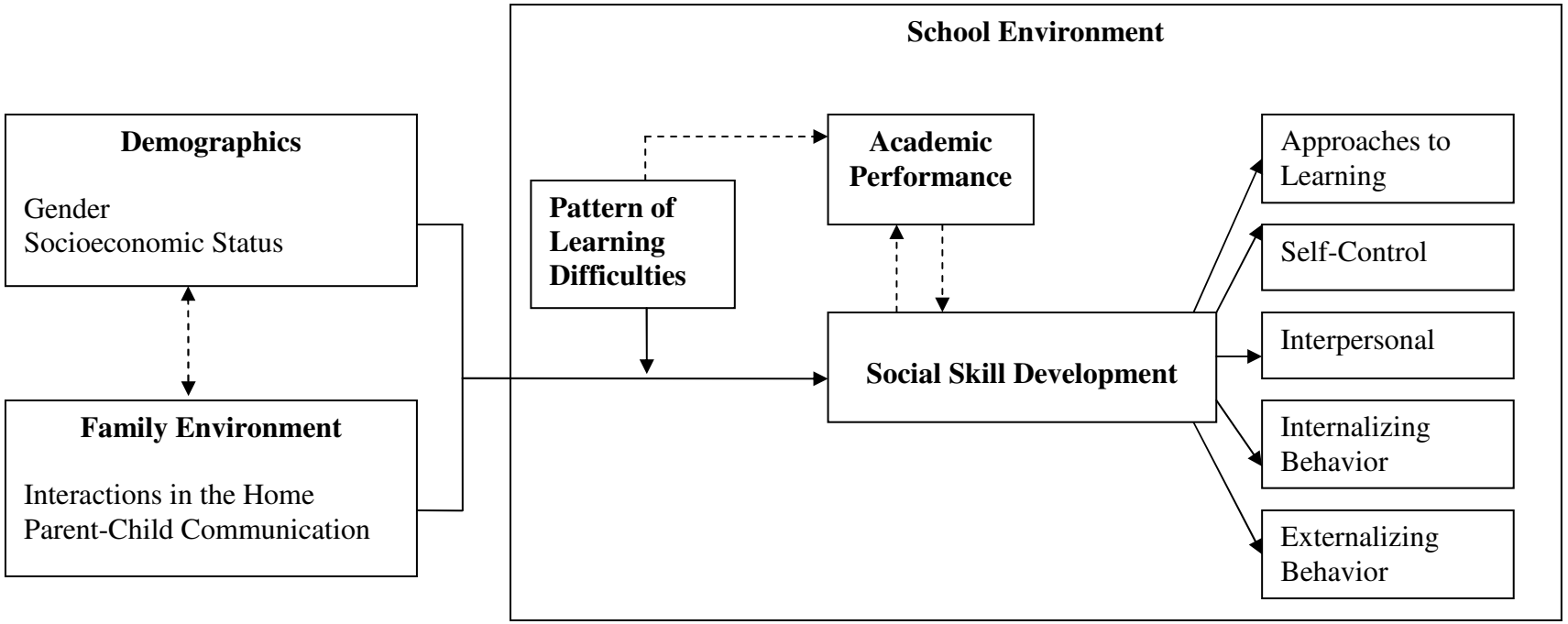
School Environment
Demographics
Gender
Socioeconomic Status
Family Environment
Interactions in the Home
Parent-Child Communication
Pattern of Learning Difficulties
Academic Performance
Social Skill Development
Approaches to Learning
Self-Control
Interpersonal
Internalizing Behavior
Externalizing Behavior

Figure 6

Multiple indicator hybrid model for the proposed study.

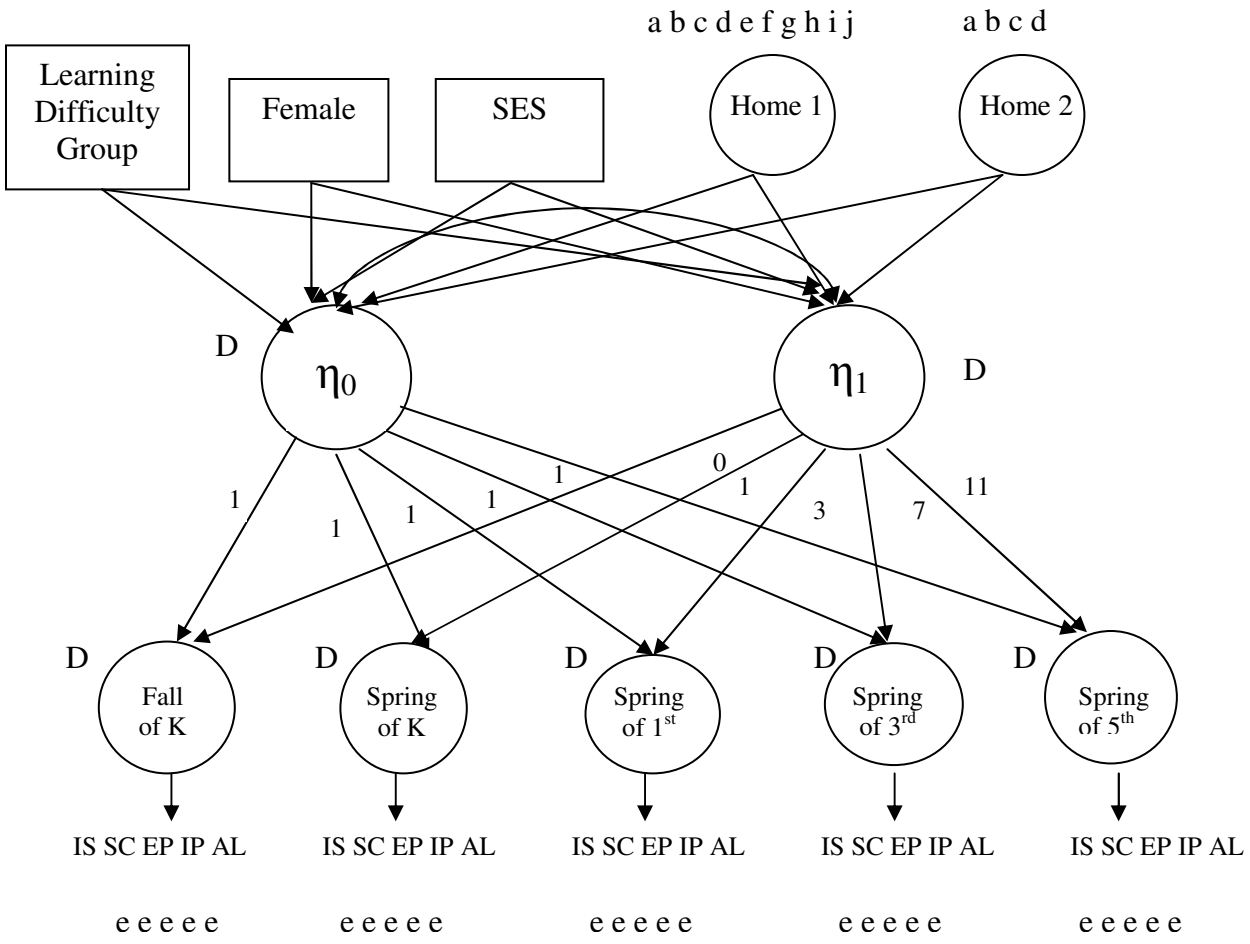
a b c d e f g h i j
a b c d
Learning Difficulty Group
Female
SES
Home 1
Home 2
D
η_0
η_1
D
1
1
1
1
1
0
1
3
7
11
D
Fall of K
D
Spring of K
D
Spring of 1st
D
Spring of 3rd
D
Spring of 5th
IS SC EP IP AL
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Figure 7

Confirmatory Factor Analysis of Home Learning Activities (Home 1) and Parent-Child Communication (Home 2).

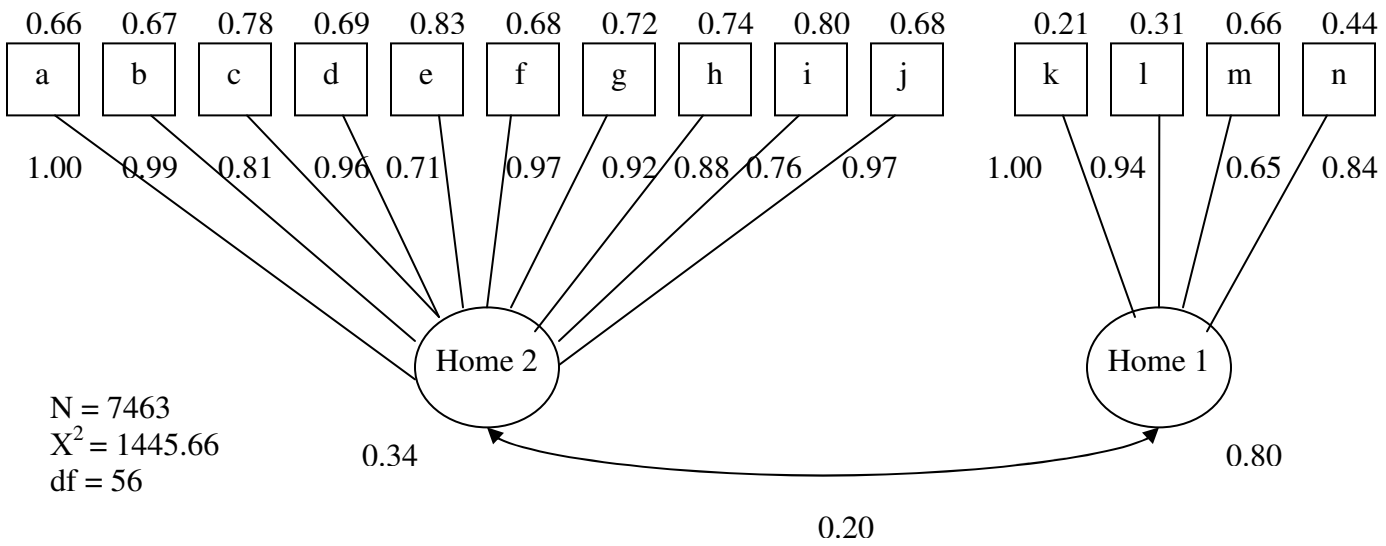

0.66 0.67 0.78 0.69 0.83 0.68 0.72 0.74 0.80 0.68
a b c d e f g h i j
1.00 0.99 0.81 0.96 0.71 0.97 0.92 0.88 0.76 0.97
0.21 0.31 0.66 0.44
k l m n
1.00 0.94 0.65 0.84
Home 2
Home 1
N = 7463
X2 = 1445.66
df = 56
0.34
0.80
0.20

Figure 8

Mean Teacher Ratings for Approaches to Learning by Learning Difficulty Category.

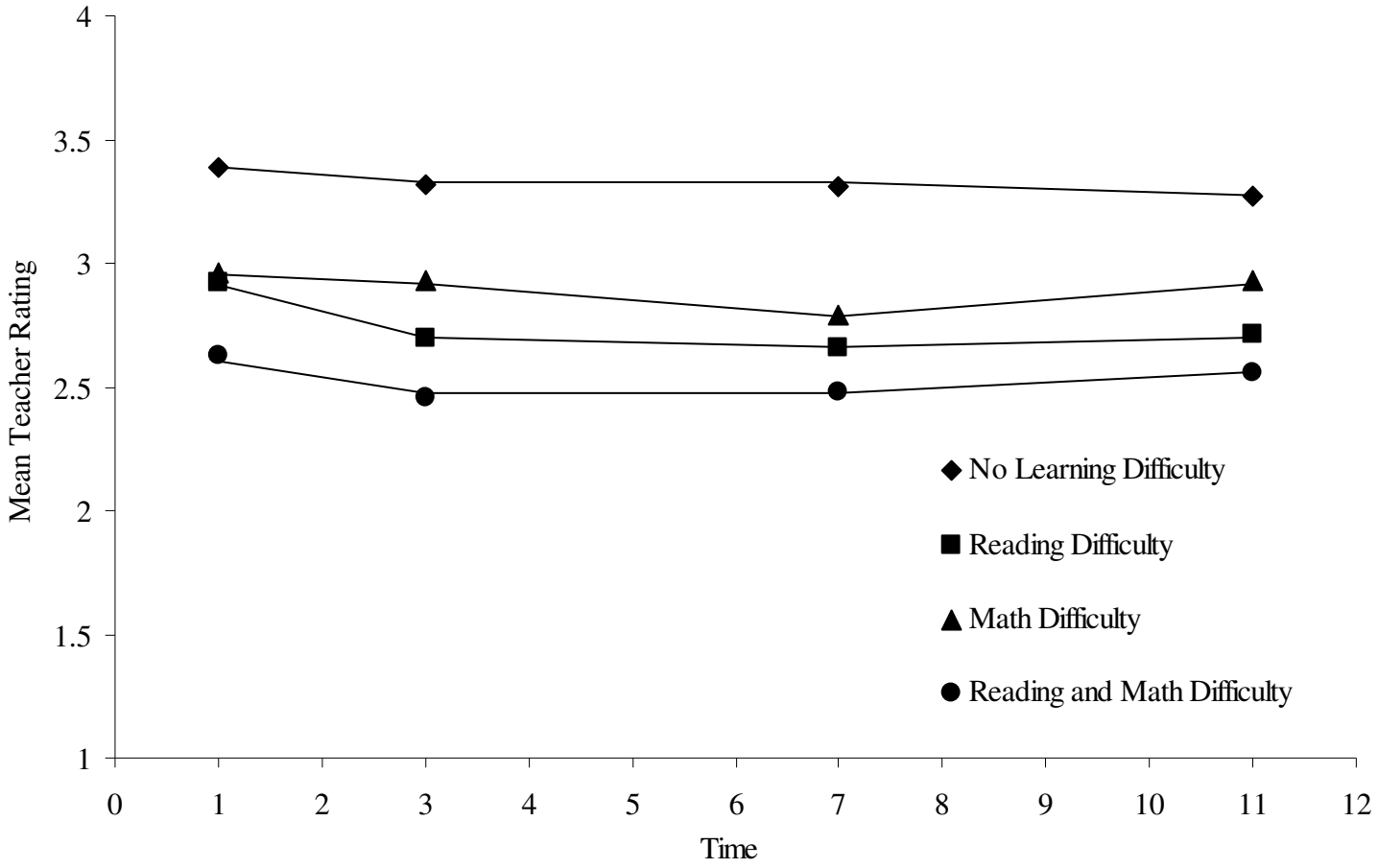

Mean Teacher Rating
4
3.5
3
2.5
2
1.5
1
0
1
2
3
4
5
6
7
8
9
10
11
12
Time
No Learning Difficulty
Reading Difficulty
Math Difficulty
Reading and Math Difficulty

Figure 9

Mean Teacher Ratings for Self-Control by Learning Difficulty Category.

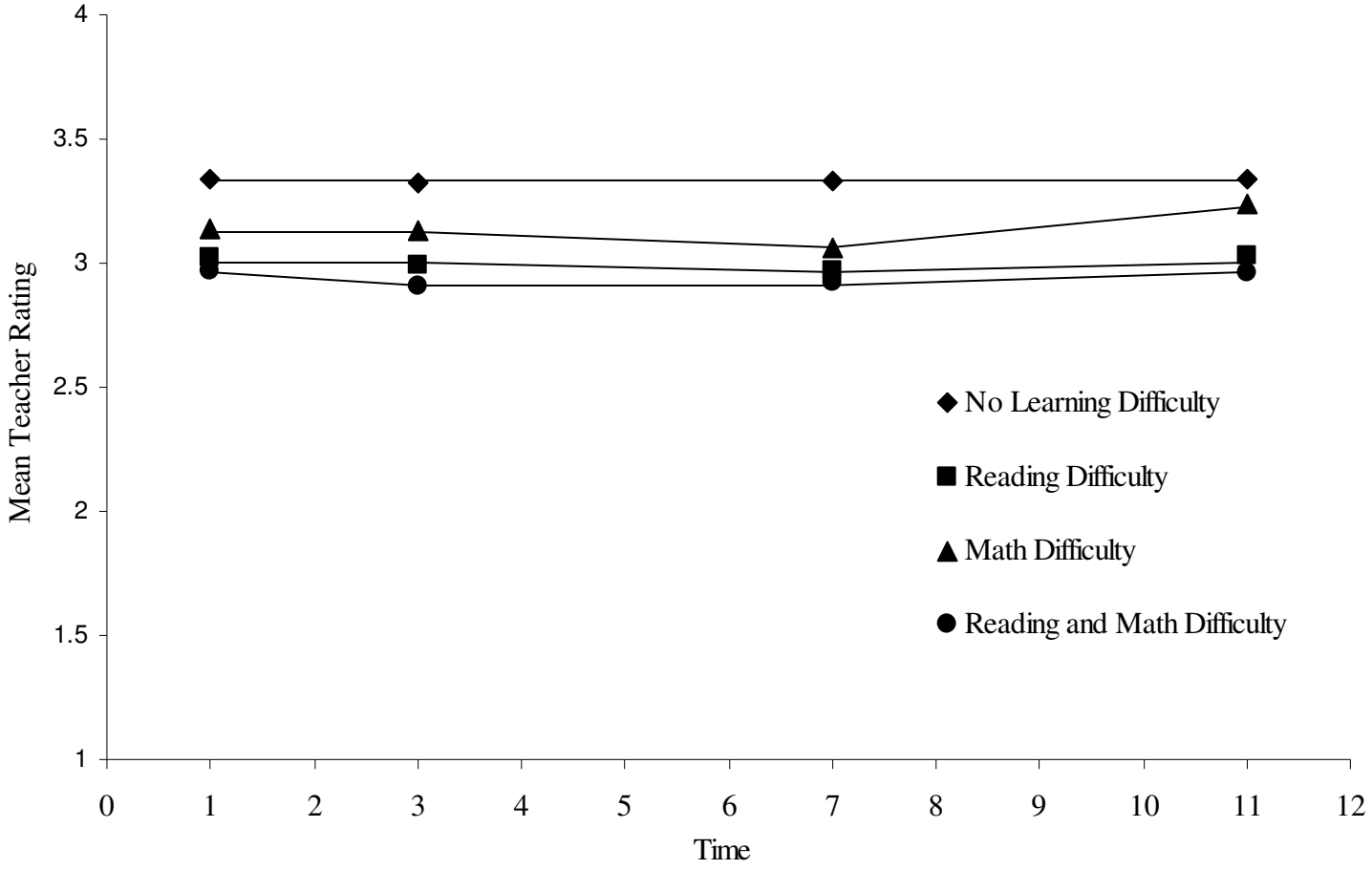

Mean Teacher Rating
4
3.5
3
2.5
2
1.5
1
0
1
2
3
4
5
6
7
8
9
10
11
12
Time
No Learning Difficulty
Reading Difficulty
Math Difficulty
Reading and Math Difficulty

Figure 10

Mean Teacher Ratings for Interpersonal Skills by Learning Difficulty Category.

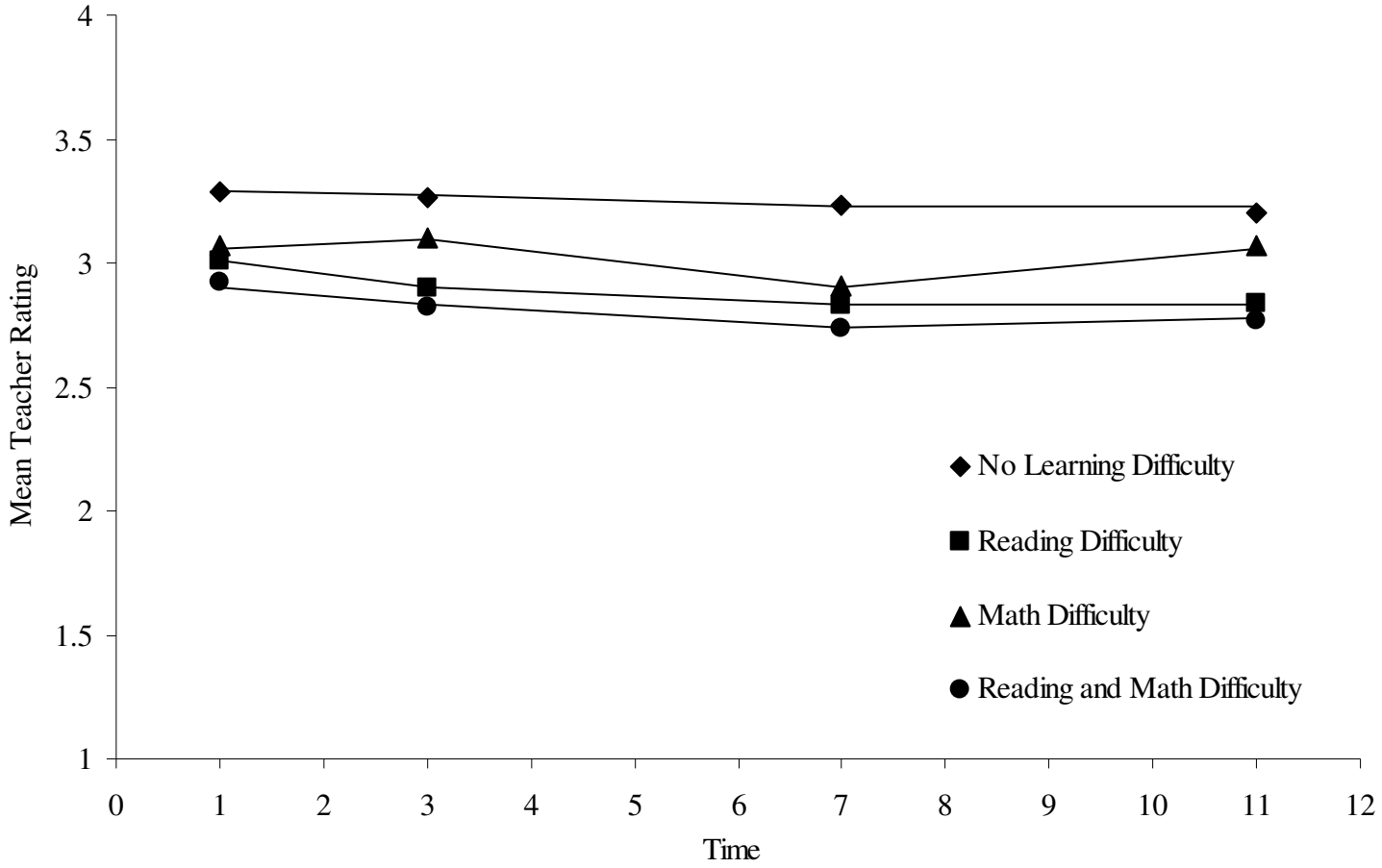

Mean Teacher Rating
4
3.5
3
2.5
2
1.5
1
0
1
2
3
4
5
6
7
8
9
10
11
12
Time
No Learning Difficulty
Reading Difficulty
Math Difficulty
Reading and Math Difficulty

Figure 11

Mean Teacher Ratings for Internalizing Behavior by Learning Difficulty Category.

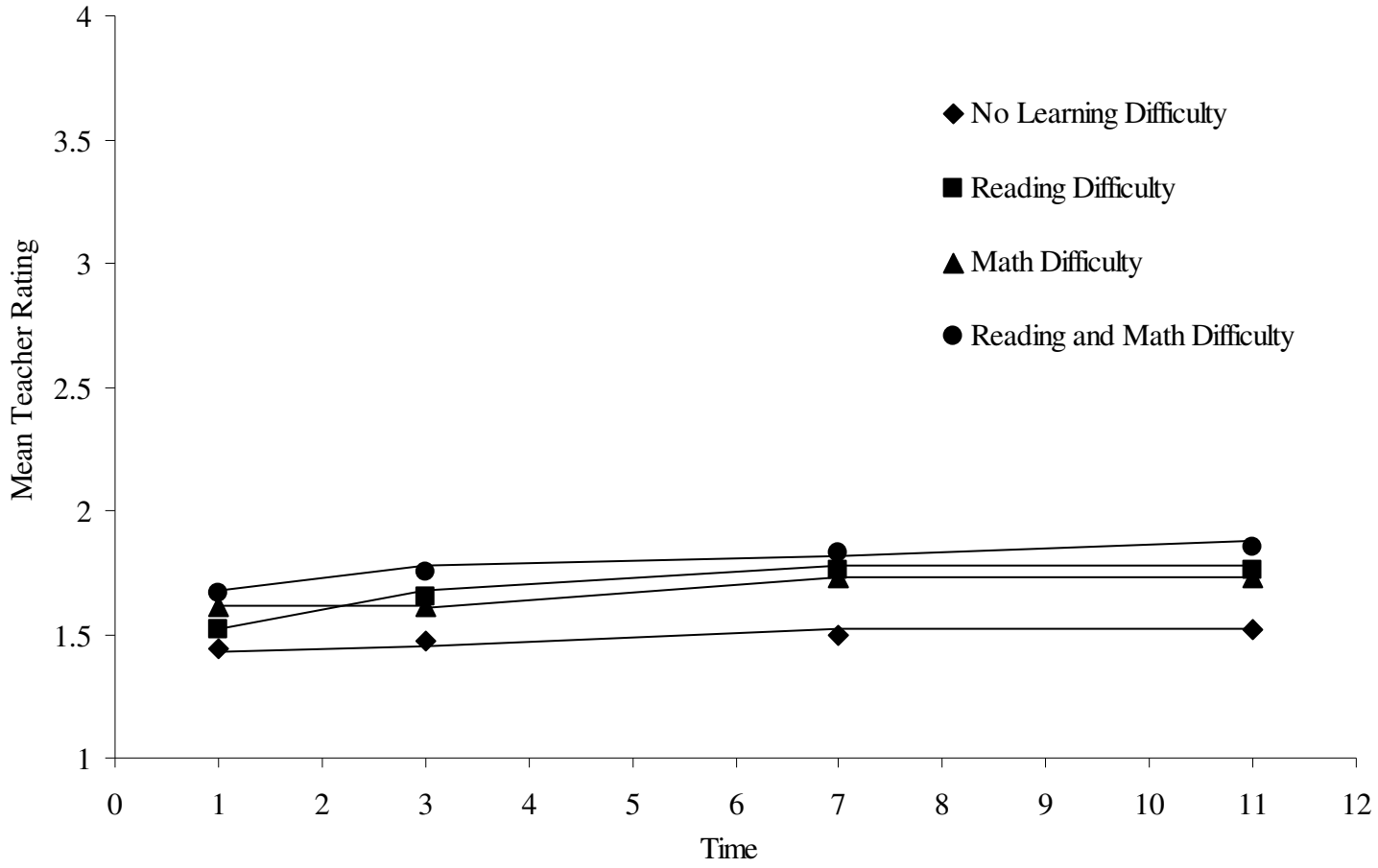

Mean Teacher Rating
4
3.5
3
2.5
2
1.5
1
0
1
2
3
4
5
6
7
8
9
10
11
12
Time
No Learning Difficulty
Reading Difficulty
Math Difficulty
Reading and Math Difficulty

Figure 12

Mean Teacher Ratings for Externalizing Behavior by Learning Difficulty Category.

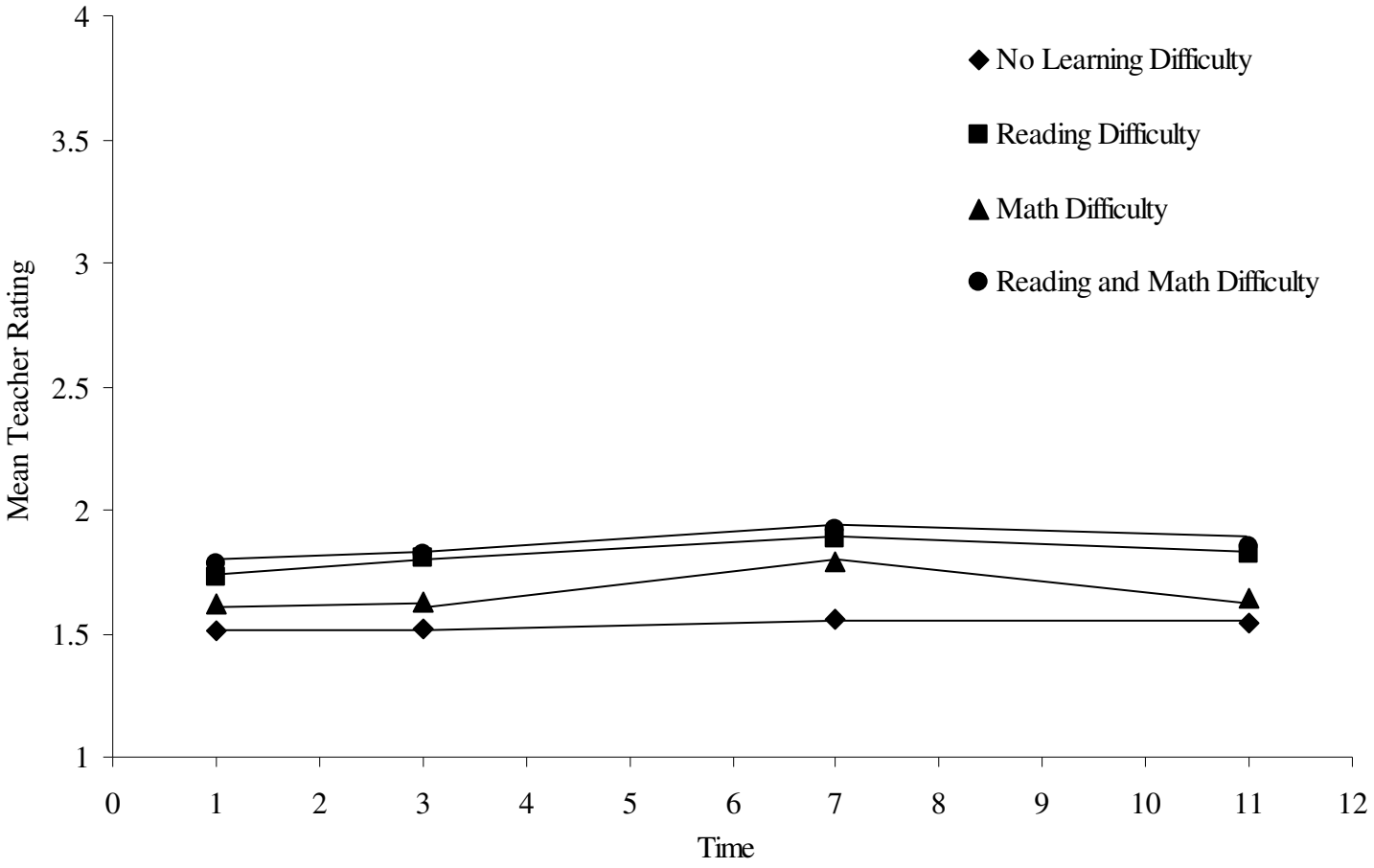

4
3.5
3
2.5
2
1.5
1
Mean Teacher Rating
0
1
2
3
4
5
6
7
8
9
10
11
12
Time
No Learning Difficulty
Reading Difficulty
Math Difficulty
Reading and Math Difficulty

Figure 13

Final model for Approaches to Learning with Covariates.

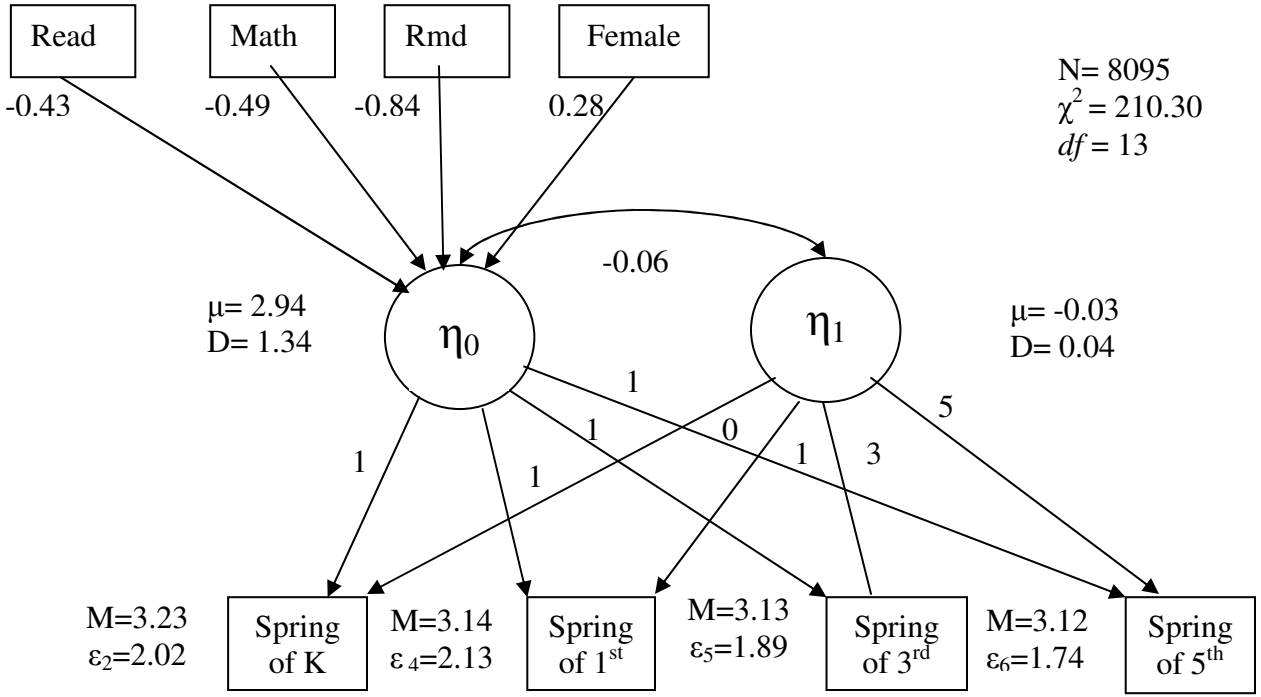

Read
Math
Rmd
Female
-0.43
-0.49
-0.84
0.28
N= 8095
χ^2 = 210.30
df = 13
-0.06
μ= 2.94
D= 1.34
η_0
η_1
μ= -0.03
D= 0.04
1
1
1
1
0
1
3
5
M=3.23
ε_2=2.02
Spring of K
M=3.14
ε_4=2.13
Spring of 1st
M=3.13
ε_5=1.89
Spring of 3rd
M=3.12
ε_6=1.74
Spring of 5th

Figure 14

Final model for Self-Control with Covariates.

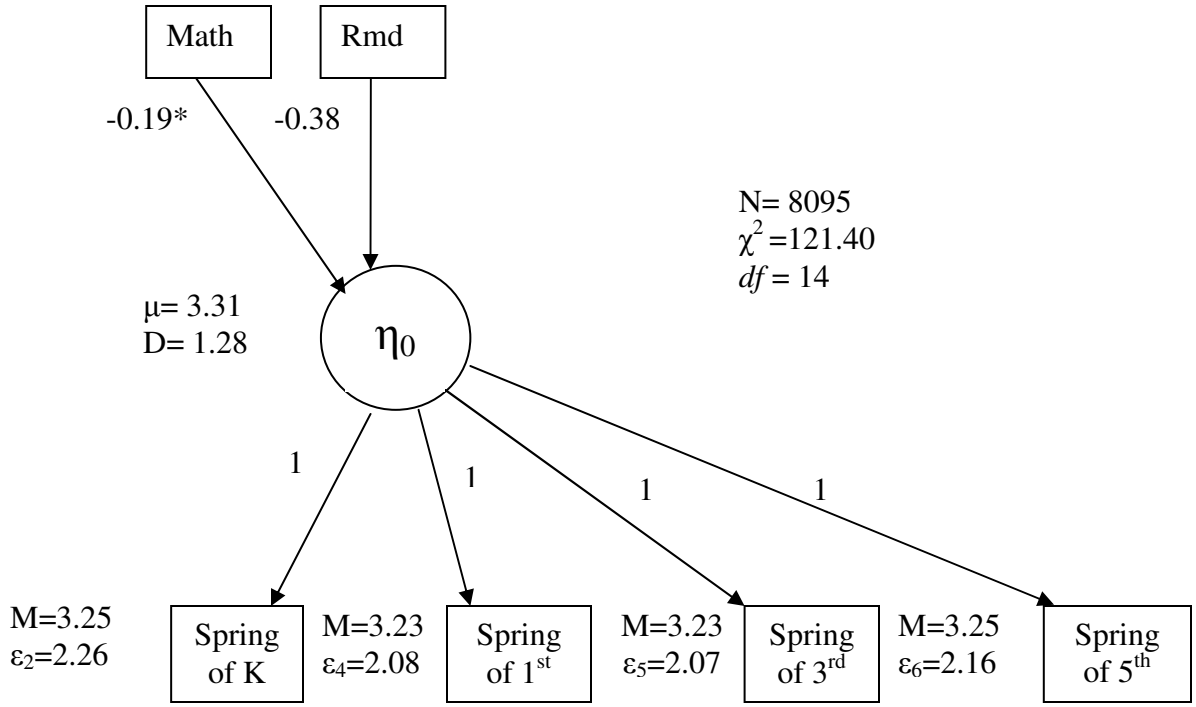

Math
Rmd
-0.19*
-0.38
N= 8095
χ^2 =121.40
df = 14
μ= 3.31
D= 1.28
η_0
1
1
1
1
M=3.25
ε_2=2.26
Spring of K
M=3.23
ε_4=2.08
Spring of 1st
M=3.23
ε_5=2.07
Spring of 3rd
M=3.25
ε_6=2.16
Spring of 5th

Figure 15

Final model for Interpersonal Skills with Covariates.

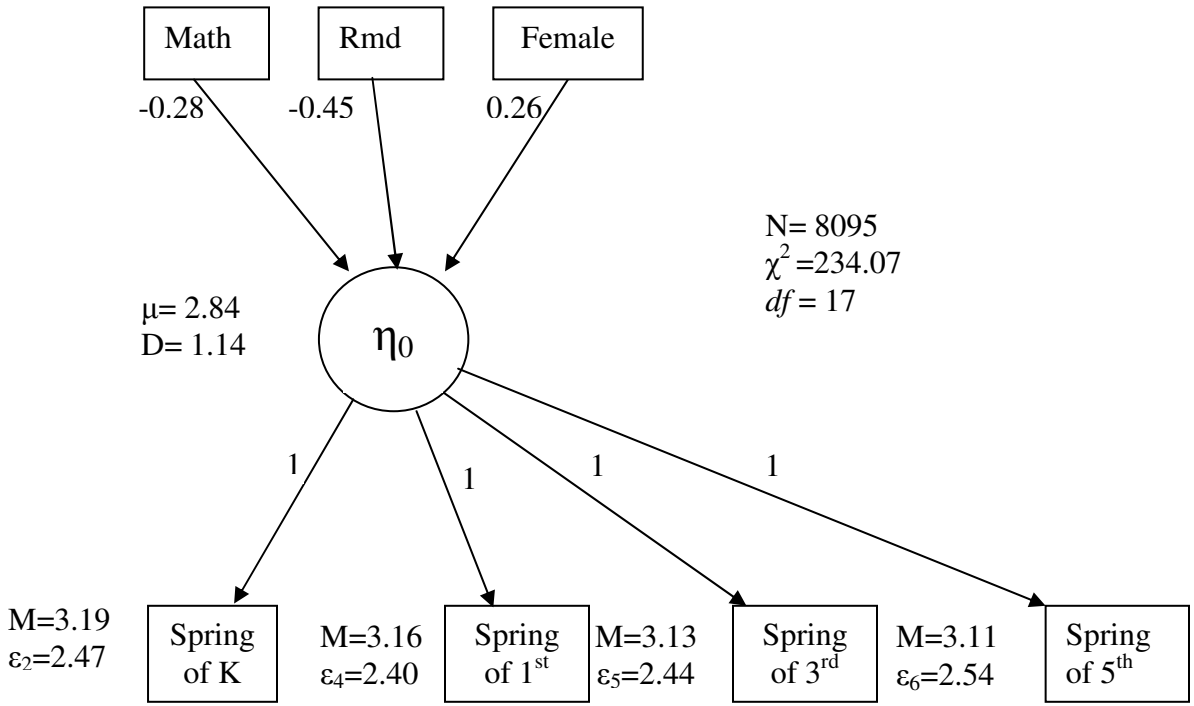

Math
Rmd
Female
-0.28
-0.45
0.26
N= 8095
χ^2 =234.07
df = 17
μ= 2.84
D= 1.14
η_0
1
1
1
1
M=3.19
ε_2=2.47
Spring of K
M=3.16
ε_4=2.40
Spring of 1st
M=3.13
ε_5=2.44
Spring of 3rd
M=3.11
ε_6=2.54
Spring of 5th

Figure 16

Final model for Internalizing Behavior with Covariates.

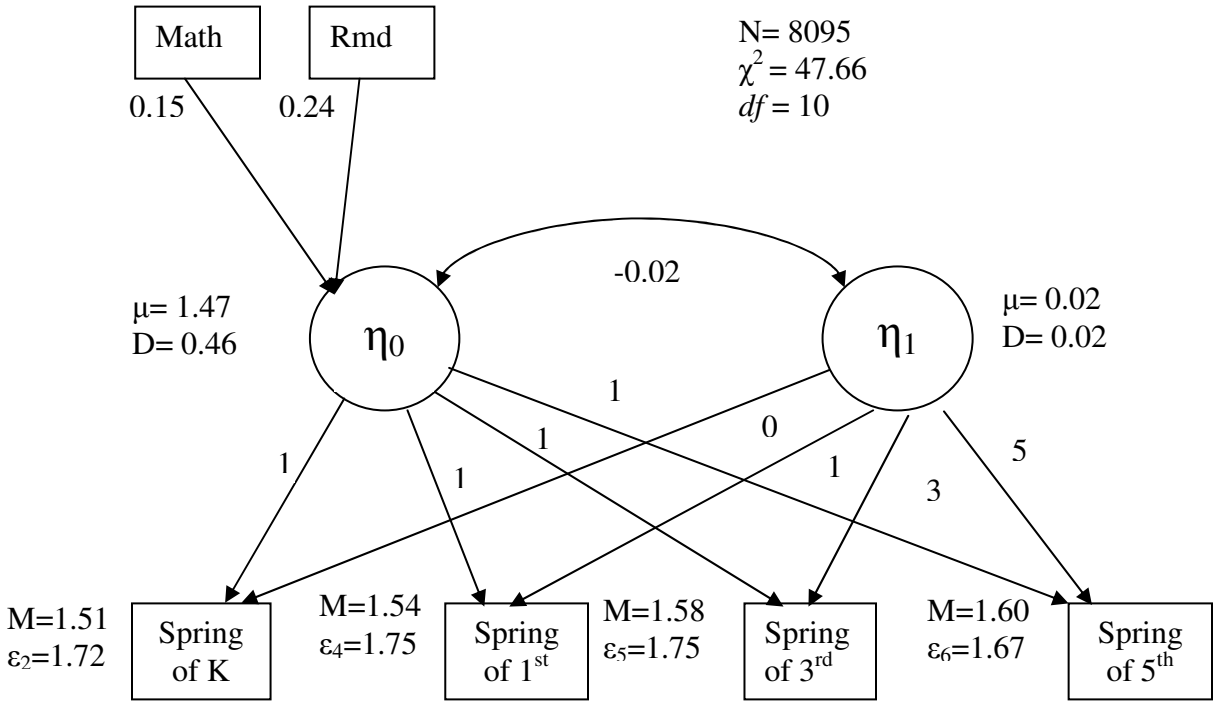
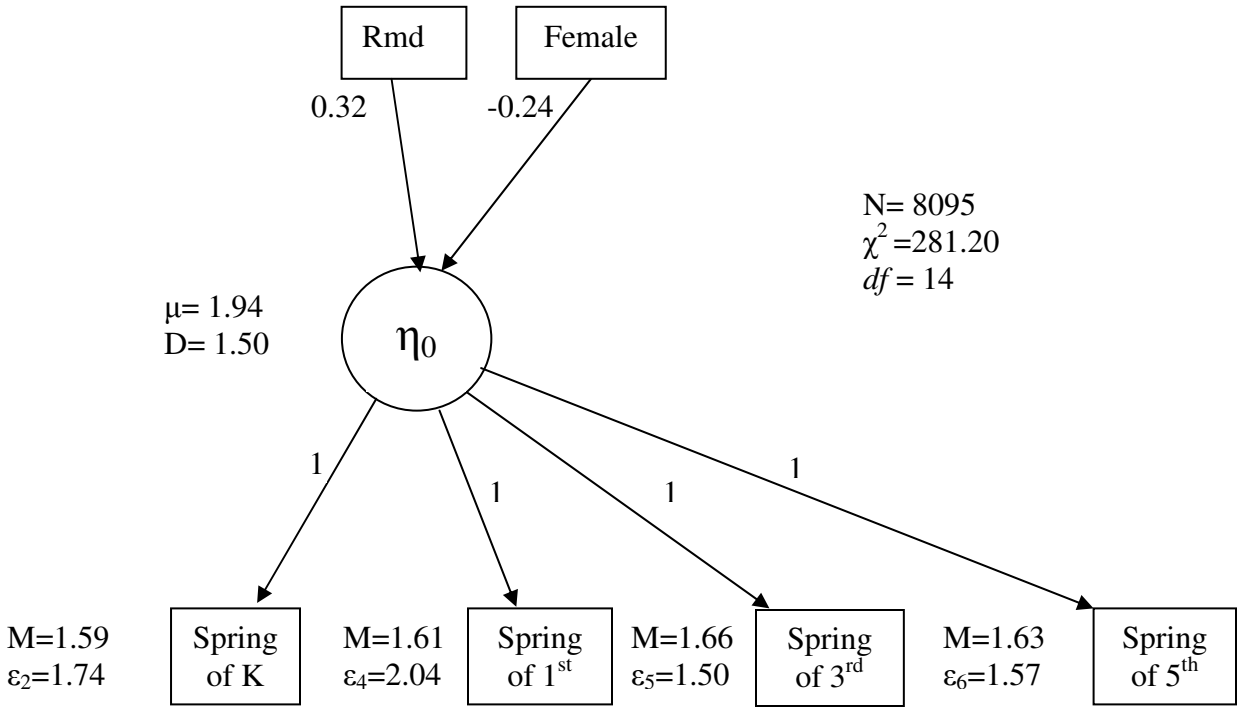

Math
Rmd
N= 8095
χ^2 = 47.66
df = 10
0.15
0.24
-0.02
μ= 1.47
D= 0.46
η_0
η_1
μ= 0.02
D= 0.02
1
1
1
0
1
1
5
3
M=1.51
ε_2=1.72
Spring of K
M=1.54
ε_4=1.75
Spring of 1st
M=1.58
ε_5=1.75
Spring of 3rd
M=1.60
ε_6=1.67
Spring of 5th

Figure 17

Final model for Externalizing Behavior with Covariates.


Rmd
Female
0.32
-0.24
N= 8095
χ^2 =281.20
df = 14
μ= 1.94
D= 1.50
η_0
1
1
1
1
M=1.59
ε_2=1.74
Spring of K
M=1.61
ε_4=2.04
Spring of 1st
M=1.66
ε_5=1.50
Spring of 3rd
M=1.63
ε_6=1.57
Spring of 5th

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