THE IMPACT OF ATTENTION DEFICITS ON RESPONSE TO

EARLY INTERVENTION FOR LANGUAGE IMPAIRMENT

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This work is dedicated to

Mommy and Daddy,

who have supported my every endeavor

on canvas and on paper.

THE IMPACT OF ATTENTION DEFICITS ON RESPONSE TO EARLY INTERVENTION FOR LANGUAGE IMPAIRMENT

by

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DISSERTATION

Presented to the Faculty of the Graduate School of Biomedical Sciences

The University of Texas Southwestern Medical Center at Dallas

In Partial Fulfillment of the Requirements

For the Degree of

DOCTOR OF PHILOSOPHY

The University of Texas Southwestern Medical Center at Dallas

Dallas, Texas

August, 2006

ACKNOWLEDGEMENTS

As I sit before my computer to type this last (yet very important) section of my dissertation, I find myself overwhelmed by the number of people I'd like to thank for their invaluable support and encouragement along this personal and professional journey. First, I wish to thank Dr. Carroll Hughes, the chairperson of my committee, for his incredible guidance and unwavering support. His instrumental advice ranged from the statistical to the political, and always left me feeling confident and collected, regardless of how overwhelmed I might have felt upon entering his office with my stacks of data and lists of questions. (Plus, I owe to him my ability to navigate successfully the blue, red, and orange texts of graduate school.) I'd like to thank Dr. Cheryl Silver for her big-picture brainstorming and keen eye for detail, as she helped narrow my focus and polish my work. I thank Dr. Shelley Benton, my research mentor at The Shelton School, for her ongoing support and wonderful company throughout this project. Her investment and encouragement made this process smoother and more rewarding than I ever thought possible. I'd like to thank Dr. Deanna Liss, my supervisor at Children's Medical Center, for her support and guidance not only with respect to this project, but also during my internship at Children's. I will always value not only her expertise in child emotional/social functioning, but also her commitment to graduate student emotional/social functioning! Finally, I thank Dr. Peter Stavinoha for his expert guidance and fresh perspective on research design and pediatric cognitive deficits (and for his enthusiastic support of the Fighting Irish). I am entirely confident when I say that I could not have wished for a better, more supportive and encouraging committee.

I would also like to acknowledge Dr. Joyce Pickering, Executive Director of The Shelton School, and Dr. Susan Fleming, Director of the Shelton Evaluation Center, for their warm welcome to the Shelton campus. Their enthusiasm, trust, and curiosity enabled me discover my own research interests while working with their wonderful students. Their teachers, staff, and students were also integral to this project, and I thank them for their support and patience in the course of my gathering data.

Certain individuals, while not directly involved in this project, were undeniably involved in this *process,* and have invaluably contributed to my ongoing professional and personal development. In particular, I want to thank Gayle Marshall, Dr. Andy McGarrahan, and Dr. Rycke Marshall for their wise clinical guidance and enthusiastic support of my professional endeavors. I especially want to thank Dr. Michael LaValle for helping me become the psychologist I have (and will) become.

Finally, I'd like to thank my family, whose love and support have enabled me to come to where I am today. I thank my mom for being the most incredible role model a young woman could have, both personally and professionally. I thank my dad for keeping me grounded, often by reminding me that not everyone thinks the way I think. (I also thank him for his time-honored theories regarding the male ego.) My sisters, Lauren and Megan, deserve thanks for cheering me on in this process and for providing ample entertainment and laughter along the way. Finally, I want to thank my friends who have traveled beside me on this long road. In particular, I want to thank Katie, whose insight and wisdom inspire me; Ty, whose quick wit will always be appreciated even after the in-class note-passing has ceased; and Macy, who has stood beside me in thick and thin, from first year to fourth year, always with me. I am truly blessed to be so surrounded.

THE IMPACT OF ATTENTION DEFICITS ON RESPONSE TO EARLY INTERVENTION FOR LANGUAGE IMPAIRMENT

Publication No. _____

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Young children exhibiting language impairment (LI) evidence a wide variety of difficulties in problematic language, coordination, attention, perception, social skills, and emotional well-being. Such children are often vulnerable to a number of prevailing cognitive, academic, and social difficulties, this vulnerability begs the need for early intervention. Attention appears to be particularly variable in children with language impairment (Cantwell & Baker, 1991). Specifically, a large percentage of language impaired children have a comorbid diagnosis of ADHD; alternately, as many as 50% percent of children diagnosed with ADHD have an underlying oral language deficit (Cohen, Barwick,

Horodezky, Vallance, & Im, 1998; Cohen, Davine, Horodezky, Lipsett, & Isaacson, 1993; Cohen et al., 1998; Gualtieri, Koriath, Van Bourgondien, & Saleeby, 1983). To date, however, there is a paucity of research investigating how attention deficits moderate the language-impaired child's response to intervention and remediation. The current study examines the impact of an experimental intervention aimed at the remediation of language, coordination, attention, and perception deficits in 20 children (ages 3-9) considered to be At Risk for Language-Learning Disorders. This study examines participants' responses over the 1st year of a 2-year explicit intervention integrating two explicit instruction methods (the Montessori Method and the Association Method). Response on all measures utilized was calculated utilizing the Reliable Change Index (RCI; Jacobson & Truax, 1991). Participants' response to intervention during the 1st year, as measured by language/vocabulary outcomes on the CELF-4, CELF-PS:2, EOWPVT, and ROWPVT, was shown to be relatively minimal. Contrary to expectation, attention deficits at baseline did not associate significantly and inversely with improvement in language/vocabulary scores. A secondary focus of this study examined participants' change in emotional and social functioning (as measured by the BASC TRS), as it related to language/vocabulary outcomes. Small cells sizes prohibited the majority of the proposed analyses, but frequency analyses and paired-samples t-tests revealed significant increases in Internalizing Problems, Anxiety, Depression, Withdrawal, and Aggression. Alternately, 56% of the participants exhibited significant improvement in Social Skills.

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CHAPTER I

INTRODUCTION

Language impairment (LI) is estimated to occur in up to 8% of children in preschool and the early school years (Law, Boyle, Harris, Harkness, & Nye, 2000). Language disorders take many shapes, manifesting in a variety of presentations and following any number of developmental trajectories. Although there is some debate as to whether certain delays in early language development constitute the beginnings of a language disorder (vs. simply "late blooming"), research has identified a number of risk factors that predict continuing language problems. Many children exhibit these risk factors in the 18- to 30-month old age range ("Late Blooming," 2005), considerably before diagnosis is discernible. Such children are considered to be "At Risk" for developing language disorders and/or learning disabilities, and evidence a wide variety of difficulties in language, coordination, attention, perception, social skills, and emotional well-being (Pickering, 2004a). Although most At Risk children suffer from a variety of these deficits, language deficits appear to be particularly predominant and problematic among this population. Often, undiagnosed language deficits lead to more severe learning and language disorders (Scarborough, 1990; Tallal, Ross, & Curtiss, 1989; Van der Lely & Stollwerk, 1996). In sum, the At Risk child with language impairment is particularly vulnerable to a number of prevailing cognitive, academic, and social difficulties.

Attention appears to be particularly variable in children with LI (Cantwell & Baker, 1991b). Specifically, a large percentage of language impaired children have a comorbid diagnosis of Attention-Deficit Hyperactivity Disorder (ADHD); alternately, as many as 50% percent of children diagnosed with ADHD have an underlying oral language deficit (Cohen,

Barwick, Horodezky, Vallance, & Im, 1998; Cohen, Davine, Horodezky, Lipsett, & Isaacson, 1993; Cohen et al., 1998; Gualtieri, Koriath, Van Bourgondien, & Saleeby, 1983). While there is considerable debate regarding the exact nature of the overlap between LI and attention deficits, it seems only logical that attention deficits likely moderate the At Risk child's response to intervention and remediation of LI. Nevertheless, no published research to date has directly investigated the impact of attention deficits on the response to early intervention for LI.

Research has shown that early intervention may effectively remediate language deficits, thereby improving the child's current language functioning (Gillon, 2000; Whitehurst et al., 1991). Moreover, the demonstrated associations between early LI and later learning disabilities (Bird, Bishop, & Freeman, 1995; Bishop & Adams, 1990; Boudreau & Hedberg, 1999; Catts, 1993; Scarborough, 1990), social skill deficits (Cohen et al., 1998; Rutter & Mawhood, 1991), and psychiatric disorders (Baker & Cantwell, 1987a; Beitchman et al., 2001; Benaisch, Curtiss, & Tallal, 1993), underlie the need for early intervention.

The Early Intervention Language Learning Program (EI Program), at The Shelton School, is a 2-year experimental intervention aimed at remediating language, coordination, attention, and perceptual deficits in 20 children (ages 3-9) considered to be At Risk for Language-Learning Disorders. By combining two explicit instruction methods, the Montessori Method and the Association Method, the designers of the EI Program hope to effectively intervene during a critical age range, thereby improving the children's language skills (among other skills not addressed in this study). This retrospective study will examine not only the children's response to intervention during the 1st year, as measured by language

outcomes, but also the suspected impact of attention deficits with respect to these language outcomes. A secondary focus of this study will examine the change in emotional and social functioning (after 1 year of intervention) as it relates to language outcomes.

CHAPTER II:
Review of the Literature

LANGUAGE IMPAIRMENT

Language Disorders and Language Impairment

Research has well established the association of language disorders with learning disabilities (Denckla, 1977; Mattis, French, & Ralph, 1975). In addition to outlining two broad categories of developmental problems, Learning Disorders and Motor Skills Disorders, the DSM-IV outlines a third category of learning disorders -- Communication Disorders. Five language disorders are described within this category: Expressive Language Disorder, Mixed Receptive-Expressive Language Disorder, Phonological Disorder, Stuttering, and Communication Disorder NOS (American Psychiatric Association, 2000). A review of the speech-language pathology literature, however, reveals a much wider variety of language disorders, each with its own unique deficits, presentation, and developmental trajectory.

A language disorder is an impairment in the ability to understand and/or use words in context, both verbally and nonverbally. Some characteristics of language disorders include the improper use of words and their meanings, an inability to express ideas, inappropriate grammatical patterns, reduced vocabulary and an inability to follow directions; children who are affected by language-learning disorders or developmental language delays may exhibit any combination of these characteristics ("General Information," 1996). As such, children may hear or see a word but not be able to understand its meaning; or, they may have trouble getting others to understand what they are trying to communicate.

Research shows that children with language disorders experience a myriad of problems within and beyond the academic arena, beginning in early childhood and often persisting through the school years. Specifically, research shows that LI often lead to dyslexia (Scarborough, 1990; Tallal, Ross, & Curtiss, 1989; Van der Lely & Stollwerk, 1996), continuous academic vulnerability (Bashir & Scavuzzo, 1992; Rescorla, 1993; Rescorla, Hadicke-Wiley, & Escarce, 1993), and problems with social adaption (Bashir, Wiig, & Abrams, 1987) during the school years. The psychosocial implications range from problems in social interaction to psychiatric illness (Hazel & Schumaker, 1988; Prizant, Audet, Burke, Hummel, & et al., 1990). In sum, oral language deficits can affect children's adaptive behavior, learning, social skills, and mental health.

Deciphering the language of language disorders.

Ironically, the language used to describe language disorders is considerably recondite. A number of terms are utilized in the research when describing these language disorders, including, but not limited to: "childhood or developmental aphasia" (Eisenson, 1972), "language disorders" (Beery, 1969), "oral language disorders" (vs. written language disorders), "specific language impairment" (Lahey, 1988), and "expressive vocabulary delay" (Girolametto, Wiigs, Smyth, Weitzman, & Pearce, 2001). The research expands to delineate "phonological delays" from "phonological deficits," and "delayed expressive language disorder" from "slow expressive language development." At the risk of becoming lost in the language of language (and following suit of Cohen et al.), this paper will primarily use the term *language impairment* (LI) to describe phonological, receptive, and/or expressive language deficits. Of course, children with LI may suffer *specifically* (or even exclusively)

from "delayed expressive language" or "deficits in receptive language," for example. These specific deficits will be defined as necessary, yet will be subsumed beneath the term *language impairment*.

Etiology.

The etiology of language impairment is not entirely clear, although a number of risk factors have been associated with LI. Several studies have demonstrated that LI generally runs in families, with reported aggregation rates ranging from 40 to 70% (Beitchman, Hood, & Inglis, 1990; Spitz, Tallal, Flax, & Benasich, 1997; Tallal, Ross, & Curtiss, 1989; Tomblin et al., 1997; Tomblin, Smith, & Zhang, 1997). In other words, approximately half of the families of children with LI have at least one other family member who has a language problem. Genetic and environmental factors are difficult to tease apart. However, it is not yet known whether the parents of children with LI were less skilled language learners themselves and passed this genetically onto their children, or if the rearing environments of these children were inadequate. Additional individual risk factors include low birth weight (less than 2500g) and late or no prenatal care (Andrews, Goldberg, Wellen, Pittman, & Struening, 1995; Goldberg, McLaughlin, Grossi, Tytun, & Blum, 1992; Halsey, Collin, & Anderson, 1993; Stanton-Chapman, Chapman, Bainbridge, & Scott, 2002).

Environmental risk includes factors related to the child's caregiving environment and family situation (Widerstrom, 1997). The environmental context in which a child is raised has long been recognized as crucial to developmental outcome (Stanton-Chapman, Chapman, Bainbridge, & Scott, 2002), as socioeconomic factors and economic deprivation are associated with risk for language problems. The literature reviews a number of

environmental variables that seem to be more predictive than others of future language disorders. Although there exists some debate, most research shows that higher birth order (e.g., third born or later) is associated with later LI (Hoff-Ginsberg, 1998; Neils & Aram, 1986; Pine, 1995; Tallal, Ross, & Curtiss, 1989; Tomblin, 1989; Tomblin, Hardy, & Hein, 1991). Low maternal education has also been associated with LI (Paul, 1991; Rice, Spitz, & O'Brien, 1999; Tomblin et al., 1997; Tomblin, Smith, & Zhang, 1997); children born to mothers without a high school diploma are at-risk for both cognitive and behavioral problems, partially due to deficits in the mother's knowledge of child development and parenting skills (Furstenberg, Brooks-Gunn, & Chase-Lansdale, 1989; Kochanek, Kabacoff, & Lipsitt, 1990). Alternately, mothers without a high school diploma may have their own residual language difficulty that places their offspring at-risk. Finally, single-parent homes have been associated with increased risk for LI (Andrews, Goldberg, Wellen, Pittman, & Struening, 1995; Goldberg, McLaughlin, Grossi, Tytun, & Blum, 1992; Miller & Moore, 1990).

Diagnosing language disorders.

Although researchers have provided extensive clinical descriptions of language disorders for more than 50 years (Beery, 1969; Eisenson, 1972; D. Johnson & Myklebust, 1967; Myklebust, 1954), few studies have accurately estimated the prevalence of language disorders. Lahey's review of these studies (1988) estimated the prevalence of language disorders at 3-12%, explaining the variability as a function of the variety of diagnostic criteria and instruments/assessments used. An epidemiological study (Tomblin et al., 1997) sampling 7,218 rural, urban, and suburban kindergartners reported a prevalence of 7.4%;

approximately one third of the children identified by this study were previously diagnosed, thereby suggesting that children with language disorders are severely underdiagnosed in the community. Law, Boyle, Harris, Harkness, & Nye (2000) reviewed studies estimating the prevalence of language *impairment* during the preschool and early school years and found prevalence estimates to be between 2% and 8%, with an overall median prevalence of 5.95%. Furthermore, most studies report a greater prevalence of LI in boys than girls, with the male to female sex ratios varying from .98:1 to 2.30:1 (Law, Boyle, Harris, Harkness, & Nye, 2000).

The definition of language disorders, and particularly learning disorders, is still a controversial topic and has been discussed for years, by numerous authors (Beitchman & Young, 1997; Cantwell & Baker, 1987a; Hammill, 1990; Kavale, Forness, & Lorsbach, 1991; Shaw, Cullen, McGuire, & Brinckerhoff, 1995). Diagnostic criteria vary for each type of language disorder, yet generally entail performance (as measured in any combination of the aforementioned language skills) that is statistically discrepant from that which would be expected for a developmentally appropriate child. The extent of discrepancy in an individual child, and the point at which a clinical cutoff is reached, however, is open to considerable interpretation (Algozzine, Ysseldyke, & Shinn, 1982; Clarizio & Phillips, 1989; Evans, 1990; Hallahan & Kauffman, 1997; Kavale, Fuchs, & Scruggs, 1994; Shaywitz, Fletcher, Holahan, & Shaywitz, 1992; Wong, 1989).

The DSM-IV requires delays in expressive and/or receptive language, not due to sensory or motor deficit or environmental deprivation, in excess of what would be expected given scores of nonverbal intelligence (i.e., usually 15 points below nonverbal IQ scores).

There are few empirical data to support this definition, however. Bishop (1994) argues that there may be no fundamental difference between children with LI who have a large discrepancy between IQ and verbal functioning and those who do not. Moreover, it is likely that children with combined depressed language and IQ scores exhibit poorer outcomes than do children with depressed language only (Beitchman, Wilson, Brownlie, Walters, & Lancee, 1996). Because there is insufficient current empirical information dictating where to draw the boundaries defining language disorders, it seems preferable to consider all children who show evidence of age-discrepant language skills as in need of assessment and possible intervention ("Practice parameters," 1998). As such, many clinicians will diagnose a language disorder when standardized global language test scores fall at least 1.25 SD below the mean (i.e., 81 or lower).

A number of risk factors, or warning signs, may appear between the ages of 18- to 30-months of age, at which point parents are well-advised to seek a formal speech/language evaluation. For example, children who have no real words by age 2, are not combining words by age 3, and/or display unintelligible speech at age 4, are considered at risk for developing a language disorder; additional risk factors include utilization of fewer and poorer gestures for communication purposes (during the earlier years, as compared with peers), delayed receptive language (i.e., difficulty understanding language), deficient or delayed vocabulary, and deficits in narrative abilities (Cicci, 1995). Other risk factors include diagnosed medical conditions (e.g., chronic ear infections), biological factors (e.g., Fetal Alcohol Syndrome), genetic defects (e.g., Down syndrome), neurological defects (e.g., cerebral palsy), and developmental disorders (e.g., Autism) ("Early Identification," 2005).

Children identified as high-risk, such as those exhibiting numerous risk factors, or those from neonatal intensive care (NICU) units, should be evaluated for language disorders early and at regular intervals. Children with no high-risk features should be evaluated if their speech and language is dissimilar from that of same-aged peers.

Evaluations may be conducted by a licensed speech-language pathologist or by a multidisciplinary team (e.g., speech-language pathologist, occupational or physical therapist, medical specialists, and a school psychologist) and, pursuant to the Individuals with Disabilities Education Improvement Act of 2004, Public Law 108-446, must include input from at least one teacher or specialist who is knowledgeable about the area of the child's suspected disability. Such evaluations may be conducted in clinics or medical settings (e.g., speech-language centers, research hospitals, etc.) or in certain academic settings (wherein the school employs licensed speech-language pathologists). Evaluations generally include a combination of standardized testing; direct observation of play and interaction with caregivers; reports by parent, teacher, and physician; and detailed analyses of spontaneous speech samples. A speech-language pathologist will assess the child's phonological awareness (ability to hear and "play with" sounds in words), speech articulation (pronunciation and clarity of speech), understanding and use of grammar (syntax), understanding and use of vocabulary (semantics), and ability to provide an extended narrative (language sample). Additionally, the speech-language pathologist generally assesses the child's executive functioning and his or her academic skills to date (e.g., reading, writing, and spelling). Several sessions, often including ongoing evaluation, may be required to obtain enough information to make an accurate diagnosis.

Diagnoses vary as a function of delayed language skills and/or specific area(s) of language deficit, and are accompanied by a number of predicted outcomes. Children with delays and/or deficits in expressive language, for example, have been shown to be at risk for delayed acquisition of reading skills (Larrivee & Catts, 1999), and to have problems with phonological awareness (Bird, Bishop, & Freeman, 1995; Dodd, 1995). Children with receptive language disorders, however, have been shown to have more severe reading deficits than other language-impaired children (Rissman, Curtiss, & Tallal, 1990). Receptive deficits, in general, seem to suggest a more severe impairment and a poorer prognosis for change (Bishop & Edmundson, 1987; Thal & Tobias, 1992). All in all, studies show that children with more widespread delays in multiple areas of language function are more likely to show reading and spelling disorders at later ages (Bishop & Adams, 1990). Longitudinal research demonstrating the risk factors associated with expressive and receptive deficits thereby underscores the importance of tailoring early interventions to remediate these specific areas of LI.

Academic Difficulties Associated with Language Impairment

Researchers first expressed concerns for the consequences of early childhood language disorders in the 19th century (Weiner, 1985); systematic follow-up studies, however, did not begin until the mid 1970s (deAjuriaguerra et al., 1976). Since then, a variety of studies have evaluated academic outcomes for preschoolers with language disorders. The studies use a variety of methods: some follow a group of children from preschool into the school years (e.g., Rissman, Curtiss, & Tallal, 1990; Scarborough & Dobrich, 1990; Tallal, 1988); others use a follow-up format and assess the children's

language and academic performance at a later age (e.g., Aram, Ekelman, & Nation, 1984; Aram & Hall, 1980; Goulandris, Snowling, & Walker, 2000; Hall & Tomblin, 1978).

Direct comparison of these studies is difficult, however, as researchers use a variety of criteria for participant inclusion, provide varying descriptions of their participants, and display little uniformity in their choice of measurements. Furthermore, studies differ in design (e.g., prospective vs. retrospective), and vary in length of time between diagnosis and follow-up. However, results of these studies and others (e.g., Johnston, 1982) suggest the following general conclusions: (a) Over time, children with language disorders show changes in the type/severity of their language problems; (b) although the order of acquisition of language forms mirrors that of non-affected children, the acquisition occurs more slowly, over an extended age span; (c) for many of these children, language problems persist throughout childhood, adolescence, and young adult life; (d) additional language problems may not become apparent until the middle school years, when the child is required to engage in higher order language tasks.

Language disorders persist beyond the preschool years in 50-88% of children (Aram, Ekelman, & Nation, 1984; King, Jones, & Lasky, 1982; Strominger, 1983). Of course, the severity, specificity, and patterns of these evolving language disorders vary across age and from child to child (Bashir & Scavuzzo, 1992). What remains constant, however, is the fact that these language differences occur across the same developmental time span when the children are required to learn to read and write. As academic demands grow increasingly complex, the gap between the child's ability and society's expectation widens. As such, the differences between the child's acquired language and the language required for learning in

school often engender ineffective and inefficient learning among children with language disorders (Bashir & Scavuzzo, 1992). Consequently, children with language disorders remain academically vulnerable throughout the school years, unless intervention takes place.

Specifically, children with LI often go on to exhibit reading difficulties (Scarborough, 1990; Tallal, Ross, & Curtiss, 1989; Van der Lely & Stollwerk, 1996). Numerous studies have confirmed Bishop and Adams's (1990) findings that preschool and kindergarten children with more severe and/or widespread language difficulties (vs. moderate delays in expressive language only, for example) appear to be at greater risk for reading and spelling disorders at later ages (Bird, Bishop, & Freeman, 1995; Boudreau & Hedberg, 1999; Catts, 1993). Although not all preschool children with oral language problems will subsequently experience reading difficulties, the rate of reading problems among these children is higher than among their nonimpaired peers (Catts, Fey, Zhang, & Tomblin, 2001).

School-age children with reading difficulties have been shown, with high frequency, to experience earlier LI: one study of second graders with reading problems found that, as toddlers, many of these children exhibited significant difficulties with oral language development (Scarborough, 1990). More recently, Catts et al. (1999) found 57% of 183 children characterized as poor readers in second grade to have exhibited difficulties in receptive language in kindergarten. In a longitudinal study of 4- and 5.5-year-old children with speech-language impairments, Bishop and Adams (1990) found measures of language development to be the best predictors of reading achievement at age 8.5. Such findings unequivocally argue the need for increased emphasis on early detection and remediation of LI.

Comorbidity of LI with Psychiatric Disorders

The association between LI and emotional and behavior disorders has been well-established in the recent child psychopathology literature (Beitchman et al., 2001; Cantwell & Baker, 1991b; Cohen, Barwick, Horodezky, Vallance, & Im, 1998; Prizant, Audet, Burke, Hummel, & et al., 1990; Vallance, Im, & Cohen, 1999). Clinical and epidemiological samples suggest that approximately 50% of children with Language-Learning Disorders have a comorbid Axis I psychiatric disorder (Beitchman, Nair, Clegg, Ferguson, & Patel, 1986; Maag & Reid, 1994; Stanford & Hynd, 1994; Torgesen, 1990). This association has been documented in numerous samples, including children presenting to psychiatric clinics (Cohen, Davine, Horodezky, Lipsett, & Isaacson, 1993; Gualtieri, Koriath, Van Bourgondien, & Saleeby, 1983; Warr-Leeper, Wright, & Mack, 1994), children presenting to speech/language clinics (Baker & Cantwell, 1991), and children identified as language impaired in epidemiological studies (Beitchman, Nair, Clegg, Ferguson, & Patel, 1986). In all of these samples, a wide range of psychiatric disorders is represented among children with LI.

Cantwell and Baker (1987b) studied 600 consecutive English-speaking child referrals to an urban community speech/language pathology clinic, and found that psychiatric prevalence was 50% for any diagnosis, 26% for behavioral disorders, and 20% for emotional disorders. The most common individual psychiatric diagnoses were ADHD (19%), anxiety disorders (10%), and oppositional defiant and conduct disorders (7%). Data from a 4-year follow up of 300 of the children revealed a significant increase in psychiatric prevalence to 60% (Cantwell & Baker, 1991b).

Conversely, clinic and community-based studies estimate that 50-80% of children with psychiatric disorders also have LI. This LI, however, often goes undetected. A considerable percentage of children admitted to psychiatric units have been found to have *unsuspected* language disorders: In one psychiatric clinic study, one third of children had unsuspected language impairments (Cohen, Davine, Horodezky, Lipsett, & Isaacson, 1993). The authors argue that parents and professionals are often misled by the relative absence of expressive language problems; as such, externalizing behaviors become the focus of attention, rather than the underlying receptive language deficit.

Even if children with language impairments do not evidence overt psychiatric or behavioral problems in early childhood, research shows that children with persistent language disorders are at risk for psychiatric disorders, especially when they mature (Baker & Cantwell, 1982; Cantwell, Baker, & Mattison, 1980). In follow-up studies, Baker & Cantwell (1987a) found that prevalence rates of psychiatric problems increased from 44% to 60% from the early years into late childhood. More recent longitudinal studies show similar results, confirming that the prevalence of psychiatric disorders increases over time in children with LI (Beitchman, Wilson et al., 1996; Cantwell & Baker, 1991b).

Beyond late childhood, LI has been associated with early adolescent behavior disorders, even after controlling for disorders in early childhood (Beitchman, Wilson et al., 1996; Beitchman et al., 2001). Young adults with a history of early childhood LI evidence one of the highest rates of psychiatric disorder in the community: studies show disorder rates of 37% for 18- to 24-year-olds and 26.6% for 18- to 20-year-olds (Kessler, MccGonagle, & Zhao, 1994). Moreover, in children who have Axis I psychiatric disorders, the presence of a

language and/or learning disorder predicts the continued presence, versus remission, of the psychiatric disorder (Cantwell & Baker, 1991a).

ADHD.

The most frequent psychiatric diagnosis among children with LI is ADHD (Beitchman, Nair, Clegg, Ferguson, & Patel, 1986; Cantwell & Baker, 1991b; Cohen, Barwick, Horodezky, Vallance, & Im, 1998; Cohen, Davine, Horodezky, Lipsett, & Isaacson, 1993; Gualtieri, Koriath, Van Bourgondien, & Saleeby, 1983; Warr-Leeper, Wright, & Mack, 1994). This co-occurrence, coupled with the fact that language competence is important for successful social and academic functioning (Bashir & Scavuzzo, 1992), illustrates the need for in-depth study of language abilities and related cognitive processes in ADHD children (McInnes, Humphries, Hogg-Johnson, & Tannock, 2003) – an area that has been critically neglected in current research literature. The overlap between LI and ADHD will be explored in depth later in this paper.

Summary of Language Impairment

Language disorders are numerous and varied in their presentations, as is the language utilized to describe and classify them. Semantics aside, research has well-established the relationship between LI and a number of associated sequelae. The presence of early risk factors begs timely evaluation and subsequent intervention for children with suspected language impairment, as these impairments place the child "At Risk" for developing a number of difficulties. Studies show language impairment to be associated with learning disorders, continuous academic vulnerability throughout the school years, problematic social adaption, and a variety of comorbid psychiatric disorders. In particular, the most frequent

psychiatric diagnosis among children with language impairment is ADHD, though the literature to date has yet to investigate the impact of attention on early intervention for LI.

The At Risk Population

The prevalence of learning disabilities (LD) has been estimated to range from 5% to 15% (Lyon, 1996), depending largely on the type of LD measured and the criteria used to diagnose LD. The discrepancy between intelligence quotient (IQ) and achievement (of 2 or more standard deviations) has been posited as a criterion for the identification of LD. There is considerable variation, however, in how the discrepancy is derived and quantified. Furthermore, recent research indicates that disability in basic reading skills, for example, is primarily caused by deficits in phonological awareness, which is independent of any achievement-capacity discrepancy (Lyon, 1996). Despite the ongoing debate surrounding the appropriate definition and diagnosis of LD, numerous risks can be identified in the early years, thereby alerting parents and clinicians to likelihood of future learning difficulties.

The child who is At Risk for developing a learning disability (Brutten, Richardson, & Mangel, 1973; Critchley, 1964; Shedd, 1967) exhibits deficits in attention, order and organization, and gross- and fine-motor skills, and perceptual confusions causing faulty concept formation. The child who is At Risk *for Language-Learning Disabilities* may exhibit the aforementioned deficits in addition to exhibiting weakness in oral language development, difficultes learning the written symbols and patterns of language, and problems with abstractions of math (Pickering, 2004a). Specifically, to be At Risk for Language-Learning Disabilities means that "individuals with certain characteristics are more likely to have an undiagnosed language impairment or to develop this condition in the future than

individuals without these characteristics" (Finkelstein & Ramey, 1980, p. 546). The At Risk child who has oral language deficits, for example, exhibits weakness in vocabulary and verbal expression. Articulation problems are often present, as are auditory discrimination and memory problems (Pickering, 2004). Once diagnosed with LI, the At Risk descriptor is generally replaced by the appropriate diagnostic category or label. Nevertheless, the child may remain At Risk for exhibiting additional learning disabilities in the future (e.g., reading, writing, or math disabilities). As mentioned previously, children with such LI are particularly at risk for developing reading disabilities, a phenomenon that has been widely investigated in recent research. From this point forward (adhering to the terminology utilized by the designers of the The EI Program), this paper will use the term "At Risk" to refer to children who are at risk for developing Language-Learning Disorders, unless otherwise specified.

Numerous studies have investigated the efficacy of early intervention for At Risk children (Al Otaiba & Fuchs, 2002; Blachman, Tangel, Ball, Black, & McGraw, 1999; Justice, 2003; Nelson, Benner, & Gonzales, 2003). These intervention studies have provided information about how to prevent (or reduce the severity of) reading disabilities via early intervention, as well as how to address reading disabilities when detected at later ages. For example, Blachman and her colleagues (Blachman, Tangel, Ball, Black, & McGraw, 1999) have shown that instruction in phonological awareness at the kindergarten level has significant positive effects on reading development during the first grade. This study and others (e.g., Blachman et al., 2004) have demonstrated that proper intervention carried out by informed teachers and clinicians can help to prevent reading failure both for children with

inherent LD in basic reading skills and for children whose developmental language deficits place them at risk for reading deficits.

Summary of the At Risk Population

In addition to frequently evidencing language impairment, At Risk children have been shown to exhibit deficits in attention, order and organization, gross- and fine-motor skills, perceptual skills, and concept formation. These deficits place the child At Risk for a number of future learning disabilities (particularly Language-Learning Disorders), and frequently for reading disabilities. Recent research has shown early interventions for At Risk children to be successful not only in improving current language and literacy skills, but also in staving off the likelihood of developing future disabilities. Given the high frequency of attention deficits amongst At Risk children, one must consider how attention may impact the child's response to early intervention.

CHAPTER III:
Review of the Literature

ATTENTION DEFICITS

ADHD and Attention Deficits

Attentional focus and self-regulatory abilities develop at a rapid rate between the ages of 3 and 6. During these years, children with normative development become increasingly able to voluntarily direct attention to less interesting stimuli and to inhibit responses to salient but irrelevant aspects (Spira & Fischel, 2005). Additionally, they begin to develop a more coherent pattern across situations. The At Risk child, however, often exhibits deficits in attention (Pickering, 2004a) and may therefore begin to exhibit a coherent pattern of problematic and inattentive behaviors.

Diagnosing ADHD.

Attention-Deficit Hyperactivity Disorder (ADHD) is one of the most commonly diagnosed problems in childhood, estimated to impact between 2% and 18% of school-age children (Rowland, Lesesne, & Abramowitz, 2002) and roughly 2% of preschool-aged children (Lavigne et al., 1996). These rates vary, of course, depending on the nature of the population sampled and the method of ascertainment. ADHD is characterized by persistently and developmentally inappropriate levels of inattention, hyperactivity, and/or impulsivity (I/H/I), which are pervasive across time and setting, and impairing to daily functioning (American Psychiatric Association, 2000). Although DSM-IV diagnosis requires that some inattentive or hyperactive-impulsive symptoms must be present before the age of 7 years, many individuals are diagnosed only after the symptoms have been present for several years

(especially in the case with the Predominantly Inattentive Type). In circumstances wherein symptoms are noticeably present during the early preschool years, clinicians must be particularly careful not to prematurely diagnose ADHD; the rapid developmental changes occurring between the ages of 2 and 6 years make it difficult to determine when I/H/I behaviors warrant a diagnosis of ADHD and when those behaviors are simply developmentally appropriate (Spira & Fischel, 2005).

Problems related to inattention generally emerge at around 5-7 years of age, with entry to formal schooling (Barkley, 1997a). Some argue, however, that attention deficits may exist before the stage of formal schooling and may only be detected later on due to increased demands for attentional control in the more rigorous academic environment of elementary school (Spira & Fischel, 2005). Inattention may manifest in academic or social situations: children with this disorder may fail to pay close attention to details, make careless mistakes in schoolwork or other tasks, and have difficulty sustaining attention in tasks or play activities. Such children often appear as if they are not listening or did not hear what has just been said; they often do not follow through on requests or instructions and subsequently have difficulty completing tasks. Tasks that require sustained mental effort are experienced as particularly aversive and are often avoided as a result.

Problems with disinhibition, or hyperactivity/impulsivity, generally arise somewhat earlier than inattention, at around 3-4 years of age (Barkley, 1997a). Hyperactivity may be manifested by fidgetiness or squirming in one's seat, an inability to remain seated when expected to do so, or excessive running or climbing in situations where it is inappropriate. Hyperactive children often talk excessively, are always "on the go" or seem "driven by a

motor," and may have difficulty playing or engaging quietly in leisurely activities. Of course, hyperactivity will vary with the child's age and developmental level, and must be diagnosed cautiously in young children.

Finally, impulsivity may manifest as impatience, difficulty in delaying responses, blurting out answers before questions have been completed, difficulty waiting one's turn, or frequently interrupting or intruding on others to the point of causing difficulties in social or academic settings.

Diagnosis is made on the basis of behavioral observations and clinical interviews gathered from multiple sources (e.g., parents, teachers, child, clinician, etc.). Often, a behavioral questionnaire or screener will be utilized to determine whether further investigation of I/H/I behaviors is warranted. Overall, attentional and behavioral manifestations usually appear in multiple contexts, including home, school, work (for adults), and social situations; some impairment must be present in at least two settings for the diagnosis to be made. Of course, the child may display different levels of dysfunction in various settings, as symptoms typically worsen in situations that require sustained attention or mental effort (e.g., listening to classroom teachers, doing homework, etc.). Although many children present with both inattentive and hyperactive-impulsive symptoms, some children exhibit one pattern predominantly. Accordingly, one of three subtypes should be indicated, based on the predominant symptom pattern for the past 6 months: Attention-Deficit/Hyperactivity Disorder Predominantly Inattentive Type; Attention-Deficit/Hyperactivity Disorder Predominantly Hyperactive-Impulsive Type; Attention-Deficit/Hyperactivity Disorder Predominantly Combined Type.

Sequelae of inattention/hyperactivity.

Children with ADHD are at increased risk for academic and social difficulties, including learning disabilities, peer rejection, and decreased teacher expectations (Ladd, Birch, & Buhs, 1999; Merrell & Wolfe, 1998; Vaughn, Hogan, Lancelotta, Shapiro, & Walker, 1992). These difficulties affect not only the child's developing sense of self-efficacy (in the classroom and beyond), but his/her future emotional, social, and occupational well-being ("National Center for Educational Statistics," 2002; Winters, 1997). Specifically, children with the inattentive type of ADHD are most at risk for academic problems, while those with the hyperactive type are at greater risk for social problems and disruptive behavior. Moreover, children with the combined type have been shown to have the most social problems of all types, and are rated as being actively disliked by more classmates than comparison children (Lahey et al., 1998).

In considering early ADHD *symptoms*, regardless of whether they warrant a diagnosis of ADHD, it is important to address the stability of these problems. A number of longitudinal studies have investigated the stability of I/H/I in preschoolers, and most have found that children experiencing these problems during the preschool years are likely to show similar problems throughout the elementary school years and into adolescence (Campbell, 1995; Egeland, Kalkoske, Gottesman, & Erickson, 1990). Campbell (1995), for example, followed (for 10 years) 46 children initially identified by parents and teachers at age 3 as inattentive, overactive, and disruptive; they were compared to a group of 22 normal controls. At age 6, 50% of the problem group met DSM-III criteria for Attention Deficit Disorder (ADD), or were reported to be inattentive/impulsive and/or aggressive by teachers

and parents (Campbell, Ewing, Breaux, & Szumowski, 1986). Children who did improve differed from those who did not in the initial severity of their symptoms at age 3. At age 9, 48% of the initial sample met DSM-III criteria for ADD and/or Oppositional Defiant Disorder (ODD), compared with 16% of controls (Campbell & Ewing, 1990). Finally, at age 13, children whose problems had persisted to age 9 were still rated (and rated themselves) as less socially competent and more aggressive than comparison children, while their mothers continued to rate them as more hyperactive than other children (Campbell, 1995). Despite the relatively small sample size of these studies, the extensive nature of the follow-up evidences stability for behavior problems from preschool through early adolescence.

Although a number of studies have examined the correlation between ADHD and future academic, social, and emotional problems, few studies have examined the sequelae of subclinical levels of ADHD symptomatology. What little research does exist in this area investigates preschool children who might not meet full criteria for ADHD but who are showing premorbid signs of the disorder. Most studies involving preschoolers adopt a dimensional, rather than a categorical, approach to the selection of children with significant behavioral problems; this method circumvents the assigning of diagnostic labels to young children based on behaviors that may be transient or reflect normative temperamental variations.

For example, numerous studies have investigated the overlap between ADHD and underachievement in school-age children; estimates range from 10-50%, depending on the definition of learning problems used (Hinshaw, 1992; Lam & Beale, 1991). Few studies, however, have focused specifically on the association between preschool I/H/I and later

academic achievement. Those conducted have yielded noteworthy results. Children described as hyperactive at age 3 have been shown to have poorer reading scores at ages 7 and 9 than did their developmentally matched peers; moreover, 52% of these hyperactive children were reading disabled at age 15, compared to 10% of the normal controls (McGee, Partridge, Williams, & Silva, 1991). Children described as hyperactive at ages 4-6 have also been shown to have poorer scores on a standardized battery of reading, spelling, and math skills at age 12-14 than comparison children (Fischer, Barkley, Edelbrock, & Smallish, 1990). With respect to inattention, Rabiner et al. (2000) investigated the specific inter-relationships between inattention and reading across the years, to find that inattention in kindergarten and first grade was predictive of poorer reading achievement/outcomes in fifth grade. Retrospectively, children who were low-achieving in second grade have been shown to have significantly more attention problems in kindergarten than children who were high-achieving in second grade (Vaughn, Hogan, Kouzekani, & Shapiro, 1990).

Of course, a number of factors likely contribute to later academic problems, and it would be presumptuous to attribute academic underachievement to early ADHD symptoms alone. It is noteworthy, however, that Horn and Packard's (1985) meta-analysis of 58 studies on the early identification of learning problems found the best predictors of reading achievement to be as follows: attention/distractibility, internalizing behavior problems, language variables, and general cognitive functioning. Despite the fact that the included studies used disparate definitions of poor achievement, these results are still impressive, in that attention/distractibility stood out among a multitude of variables as one of the best predictors of achievement.

A number of theoretical models have been proposed to explain the relationship between I/H/I and later learning difficulties. One model is based on the stability of problem behaviors from early childhood through adolescence: preschool problems with I/H/I persist into elementary school, and these problem behaviors in elementary school are associated with learning problems (McGee & Share, 1988). However, McGee and Share point out that "remediation" of ADHD does not necessarily lead to improvements in academic achievement. Blackman and colleagues (1991) have proposed an alternative model, positing a third variable as a mediator: preschool I/H/I hinders the acquisition of emergent literacy skills, which are related to reading achievement in elementary school. Young children with symptoms of ADHD often miss the opportunity to learn the skills taught in their classrooms, either because they cannot maintain attention to the lessons, or because of disruptive behavior and subsequent removal from preschool (Blackman, Westervelt, Stevenson, & Welch, 1991). Thus, children with poor attentional and behavioral capacities may acquire fewer essential skills (e.g., emergent literacy) before formal schooling begins, and may therefore find themselves at a continued disadvantage throughout their academic careers.

Executive functioning and working memory in ADHD.

One critical cognitive deficit in ADHD is the dysfunction of behavioral inhibition (Barkley, 1997b). Presumably, this deficit interferes with executive function, the cognitively based control system that regulates behavior in a manner analogous to that of executives in a company, by selecting information and setting priorities, generating strategies, allocating resources, monitoring outcome, or redirecting responses (Barkley, 1997b; Borkowski, 1996; Hayes, Gifford, & Ruckstuhl, 1996; Pennington & Ozonoff, 1996). Current

conceptualizations of ADHD propose that a neurodevelopmental deficit in executive function limits development of self-regulation skills that guide behavior and cognitive functioning, thereby leading to the symptoms and performance deficits typical of ADHD (Barkley, 1998; McInnes, Humphries, Hogg-Johnson, & Tannock, 2003; Tannock, 1998).

Working memory is one aspect of executive functioning implicated in recent theories of ADHD (Barkley, 1997b; Brown, 2000; Cohen et al., 2000; Kempton et al., 1999; Martinussen & McInnes, 2001), and is also central to current theories of language comprehension (Kintsch, 1998; Williams, Stott, Goodyer, & Sahakian, 2000; Zwaan & Radvansky, 1998). It has also been linked with language functioning in children, such as reading comprehension ability (Nation, Adams, Bowyer-Crane, & Snowling, 1999; Swanson, 1999), vocabulary acquisition (Baddeley, Gathercole, & Papagno, 1998), and early academic achievement (Gathercole & Pickering, 2000).

Numerous recent studies have shown children with ADHD to have working memory deficits (Cohen et al., 2000; Karatekin & Asarnow, 1998; Kempton et al., 1999; Martinussen & McInnes, 2001; Williams, Stott, Goodyer, & Sahakian, 2000). A subset of these has explored the potential link between working memory and basic language deficits (Cohen et al., 2000; Williams, Stott, Goodyer, & Sahakian, 2000); however, methodological constraints (e.g., differences in age range of participants, research designs, and working memory tasks) preclude clear interpretation of these preliminary findings (McInnes, Humphries, Hogg-Johnson, & Tannock, 2003). For example, findings from a study by Cohen et al. (2000) suggested that ADHD children's working memory deficits were primarily related to their language abilities; these findings appeared to be consistent with literature suggesting that

working memory is language based, even when nonverbal information is involved (Denckla, 1996a, 1996b). However, Cohen and colleagues' use of the sentence span task (Daneman & Carpenter, 1980) as one of their working memory tasks may have confounded their results, as it requires both sentence-level language processing ability and working memory. Again, the nature of the overlap between ADHD and LI renders assessment a complicated task.

Deficits in working memory have been shown to impact listening comprehension in both ADHD and LI (McInnes, Humphries, Hogg-Johnson, & Tannock, 2003). McInnes and colleagues also found that ADHD children showed poorer verbal working memory skills than non-ADHD controls. Given that working memory is a key cognitive resource in comprehension (McInnes, Humphries, Hogg-Johnson, & Tannock, 2003), it follows that working memory is integral to one's ability to comprehend and respond to intervention. Not unrelated, working memory deficits have also been linked to academic underachievement (Gathercole & Pickering, 2000), and may be an important underlying factor in the academic problems of those with attention difficulties.

Treatment of ADHD.

Multimodal treatment has been shown to be the most effective treatment for children with ADHD, and incorporates a number of components: educating parents and children about the diagnosis and treatment, implementing behavioral management techniques, administering stimulant medication, and utilizing appropriate educational programs and supports ("Diagnosis and Treatment of ADHD," 2005). Psychosocial treatment is a critical component in treating children with attention-deficit/hyperactivity disorder (ADHD). The scientific literature (e.g., Pelham et al., 1988; Pelham, Wheeler & Chronis, 1998), the

National Institute of Mental Health (NIMH), and many professional organizations agree that behaviorally oriented psychosocial treatments (also called behavior therapy or behavior modification) and stimulant medication have a solid base of scientific evidence demonstrating their effectiveness. For example, the Multimodal Treatment Study of Children with ADHD (MTA), a longitudinal study conducted by NIMH, showed that children who were treated with medication alone, which was carefully managed and individually tailored, and children who received both medication and behavioral treatment experienced the greatest improvements in their ADHD symptoms, as compared with children receiving only behavioral treatment and children receiving the "usual community care" (MTA Cooperative Group, 1999a, 1999b).

With respect to medication, stimulant medications have been shown to be an effective first-line treatment for ADHD (Jensen, Arnold, & Richters, 1999). Concern persists, however, regarding the possible side effects and long-term health outcomes associated with stimulant consumption (Rowland, Lesesne, & Abramowitz, 2002); as such, a number of parents are reluctant to utilize medication in managing their child's symptoms. The 2003 National Survey of Children's Health (NSCH) indicated that, in 2003, approximately 4.4 million children aged 4--17 years were reported to have a history of ADHD diagnosis; of these, only 2.5 million (56%) were reported to be taking medication for the disorder ("Mental Health," 2005). Subsequently, a number of children with ADHD experience ongoing symptoms that impact their cognitive, academic, social, and emotional functioning.

Comorbidity of ADHD with LI

ADHD is a heterogeneous disorder which exhibits marked overlap with other disorders (Biederman, Newcorn, & Sprich, 1991). Communication/language disorders, which often remain unrecognized, are one class of disorders for which children with ADHD appear to be particularly at risk (Baker & Cantwell, 1992; Cohen, Davine, Horodezky, Lipsett, & Isaacson, 1993; Tannock & Schachar, 1996). The literature shows the co-occurrence of ADHD and speech/language impairments to range from 8% to 90% (for review, see Cantwell & Baker, 1991b; Cohen, 1996; Tannock & Schachar, 1996), with most studies suggesting overlap in the range of 20-60%. More recent studies confirm these findings: Cohen et al. (2000), in her research with 7- to 14-year old children presenting as child psychiatric outpatients, found considerable overlap, in that 63.6% of the children reached criteria for LI, while 46% met criteria for ADHD. Regardless of whether they warrant the full ADHD diagnosis, however, children with early behavior problems are consistently shown to suffer from language deficits (Barkley et al., 2000; Lahey et al., 1998; Rabiner, Coie, & The Conduct Problems Prevention Research Group, 2000; Shelton et al., 1998; Vaughn, Hogan, Lancelotta, Shapiro, & Walker, 1992).

Language impairment is present in as many as 50% of ADHD cases, yet is identified only upon formal assessment, and tends to be obscured by parental and teacher focus on disruptive behavior (Cohen, Barwick, Horodezky, Vallance, & Im, 1998; Cohen, Davine, Horodezky, Lipsett, & Isaacson, 1993; Cohen et al., 1998). It is not surprising that LI is often mistaken as behavioral problems (e.g, inattention, noncompliance), as LI tends to be subtle and difficult to detect (Cohen, 1996; Cohen & Lipsett, 1992; Stark & Tallal, 1988).

The literatures to date, however, have only recently begun to consider the overlap between ADHD and LI, and studies of language functioning in children with ADHD are limited (Cohen et al., 2000).

Nature of overlap between ADHD and LI.

Language impairment is not considered directly in the diagnosis of ADHD, although it is implicated in both the inattentive and hyperactive-impulsive symptom clusters (McInnes, Humphries, Hogg-Johnson, & Tannock, 2003). For example, the DSM-IV suggests that school-age children may evidence hyperactive/impulsive symptoms by blurting-out answers in class, speaking out of turn, interrupting, and talking excessively; these behaviors also signal poor pragmatic language functioning. Recent studies have confirmed informal observations that children with ADHD demonstrate a number of difficulties in pragmatic language: excessive talking when inappropriate, providing insufficient or ambiguous information when further detail is required, poor turn-taking skills, and difficulties introducing and/or maintaining topics (Humphries, Koltun, Malone, & Roberts, 1994; Tannock, Purvis, & Schachar, 1993). Alternately, children may evidence inattentive symptoms by "zoning-out," forgetting frequently, or failing to follow through on instructions; these behaviors may implicate language comprehension abilities.

Some behaviors used to diagnose ADHD may not be attributable solely to current constructs of hyperactivity/impulsivity and attention. Hinshaw (1992), in his investigation of the relationship between ADHD and underachievement, reviewed a number of studies in an effort to identify antecedent variables that might explain the association between behavior problems and learning problems. Of the variables he reviewed, language deficits have

received perhaps the most attention as a common cause of both learning disabilities and ADHD. Researchers have more recently begun to wonder whether impairments in some aspects of language functioning may be integral to ADHD, rather than a correlate or comorbid disorder (McInnes, Humphries, Hogg-Johnson, & Tannock, 2003). Hence, the need arises to reevaluate the role of linguistic (e.g., language comprehension) and cognitive factors (e.g., working memory) that may underlie behavior symptoms used to diagnose ADHD (McInnes, Humphries, Hogg-Johnson, & Tannock, 2003). In light of current concerns that ADHD may be overly diagnosed, Cohen et al. (2000) argues that the examination of ADHD symptoms as an epiphenomenon of LI warrants further investigation.

Few studies have separated the effects of ADHD and LI (Cohen, 2000). Some argue, for example, that there may be a threshold of task difficulty at which ADHD children who appear to have normal language abilities begin to function like children with language deficits (McInnes, Humphries, Hogg-Johnson, & Tannock, 2003). The studies that *have* investigated the language abilities of children with ADHD often do not distinguish between children with ADHD alone (ADHD-only) and those with comorbid learning disorders (e.g., reading disorder), thereby making it difficult to determine whether the language impairments are specific to ADHD or more a function of the comorbid disorder (Purvis & Tannock, 1997).

Given the overlap between LI and attentional deficits, attributing attentional deficits to either ADHD or LI has proven difficult. Children with LI often have been shown to suffer from attentional deficits, even in the absence of an ADHD diagnosis. McInnes et al. (2003) investigated listening comprehension and working memory among four groups of boys aged

9-12: ADHD, ADHD + LI, LI alone, and Normal Controls. Results showed that language impaired children received higher ratings on inattention symptoms than did their non-impaired peers (as reported by teachers). Although these children did not come close to meeting classification criteria for the ADHD+LI group, their slightly higher inattention ratings, though not in the clinical range, reinforce the notion that some inattention symptoms may be associated with underlying language deficits (McInnes, Humphries, Hogg-Johnson, & Tannock, 2003).

As such, language deficits are often overlooked as parents and clinicians attribute attentional deficits to ADHD symptomatology. In the aforementioned sample, only 4 of 18 children in the ADHD+LI group had been previously assessed for possible language deficits, despite having had chronic academic difficulties (McInnes, Humphries, Hogg-Johnson, & Tannock, 2003). Findings from this study suggested the possibility that often undetected listening comprehension deficits, co-occuring with ADHD, may underlie some behavior symptoms associated with ADHD, and may therefore impact future social interactions. Undetected LI could also influence the potential success of common behavioral treatment programs for ADHD, such as social skills groups or counseling that rely on oral communication skills (e.g., talking, listening, and comprehending) (McInnes, Humphries, Hogg-Johnson, & Tannock, 2003).

Interference with assessment accuracy.

The substantial overlap between ADHD and LI predicts that numerous children with ADHD will show up on speech-language pathologists' caseloads. Given the core symptomatology of ADHD, many clinicians may be concerned about the validity of testing

children with ADHD. While few studies have examined the language skills of children with ADHD, even fewer have addressed these specific assessment-based issues.

Oram and colleagues (1999) analyzed children's performance on 18 standardized measures used to identify language impairment; she compared 3 groups of children aged 7 to 11 years: ADHD-only, ADHD with comorbid LI, and non-ADHD controls. Although there were no significant findings for 17 of the tasks, she found that children with ADHD performed poorly on the Formulated Sentences subtest of the CELF-R (Semel, Wiig, & Secord, 1987), despite a lack of any other linguistic deficits. She and her colleagues concluded that the Formulated Sentences subtest appeared to tap not only core aspects of language, but also the way in which behavioral inhibition and executive function are required for certain components of communication (Oram, Fine, Okamoto, & Tannock, 1999). Although only 1 of 18 language tasks proved difficult for children with ADHD in the absence of language impairment, results caution clinicians about making unsubstantiated assumptions about task demands. Additionally, these results call for future research on the interaction of ADHD and LI as it impacts other frequently used, standardized measures.

Summary of Attentional Implications for Language Impairment

ADHD is one of the most commonly diagnosed problems in childhood and has been shown to be particularly comorbid with language disorders. Children exhibiting problems with attention and/or hyperactivity, regardless of whether they meet criteria for ADHD, are at increased risk for academic difficulties/underachievement and the development of reading disorders; moreover, these children experience social difficulties and peer rejection in excess of that experienced by their unimpaired peers. Given the degree of overlap between

attentional deficits and LI, some researchers have begun to wonder whether LI should be implicated in the diagnosis of ADHD. Alternately, research underscores the need for careful examination of the seemingly-ADHD child, as his/her symptoms more accurately may be a reflection of underlying LI. Regardless, it seems logical to hypothesize that the high rate of inattention among children with LI bears significant implications for such children's response to early intervention for LI. Oddly, research has yet to examine this critical interaction.

CHAPTER IV:
Review of the Literature

SOCIAL AND EMOTIONAL FUNCTIONING IN CHILDREN WITH LI

Emotional Functioning in Children with LI

Longitudinal research emphasizes that children with LI often exhibit poor long-term social and emotional outcomes (Beitchman, Brownlie et al., 1996; Beitchman, Wilson et al., 1996; Cantwell & Baker, 1991b; Rutter & Mawhood, 1991). Even if criteria for an Axis I disorder are not met, children with LI have been shown to experience considerable performance anxiety, poor peer relationships, and numerous family conflicts (Falik, 1995). Additionally, they have been shown to exhibit low self-esteem, social skill deficits, demoralization, and depression (Kauffman, 1997; Kavale & Forness, 1995).

Self-esteem.

The age at which a child's LI is diagnosed appears to impact self-esteem and, subsequently, emotional functioning. Having a diagnosed disability may play an integral role in a child's developing sense of self: whereas yet-to-be-diagnosed learning disabled kindergarten children have been shown to exhibit higher self-esteem than identified learning disabled children (Vaughn, Hogan, Kouzekani, & Shapiro, 1990), yet-to-be-diagnosed *school-age* children have been shown to exhibit lower self-esteem than diagnosed children (Ribner, 1978). These studies, when considered in conjunction with one another, suggest that having an unidentified learning problem may be increasingly detrimental to self-esteem over time. Furthermore, it is generally assumed that self-esteem partially determines whether children will act on the social cognitive knowledge they have (Crick & Dodge, 1994). Taken

together, these findings support the positive impact of early diagnostic labeling and intervention.

Future emotional sequelae.

Early childhood LI is stable across time (C. Johnson et al., 1999) and is associated with increased anxiety disorders in young adulthood. Clinic and community studies have reported increased rates of anxiety and withdrawn behavior among language impaired groups into adolescence (Baker & Cantwell, 1987a; Benaisch, Curtiss, & Tallal, 1993). More recent findings extend these associations into young adulthood. In a 14-year longitudinal study on the psychiatric outcome of speech/language impaired and control children, Beitchman et al. (2001) found that children with early LI had significantly higher rates of anxiety disorder in young adulthood when compared with nonimpaired children. Specifically, the majority of participants with anxiety disorders had a diagnosis of social phobia.

Alternately, studies have shown that 75% of young children with emotional and behavioral disorders have concurrent language deficits (Baker & Cantwell, 1985; Cohen, 2001). These findings, coupled with the fact that language deficits among children with emotional/behavioral disorders tend to be stable or increase over time (Cantwell & Baker, 1987b; C. Johnson et al., 1999), point toward a consistent and troublesome overlap between LI and emotional/behavioral problems.

It is not surprising that many children with language problems develop psychopathology associated with speaking to others and general social interaction. Early experiences of peer rejection (Asher & Gazelle, 1999), coupled with ongoing communication deficits (C. Johnson et al., 1999), may lead to humiliation and fears of embarrassment,

thereby resulting in social avoidance and anxiety. Ultimately, it is unclear whether LI is causally related to the later development of an anxiety disorder; LI is, however, associated with a significantly increased risk of developing one. Given that anxiety disorders impact the quality of life of affected adults (Wittchen & Beloch, 1996) and account for substantial economic and health care costs (Greenberg, Sisitsky, & Kessler, 1999), early identification and remediation of LI is warranted for these at-risk children.

Social Functioning in Children with Language Impairment

Longitudinal and cross-sectional studies of both clinic and nonclinic populations have documented the association between LI, psychiatric disorder, and poor social competence (Beitchman, Brownlie et al., 1996; Beitchman, Wilson et al., 1996; Cantwell & Baker, 1991b; Cohen, Barwick, Horodezky, Vallance, & Im, 1998; Cohen, Davine, Horodezky, Lipsett, & Isaacson, 1993). Furthermore, research has shown that children with LI are rated by both teachers and parents as having poorer social competence compared to children with normally developing language, regardless of psychiatric status (Beitchman, Brownlie, & Wilson, 1996).

Given that language serves as a predominant medium for social interaction, it seems only natural that children with LI may have concurrent deficits in social skills. To begin, learning-disabled children, many of whom have LI, have been reported to be insensitive to social cues (Nabuzoka & Smith, 1995; Ozols & Rourke, 1985). Studies of preschoolers with LI have shown that these children, when compared to their non-impaired peers, tend to be more passive than active in their conversations (Rice, Sell, & Hadley, 1991), participate in proportionately fewer peer interactions, and have difficulty gaining entry into peer activities

(Craig & Washington, 1993). Late talkers have been shown to have lower socialization skills than matched normally speaking toddlers, and at follow-up, are often still behind in expressive communication and socialization (Paul, Looney, & Dahm, 1991). It is noteworthy that children with ADHD show similar social skill deficits, in that they have difficulty organizing and monitoring the listener's comprehension as they speak (Purvis & Tannock, 1997) and have an impaired ability to obtain meaning from their social context (Stacey, 1994). This literature suggests that toddlers exhibiting socialization problems, including reluctance to initiate and participate in conversations with peers, are particularly in need of early intervention.

Social performance and LI.

Although research has established the association between social cognition and behavior in both clinical (Selman & Demorest, 1984) and nonclinical (Dodge, Pettit, McClaskey, & Brown, 1986) populations, few studies have investigated how LI interfaces with social cognition and behavior. Social cognition refers to the cognitive processes individuals apply to understand social situations (Staub & Eisenberg, 1981). In 1995, Stevens and Bliss were the first to directly relate LI to social cognitive processing. Upon presenting a hypothetical conflict resolution situation (to be solved with peers) to children in grades 3 to 7, children with LI exhibited poorer social problem-solving skills than did children with normally developing language. More specifically, children with both receptive and expressive language impairments performed more poorly than did children with predominantly expressive LI. In general, children with pervasive and receptive language impairments have been found to exhibit the greatest behavioral disturbance and the poorest

social competence (Beitchman et al., 1994; Rutter & Mawhood, 1991). These results suggest that problems in social skills and/or social performance are impacted not only by difficulties in processing social and emotional information, but also by deficits in language expression.

Emotion decoding and social problem solving.

Cohen, Menna, et al. (1998) compared the social cognitive processing of children with previously identified LI (PILI), with unsuspected LI (USLI), and with normally developing language (NDL). They found that children with LI (PILI or USLI) generally exhibited greater deficits in social cognitive processing, and particularly in emotion decoding and social problem solving, than did children with normally developing language. Emotion decoding, or the ability to recognize, understand, and respond appropriately to social and emotional cues in others, plays an integral role in social cognition. Cohen and colleagues found that children with LI have difficulty matching verbal cues to emotions in a social contexts, and deficits in identifying the feelings of participants in a conflict.

Although the emotion decoding speed of children referred to psychiatric treatment and assessment is slower in general than for nonpsychiatrically referred children, actual misperception of emotions is characteristic only of children with LI (Kaminska, 1995). Moreover, children with LI and a comorbid psychiatric disorder show deficits in relation to children without LI on nonverbal tasks examining the capacity to understand complex emotions (Vallance & Cohen, 1997). These findings reinforce the possibility that social performance deficits associated with behavior problems and psychiatric disorders differ for children with LI and with normal language.

Additionally, Cohen, Menna, et al. (1998) found language impaired children to exhibit less mature social problem-solving skills; specifically, they evidenced deficits in identifying and evaluating strategies to overcome social obstacles and in knowing when a conflict is resolved. These social problem-solving steps often require elaborate verbal explanations and rely heavily on cognitive processes such as working memory (Cohen et al., 1998), which has been shown to be problematic in children with learning impairment. Dale (1996) has suggested that although language may play a role at all steps in the social problem solving process, it may be more important for some steps than for others.

Some children with LI enjoy positive social relationships despite widespread deficits in social perception and performance (Cohen et al., 1998). Research has shown, however, that deficits in social cognition often extend into adulthood, thereby continuously impacting their social perceptions and performance: Rutter and Mawhood (1991) found that over half of a group of language-impaired individuals followed into adulthood had marked deficits in their social relationships. What differentiates these selective relationships is not well understood. Tenuous social outcomes, combined with the language-impaired child's increased risk for developing an anxiety disorder, underscore the importance of early language intervention.

Treatment Implications for Children with LI and Emotional/Social Difficulties

The treatment needs of children with LI are often complex (Forness & Kavale, 1996; Hallahan, Kauffman, & Lloyd, 1996; Hedge, 1996; Myers & Hammill, 1992; Swanson, 1991). Because children with LI have been shown to exhibit significant struggles with anxiety, social skill development, and behavioral regulation, it follows that many of these

children present for psychotherapeutic services. Individual and/or group psychotherapy may be recommended for peer problems and low self-esteem associated with chronic underachievement; children with poor peer relationships may benefit from social skills groups. As such, psychotherapy must be carefully tailored to the child's specific language deficits. LI may serve as an often-overlooked contributor to some of the difficulties children have in therapy, such as difficulties expressing their thoughts concisely or communicating meaning in emotionally loaded situations. Rather than considering these difficulties as resistance, therapists should consider broader LI as an alternative explanation in some cases (Vallance, Im, & Cohen, 1999), and may wish to incorporate nonverbal intervention strategies.

Most therapies are verbally based, including the cognitive, behavioral, and social skills training techniques often applied to children with ADHD (Cohen et al., 2000). It is noteworthy, then, that few therapists systematically evaluate language competence prior to beginning such therapies. Therapists would be well-advised to consider working collaboratively with speech-pathologists, not only for the purposes of maximizing the efficacy of therapeutic intervention, but also to investigate whether undetected LI may be contributing to the child's social, emotional, and/or behavioral distress. It follows that therapists working with language-impaired children must structure the language environment of the therapeutic setting, so as to compensate for the children's potential communication deficits. Interventions including nonverbal approaches, such as games, activities, art materials, and computers, are more likely to evoke patient responsiveness than are exclusively language-based interventions ("Practice Parameters," 1998). Interestingly, there

is evidence that psychotherapy has a beneficial effect on language functioning, particularly in therapies where verbal interactions are spontaneous rather than structured (Russell, Greenwald, & Shirk, 1991). This kind of structure, however, runs counter to that utilized in most cognitively-oriented interventions. Future research is needed to link LI, treatment content, and outcome.

Summary of Social and Emotional Functioning in Children with LI

Language impairments do not exist within a vacuum. Rather, they are associated with deficits in cognition, which in turn engender deficits in social, emotional, and behavioral functioning. Alternately, emotional and behavioral problems (e.g., depression or ADHD) may influence the efficiency of cognitive processing (Cohen et al., 1998). Research on comorbidity over the past 10 years has repeatedly confirmed that early LI puts children at risk for concurrent and future psychiatric problems and predicts disruptive behavior disorders (particularly ADHD) and anxiety disorders; moreover, general LI (vs. specific LI in one area of functioning) predicts worse emotional and behavioral outcomes. Additionally, children with LI have been shown to exhibit deficits in social skills, problems in social cognition and emotional decoding, and poor social problem solving skills.

CHAPTER V:
Review of the Literature

EARLY INTERVENTION FOR LANGUAGE IMPAIRMENT

The literature reviewing early interventions for children with LI covers a dizzying array of intervention techniques aimed at various ages and populations, whose selection for intervention was based on a variety of diagnostic and inclusion criteria. This aside, early interventions are united by a common, primary objective: bringing the child's performance within normal limits for his or her chronological age as quickly as possible (Olswang, Rodriguez, & Timler, 1998). Although there exists some debate as to when or how to intervene, early identification includes evaluating and providing treatment to families and their children under 3 years old who have, or are at risk for having, a disability, or delay in speech, language or hearing ("Early Identification," 2005). Identifying these children involves the consideration of a number of risk factors and predictors of change; subsequently, treatment may take the form of any number of intervention techniques. Despite the pressing need for additional and future research regarding the efficacy of various interventions for LI, a rich body of existing data is available to guide current decisions regarding the timing and type of intervention to implement.

Risk Factors and Predictors of Change

There exists some debate in the literature as to *when* to begin intervention with the child with LI. Intervention involves a significant commitment of time, energy, and finances, and is thus not to be undertaken haphazardly. To date, research has yet to directly link a single language-learning disorder with a particular treatment. Clinicians must therefore make

an informed decision on the basis of their knowledge of the disorder as it relates to typical language learning. This entails assessing the child's performance by identifying behavioral characteristics of the disorder (i.e., the symptomatology) and projecting possibilities for change in the immediate future.

"Predictors of change" are behavioral characteristics that suggest that a child who is delayed in language-learning will catch up to his or her peers, or behavioral characteristics that suggest that a child is ready to move ahead to the next language milestone (Olswang, Rodriguez, & Timler, 1998). Risk factors are familial or behavioral characteristics that suggest that a child is likely to have a true LI, rather than simply being a "late bloomer" (Olswang, Rodriguez, & Timler, 1998). When considering the need for and timing of intervention, research indicates that children exhibiting few positive predictors of change and many risk factors are more likely to have a true impairment and need for early intervention.

In their review of predictors of change, Olswang and colleagues (1998) outline the following predictors: language production, language comprehension, phonology, imitation, play, gestures, and social skills. With respect to language production (or expressive language), research shows that the quantity and variety of vocabulary appears related to language change. The earliest characteristic of a language learning difficulty is often a delay in the production of first words: a 2-year-old with fewer than 50 words is clearly at risk for continued delay, and the risk grows as the child ages with little change in language production (Paul & Alforde, 1993; Rescorla, Hadicke-Wiley, & Escarce, 1993; Rescorla & Schwartz, 1990). Expressive vocabulary size in relationship to age (Fischel, Whitehurst, Caulfield, & DeBaryshe, 1989; Olswang, Long, & Fletcher, 1997) and expressive vocabulary

in relation to comprehension (Thal, Oroz, Evans, Katich, & Leasure, 1995) also appear to be predictors of continued language growth. In sum, the toddler with a small vocabulary in relation to age and a less diverse vocabulary composition is likely to be a good candidate for intervention (Fischel, Whitehurst, Caulfield, & DeBaryshe, 1989; Olswang, Long, & Fletcher, 1997; Rescorla, Roberts, & Dahlsgaard, 1997).

With respect to language comprehension (or receptive language), receptive deficits seem to suggest a more severe impairment and a poorer prognosis for change (Bishop & Edmundson, 1987; Thal & Tobias, 1992). Thus, toddlers with significant expressive and receptive language delays of 6 months or more are most at risk for continued language delay, and most appropriate for early intervention. Research has shown that toddlers with delayed receptive and expressive language often evidence lower socialization skills than do matched normally-speaking toddlers (Paul, Looney, & Dahm, 1991). In general, studies indicate that toddlers exhibiting socialization problems, including reluctance to initiate and participate in conversations with peers, may be of greater concern for a clinician, and may therefore be likely candidates for intervention (Craig, 1993; Hadley & Rice, 1991; Rice, Sell, & Hadley, 1991).

Research investigating heritability for specific LI consistently shows a family history of LI or learning disability to be a risk factor for a toddler who is late in learning to talk. Numerous studies have reported a higher proportion of relatives with histories of LI or learning disability in families of children diagnosed with Specific Language Impairment than in those of typically developing children (Bishop, North, & Donlan, 1995; Lahey & Edwards, 1995; Lewis & Thomson, 1992; Paul, 1991; Weismer, Murray-Branch, & Miller, 1993). In

sum, if one of the toddler's parents or siblings demonstrates persistent language and learning difficulties, the toddler is at increased risk of continued language delay. Clinicians should therefore be particularly alert to this risk factor when considering early intervention for a child.

In addition to a child's predictors of change and risk factors, parent needs must also be considered in determining the timing and efficacy of early intervention. Research has investigated both parent characteristics and parent concerns, with respect to deciding whether to recommend intervention and to selecting the type of intervention considered most advantageous. Although extensive research has investigated parent characteristics as they relate to a child's language and intellectual development, results have been anything but clear. Few isolated characteristics appear to be directly related to children's development. Socioeconomic status (SES), however, appears to consistently predict children's development, in that low-SES families appear to be at higher risk for negative child outcomes (Hart & Risley, 1995; Siegel, 1981, 1982).

A review of the literature suggests that several characteristics predict whether change in a toddler's language production is imminent and whether the child is legitimately at risk for the development of true LI. Unfortunately, research to date does not prioritize or weight these characteristics. Thus, one is left to consider numerous characteristics that, when added together, begin to paint a picture of a toddler who is in serious trouble for language development and for whom early intervention would be recommended. Simply, the fewer predictors of change demonstrated by a toddler, coupled with the greater number of risk factors evidenced (by both the child and the child's family), the more concerned a clinician

should be about language development – and the stronger the recommendation for early intervention.

Learner characteristics influencing responsiveness to intervention.

To date, few studies have investigated the learner characteristics influencing the treatment effectiveness of early intervention for LI. Specifically, despite the large body of research linking LI with ADHD, research has yet to investigate the impact of attention deficits on the language-impaired child's response to early intervention. A relatively small number of studies, however, have begun to investigate the characteristics that influence a child's response to early *literacy* interventions (Justice, 2003; Rvachew, 2003). As literacy has been shown to be linked to language abilities, these studies are of interest. In a meta-analytic review of learner characteristics influencing the treatment effectiveness of early literacy interventions, Nelson, Benner, and Gonzales (2003) found that the primary characteristics influencing responsiveness included, in order of magnitude, problem behavior, phonological awareness, memory, and IQ. Children who evidenced attention or problem behaviors (i.e., "emotional or behavioral disorders") appeared not to benefit from early literacy interventions even when they were delivered in a one-on-one instructional format (Vadasy, Jenkins, Antil, Wayne, & O'Connor, 1997). Phonological awareness deficits were highly characteristic of children who were nonresponders; this finding was consistent with those of a previous meta-analytic review wherein 16 of 21 studies showed nonresponders to have phonological awareness deficits (Al Otaiba & Fuchs, 2002). Nelson et al. also found that memory deficits and [lower] IQ predicted poorer response to intervention, while

demographic learner characteristics (e.g., age, ethnicity, grade level) did not appear to influence treatment effectiveness.

Although these findings support the influence of attention on a child's response to early *literacy* intervention, it is logical to theorize that attention may similarly impact a child's response to early *language* intervention, especially given the underlying relationship between language development and literacy outcome. Hence, there exists a need for studies like the current one, to investigate attention as it influences treatment effectiveness of early intervention for LI.

Variants of Early Interventions

Intervention for LI may take several forms: direct one-to-one treatment with the child, group treatment with the child, parent training, or some combination of these alternatives. To a degree, the severity of a child's language deficits may dictate the form of intervention required. Although there is much debate in the literature, some clinicians recommend a "watch-and-see" approach for the child who demonstrates numerous predictors for change and minimal risk factors for language impairment. Paul (1996) advocates such an approach for these children and recommends reviewing the child's language status at 3- to 6-month intervals. Nevertheless, emerging research investigating the sequelae of early risk factors is pointing more consistently toward early intervention.

When considering intervention for the language-impaired child, one must keep in mind the possibility of comorbid attentional problems. Unfortunately, there is a paucity of research on the attentional demands of current early childhood curricula in preschool and kindergarten classrooms. Some speculate that poor academic skills may make it difficult for

children to pay attention, resulting in more disruptive behavior in the classroom; this lack of attention may then lead to even less learning, thereby causing greater attentional and behavioral difficulties in the future (Arnold, 1997). Studies have shown, for example, that without proper attentional and behavioral restraint, children with reading problems could not benefit from remedial intervention targeted at improving reading skills, especially when the instruction was delivered in a large classroom context (Torgesen et al., 1999, 2001). Thus, the issue of attention must be considered when planning intervention for the language-impaired child, as traditional methods of remediation may not sufficiently address the needs of these children.

Timing is another key element to intervention. Ward (1999) found that early intervention is effective for children as young as 1-2 years of age: a sample of 8-21 month old language-delayed children was divided into matched experimental and control groups, wherein the experimental group received early intervention. Both groups were followed up until the children were 3 years of age, or, the age at which children are usually referred for speech and language therapy. Results showed that at 3 years, only 5% of the experimental group showed language delay, whereas 85% of controls did so; moreover, the differences in mean language quotient in experimental and control groups were statistically different. Of course, not all children will be identified as language-delayed or language impaired by 21 months of age. Nevertheless, research has shown that even the earliest of interventions can be helpful in remediating LI.

Finally, in designing intervention for LI, one must consider not only individual-level risk factors but also population-level risk factors, so as to maximize intervention efficacy. In

other words, consideration of the number of individuals in the population exposed to a given risk factor is critical for intervention planning (Stanton-Chapman, Chapman, Bainbridge, & Scott, 2002). For example, an intervention which successfully prevents all children born with very low birth weight (an individual risk factor) from having a LI will only reduce the rate of LI in the population by 2.5%. This is because only about 8 out of every 1000 live births are considered "very low birth weight." Alternately, an intervention targeted at a risk factor that occurs more frequently in the population (e.g., maternal education of fewer than 12 years, which is present in one-fourth of all births), would have a greater potential impact on rates of LI in the population (13%) (Stanton-Chapman, Chapman, Bainbridge, & Scott, 2002).

Explicit approaches.

To date, the majority of literature addressing early intervention for LI focuses not on language outcomes per se, but on related outcomes in literacy and/or academic skills. Considering the literature on early literacy intervention as an example, At-Risk children have been shown to attain the most benefit from participating in carefully-constructed activities designed to explicitly promote emergent literacy performance in key areas (e.g., see Fey, Catts, & Larrivee, 1995; Lundberg, Frost, & Peterson, 1988; O'Connor, Jenkins, Leicester, & Slocum, 1993; van Kleeck, Gillam, & McFadden, 1998). Often, explicit approaches use a specific developmentally derived curriculum in which children participate, for a particular amount of time each day or week, in a set series of activities. One such example is the Sound Foundations Program (Byrne & Fielding-Barnsley, 1991), used effectively by Whitehurst et al. (1994) to increase the emergent literacy skills of Head Start children.

The two-fold argument for a more explicit approach to intervention (for emergent literacy or LI, for that matter) is derived primarily from the LI literature (e.g., Fey, Catts, & Larrivee, 1995; Paul, 2001). The first argument is that time is of the essence: engagement in explicit instructional activities is the most efficient route to skill development; activities can be designed to target specific areas of difficulty or areas most highly associated with later literacy outcomes (Lundberg, Frost, & Peterson, 1988). The second argument is that children with emergent literacy difficulties require more formalized or structured opportunities to develop key skills, as these children (for whatever reason) are not developing skills in the same manner or rate as are their typically achieving peers. As such, a more direct approach is required to encourage skill development in critical areas, as has been shown to be effective for children exhibiting a range of adverse developmental circumstances (Layton, Deeny, Upton, & Tall, 1998; Majsterek, Shorr, & Erion, 2000; O'Connor, Jenkins, Leicester, & Slocum, 1993; van Kleeck, Gillam, & McFadden, 1998).

Justice (2003) investigated the relative efficacy of an experimental explicit approach to emergent literacy intervention for 18 preschoolers experiencing multiple risk factors (e.g., oral language difficulties and poverty). The explicit approach required children to participate in structured activities designed to promote their skills in targeted areas of deficit. The majority of participants exhibited significant difficulty with oral language development, and results showed that oral language skill explained nearly 25% of the variance in literacy outcome. This finding demonstrates the impact of LI on children's responsiveness to emergent literacy intervention; furthermore, it argues the importance of explicit intervention, as it was found to be more effective and efficient for advancing widespread change (i.e.,

affecting all of the performance indicators studied) relative to literature-based activities in which literacy goals were less explicitly addressed.

In keeping with examining early literacy intervention as a model, phonological abilities are also critical to reading development (Byrne, Fielding-Barnsley, Ashley, & Larsen, 1997; Share, 1995) and are widely recognized as one of the core deficits in reading disabilities (Adams, 1990; Catts, 1993; Stanovich, 1988; Torgesen, Wagner, & Rashotte, 1994). In her research with 4-year olds with delayed expressive phonology skills, Rvachew (2003) found that identifying deficits in phonological awareness during the preschool years enabled earlier and explicit intervention, thereby reducing the likelihood of delayed acquisition of reading skills during the school years. Similarly, Gilion (2000, 2002) has shown that kindergarten-age children with delayed expressive phonology obtain long-term benefits from an intensive phonological awareness treatment program. Although additional descriptive studies (including those of younger children) are required to better understand the way in which implicit oral language skills can be improved via explicit phonological awareness training, emergent literacy research to date has shown explicit interventions to be superior to generalized ones in advancing widespread change.

Literacy aside, the demonstrated efficacy of explicit intervention for improving language skills is noteworthy. Long-term prognosis for language impairment, however, is variable (Kavale & Forness, 1995, 1996; Spreen, 1988). Findings suggest that children with more severe impairments may be less influenced by intervention (Justice, 2003); specifically, children with more pervasive impairments in expressive and receptive language have been shown to have poorer outcomes than those with less pervasive impairments (Beitchman et

al., 1994). As such, qualitatively and quantitatively different intervention approaches may be required to optimize early and later language development.

The Montessori Teaching Method

The Montessori Method is a systematic instructional strategy rooted in the philosophy that children, when provided adequate opportunities to select and engage in a hierarchy of learning activities, will advance their own learning by individually choosing developmentally appropriate and increasingly challenging activities. Developed in the early 1900s by Dr. Maria Montessori, the first woman physician in Italy, the Montessori Method utilizes a "prepared environment" wherein presentations of new material, learning activities, and the physical environment is both standardized and highly structured. Although the majority of Montessori programs are targeted for children ages 3 to 6 years, many are designed for infants/toddlers (ages 2 months to 3 years), elementary children (ages 6-12), adolescents (ages 12-15), and even a few high schools ("Montessori," 2005). It is estimated that there are over 4,000 certified Montessori schools in the United States, and approximately 7,000 worldwide ("Montessori," 2005).

The Montessori Curriculum encompasses four major areas of concentration: (1) The Practical Life curricula include skills which help the young child master care of self and environment; incorporated in these tasks are motor development (e.g., pouring; carrying a tray) and interpersonal relationship skills (e.g., greeting a friend; talking softly). (2) The Sensorial curricula provide the child the opportunity to investigate his or her surroundings via visual, auditory, tactile-kinesthetic, gustatory, and olfactory identification and discrimination (e.g., the Montessori bells are utilized to teach gradation of tones; tasting and

smelling experiences develop the gustatory and olfactory senses). (3) The Language curricula consist of oral language, pre-writing activities, and pre-reading activities which lead to reading and writing. Oral language is encouraged through the verbal labeling of the materials used in each activity, the discussion of the attributes and functions of these materials, and in the child-teacher and child-child narratives in the classroom. (Montessori language activities will be discussed in detail below.) (4) The Mathematics curricula include a hierarchical study of various activities (e.g., Missing Number, Tens Board, etc.), wherein the child is gradually introduced to quantities, mathematical patterns, and relationships.

The classroom is a well-ordered environment wherein each activity is set up on a separate tray (or other appropriate container). Each tray is placed on a shelf. Each group of shelves defines an area of curriculum and is organized by level of difficulty. The teacher has carefully presented (in the method described below) the independent usage of each of these activities, and the child is encouraged to individually select and engage in activities appropriate to his/her developmental abilities. The room is a relatively quiet place, as children are spread out across the floor, working on individual mats with their selected activity tray. Children are supported in being aware of sound levels and in quieting down if the sound becomes too distracting. The teacher usually speaks in a clear, quiet voice, close to the child with whom he/she is speaking and on the child's level, so that the child can see the teacher's mouth. The teacher rarely talks across the room, but asks that the children come to him/her or to each other to converse. This orderly environment is consciously limited in distractions and thereby helps the child focus attention on each work task.

The procedures for presenting material provide additional structure and opportunity for attentional focus. Every presentation involves four basic parts, all of which implicate attention: (1) Setting up the work area: the child uses a mat to delineate his/her "territory"; this set-up, plus the act of obtaining the materials (e.g., mat, tray, etc.), requires attention to be focused and refocused on the task at hand. (2) Selecting the activity: the Montessori principles advocate matching the level of presentation (i.e., task difficulty) precisely to the child's developmental and skill level, thereby optimizing learning, discovery, and success (Hunt, 1968). (3) Using the material (e.g., stacking incrementally-sized blocks): During the first presentation of new materials, the teacher does not distract the child from the visual input with any verbalization; he/she uses slow, clear hand movements and speech, monitoring and maintaining the child's attention throughout. After the presentation, the child is given the opportunity to mimic the lesson while the teacher observes the child's attention, order, and concentration. The teacher's observations regarding what the child can and cannot do will guide subsequent presentations. This aspect of the Montessori system proves ideal for the language disordered child, in that all presentations are first made without nomenclature. Only after success at perceiving the sensory information of the presentation is language attached and a concept formed (Pickering, 2004a). (4) Returning the material to the shelf: The shelves or areas of the room where the activities belong are marked with symbols which match the symbols on the materials; these symbols assist the child in finding where things go, while directing the child's attention in this final step of each activity.

Montessori adapted for the At Risk child.

The At Risk child has deficits in attention, order and organization, gross and fine motor skills, perceptual confusions, oral language development, written language, and mathematical abstractions (Pickering, 1988). The traditional Montessori Method provides a program which allows diagnostic teaching in all of these areas and offers a hierarchy of skills with which the teacher may help each child "match" his work to his developmental level. Moreover, it provides a model in which the teacher can present materials to the At Risk child 1:1, which is often crucial with this population. The current study, however, utilizes *Montessori for the At Risk Child*, an adaptation of the traditional Montessori Method. Montessori for the At Risk Child, while maintaining the general structure and standardization of the traditional Montessori Method, incorporates teachings adapted explicitly to meet the needs of the At Risk child.

The At Risk child, as compared to the average child, often requires additional guidance within the Montessori classroom. As such, At Risk children generally need the teacher present in their learning environment for greater time periods. Additionally, At Risk children require: additional and more direct assistance on attention/focus/and concentration; additional guidance in selecting and performing tasks; specific and direct teachings for oral language development; direct teaching of written language and/or math symbols; pre-writing and writing practice with a multi-sensorial techniques; and language presentations modified with techniques or programs for children with specific reading disabilities (Pickering, 1988). Montessori for the At Risk Child therefore augments the traditional method with teachings tailored explicitly to address these needs.

Although attention, focus, and concentration are generally functional for learning by 3 years of age, the At Risk child often exhibits deficits in these areas and must be taught to attend. The teacher must therefore help the child reach a level of attention that is within the learning range and must employ techniques during presentations to help maintain it. Furthermore, the teacher must help the child learn to make choices, else he/she may wander and do little meaningful work. Although the average child may be able to choose developmentally appropriate activities with little assistance, the At Risk child requires additional support, encouragement, and assistance in choosing and organizing his/her work. Teachers will likely need to limit the choices for the At Risk child by directing the child to choose any task in a certain area of the room, by offering the child a choice between two activities, or by selecting the materials for the child. (For children with attentional deficits, it is often necessary to make most of the selections for the child.) In some cases, a card file may be constructed, containing pictures of the materials appropriate for the child's use on a given day. This device, accessible by the child, helps the child learn how to choose, while appropriately limiting him/her to developmentally appropriate activities.

Montessori for the At Risk Child also incorporates additional presentations of materials, often with more direct instruction than would be included in the traditional method, and with additional steps to help master concepts. It is critical for teachers to present carefully (and slowly) all materials, being alert for gaps in concept formation and directly teaching these percepts/concepts in small steps for mastery. Language presentations, for example must be structured more precisely from simple to complex than is necessary for the average child working within the traditional method. The average child may learn how to

build words with all 5 short vowels simultaneously (e.g., cat, cup, cot, etc.), while the At Risk child needs the teacher in very specific presentations to help him master the "short a" consonant-vowel-consonant pattern (e.g., cat, cap, bad, mat, etc.) before progressing to another vowel sound.

Children with language disorders have been shown to benefit from Montessori for the At Risk Child procedures, wherein the remediation of language deficits is accomplished via direct teaching procedures that are repeated until they become automatic (Pickering, 2003). The aforementioned precisely structured language presentations are critical, as At Risk children evidence a number of language deficits: difficulty maintaining sound/symbol relationships, faulty ability to perceive word patterns, weakness in blending sounds into words, and slow and labored decoding skills (Pickering, 2004b). Indirect teaching of language skills is reinforced through individual activities on the shelves, where the child will find structured language activities, grouped by order of difficulty, in one area of the room. Language lessons and others are thus broken into reduced levels of difficulty or increased levels of abstraction, as appropriate to the At Risk child.

In general, research studies have shown that Montessori children are well prepared for later life, academically, socially, and emotionally; in addition to performing well on standardized tests, Montessori children are ranked above average on such criteria as following directions, submitting work on time, listening attentively, using basic skills, showing responsibility, showing enthusiasm for learning, and adapting to new situations ("Montessori," 2005). Furthermore, data collected during more than 20 years of applying Montessori to students At Risk indicates that these students scored effectively on

standardized measures appropriate for their age (Pickering, 2004b). This data (describing the efficacy of Montessori *for the At Risk child*) and related research studies are relatively limited, however; as such, little empirical data is currently available regarding the specifics of the At Risk child's response on standardized measures.

In sum, the Montessori Method's hierarchical curriculum enhances the development of attention, order and organization, gross-and fine-motor skills, visual and auditory perception, oral language development, academic skills of written language and mathematics, and personality growth. Moreover, the program's philosophy of explicitly matching task difficulty to developmental level enables the child to experience a sense of discovery and success in learning. Subsequently, the child is more likely to feel successful in school and therefore develop a competent self-concept (Pickering, 2004b).

The Association Method

The Association Method is a systematic instructional strategy currently being used to teach children with speech and language disorders, children with reading disabilities, and children with hearing loss. It is an explicit, incremental, phonetically based, multi-sensory approach designed to increase the understanding and use of spoken language; improve articulation, co-articulation, and speech fluency; and teach reading and written composition skills. Originally developed by Mildred McGinnis in the 1920s and 1930s to work with veterans who had lost their ability to speak due to closed head injuries (McGinnis, 1939, 1963), the Association Method was later adapted to work with children with hearing loss at Central Institute for the Deaf in St. Louis, MO (Duchan, 2001). It is currently being used with children and adults with a variety of disorders, including hearing loss, auditory

processing disorders, language learning disorders, articulation disorders, attention deficit disorder, traumatic brain injury, and cerebral palsy ("Apraxia-Kids," 2004; Dubard & Martin, 1997; "DuBard School for Language Disorders," 2004; Kotler, 2004; "National Aphasia Assocation," 2004; Withrow, 2001). Additionally, it has been used with children who have learning disabilities, particularly those with reading disabilities ("International Dyslexia Association," 2004; Withrow, 2001).

The goal of the Association Method is to teach the child to attend, process, store, and retrieve spoken and written language in an appropriate and automatic manner. McGinnis (1963) contended that for language learning to take place, the processes of attention, retention, and recall must not only be intact, but also be used in association with each other; specifically, she posited that attention leads to retention, which leads to recall. The ten principles governing instruction in the Association Method therefore serve to enhance attention and memory: (1) Receptive language learning follows expressive instruction and production: a "just say it" technique encourages precise articulation that then provides the motor and acoustic feedback that leads to understanding (Dubard & Martin, 1997); (2) Incremental teaching: the child is taught one small element at a time (e.g., phonemes, syllables, nouns, sentences, discourse); (3) Encourage success: self-confidence is developed through task mastery; if a student is given a sound that he/she cannot retain after several weeks, that sound is eliminated from practice, replaced with another sound, and re-introduced at a later date; (4) Systematically build on previously mastered material: use only the sounds the child has mastered in new syllables and nouns, only the nouns he/she has mastered in simple sentences, and so on; (5) Written form accompanies all that is taught;

instruction is multi-sensory, encouraging the child to learn to *read* the sound/word/sentence, then *write* it; (6) Modification of rate of speech: both the instructor and the child are required to slow their speech production when material is presented, so that the child is encouraged to attend and discern; (7) All spoken items are associated with a visual symbol: sounds are paired with phonetic symbols, nouns are cued from pictures; later instruction eliminates the symbols and picture cues, thereby using rote memory to strengthen auditory memory; (8) Complete recall is expected without teacher prompting: new material is introduced only when the child can produce the material without any cue from his or her teacher; (9) Structure, repetition, and similarity are promoted in the child's environment: routine is crucial in reducing the child's anxiety; (10) Multi-sensory teaching is key: auditory, visual, tactile, and motor-kinesthetic information for learning are integrated and/or associated.

Currently, the Association Method is being implemented in only a handful of schools in the United States ("DuBard School for Language Disorders," 2004; Kotler, 2004; "Magnolia Speech School," 2004; "TALK, Inc.," 2004). While there exists a number of alternative instructional strategies for use with children with LI, the Association Method is unique in its attention to *oral language* delays and deficits. Alternate programs, such as Alphabetic Phonics or the Orton-Gillingham Approach, are designed primarily for children with written language disorders (i.e., disorders in reading, writing, and spelling), and do not target oral language deficits as explicitly as does the Association Method. The Association Method targets oral language deficits while simultaneously addressing written language deficits, and is therefore more appropriate for a classroom whose children have varied (both oral and written) language/articulation deficits. Support for the Association Method comes

from teachers, therapists, and parents who have seen the benefits to children with speech, language, and reading disabilities; programs using the Association Method continue to do so because they see improvement in children who, due to the severity of their disabilities, are often quite difficult to teach (Sullivan & Perigoe, 2001). Although this method has been used for over 60 years, it lacks objective research on the efficacy of its techniques. Thus, its efficacy has yet to be empirically supported, but is based on positive anecdotal reports and experience.

Rationale for choosing Montessori/Association.

Children are encouraged to expand their repertoire of receptive and expressive language at a dramatic pace during the early years of life. It is quite pertinent, therefore, to consider whether early problems of inattention, hyperactivity, or impulsivity might hinder learning in the classroom, thereby further thwarting the language-impaired child's academic, social, and emotional functioning. The activities in a Montessori setting are designed to assist the child in developing attention, organizational skills, and habits of completing tasks in an orderly sequence, all of which have been shown to be areas of difficulty for many children with LI and/or attentional deficits. Longitudinal studies such as that by McGee et al. (2002) support this style of intervention, in suggesting that remediation of both symptoms of inattention/overactivity and reading problems must be addressed in order to effect significant change in academic achievement.

Additionally, research has shown that working memory is compromised in LI and ADHD populations (McInnes, Humphries, Hogg-Johnson, & Tannock, 2003; Nation, Adams, Bowyer-Crane, & Snowling, 1999; Swanson, 1999). Hence, academic problems that

are typically attributed to compliance or task-completion problems in children with attentional deficits may actually have more to do with weak comprehension skills for longer, complex information (McInnes, Humphries, Hogg-Johnson, & Tannock, 2003). The Montessori and Association methods' systematic and hierarchical presentation of curricula may therefore be an ideal intervention for these children, in that the level of instruction is matched specifically to the developmental level of the individual child. Moreover, the Association Method's explicit instructional strategies for written *and* oral language deficits are well-matched to young children with both oral and written language impairment.

Summary of Early Language Interventions

Research has identified a number of risk factors and predictors of change, thereby empirically supporting the need for early intervention. Furthermore, early identification of and intervention for children with LI serves not only to remediate current functioning, but also to reduce the likelihood of future cognitive, academic, and social difficulties (Ramey & Campbell, 1984). Although there is some debate as to when and how to intervene, researchers reasonably argue that the magnitude of concern should directly translate to the recommendations for intervention (Olswang, Rodriguez, & Timler, 1998; Thal & Katich, 1996; Whitehurst & Fischel, 1994). The Association and Montessori methods, with their explicit approaches to teaching language and sustaining attention, are well-suited to the child with LI and attentional deficits. As future research further discerns the etiology of LI, interventions will likely become more explicit in nature and more defensibly matched to the child's specific symptomatology (Olswang, Rodriguez, & Timler, 1998). Until then,

interventions like the EI Program effectively apply the knowledge to date, thereby enhancing current understanding of the efficacy of early intervention.

CHAPTER VI

AIMS AND HYPOTHESES

Purpose of Study

A review of the literature suggests that a large percentage of children with LI exhibit significant attention deficits; similarly, a large percentage of children with attention deficits have been shown to exhibit underlying LI. Numerous recent studies have investigated the presentation of ADHD among children with LI, as researchers have begun to question the nature of the overlap between ADHD and language-learning disabilities. While numerous studies have investigated early interventions for children with LI, none have investigated the impact of attentional deficits on the remediation of language deficits via early intervention. Thus, the main purpose of this retrospective investigation is to examine how attentional deficits impact LI remediation over the course of 1 year of early intervention. Additionally, children with LI have been shown to exhibit various emotional problems (e.g., anxiety) and deficits in social skills, beyond those evident in their non-impaired peers. Consequently, a second purpose of this study is to examine changes in specific emotional and social functioning (over the course of 1 year, as measured by teacher report) in relation to change in LI. This study will contribute to the literature as it is the only study to date to examine the impact of attentional deficits on early intervention for LI, and subsequently, on specific areas of emotional and social functioning.

Aims and Hypotheses

Aim I: To assess whether a Montessori/Association Method early intervention program for children with LI improves children's language abilities over the course of one year, as measured by change in composite language scores, expressive vocabulary scores, and receptive vocabulary scores.

Aim II: To assess the relationship between attentional deficits and change in LI.

Aim III: To assess the relationship between change in LI and specific areas of emotional/social functioning.

Specific hypotheses are listed in Chapter VII (Method), within the *Statistical Analyses* section.

CHAPTER VII

METHOD

Design

Participants.

Participants are 20 children from an ongoing research initiative entitled, "The Early Intervention Study" (EI Study), an experimental intervention at The Shelton School for children with moderate to severe language impairments. Children were 3 to 9 years of age at Pre-testing and have met criteria for LI (as defined below), in that each child evidences a language disorder, an articulation disorder, or a combination of the two.

A child was considered to have a language disorder if his or her scores on standardized measures of language ability (documented prior to the child's inclusion in the study) fell in the Below Average range, as compared with the normative sample. Standardized measures included those measuring overall language ability (e.g., tests like the Clinical Evaluation of Language Fundamentals-4th Edition), expressive language, receptive language, auditory processing, or any combination of the above. Children included in the study were determined [by speech-language pathologists at The Shelton School] to have Moderate Language Disorders (standard scores falling in the 71-78 range on any of these measures) or Severe Language Disorders (standard scores of 70 and below on any of these measures).

A child was considered to have an articulation disorder if his or her scores on standardized measures of articulation (documented prior to the child's inclusion in the study) fell in the Below Average range, as compared with the normative sample. Standardized

measures included those measuring phonological awareness, phonological deficits, or apraxia of speech. Children included in the study were determined to have moderate articulation impairment (standard scores falling in the 71-78 range for any of these constructs) or severe articulation impairment (standard scores of 70 and below).

Moreover, the included children met criteria for being considered At Risk for developing learning disabilities *in addition to* their identified LI, in that they presented with deficits in at least one of the following areas: attention, cognition, memory (auditory and/or working memory), academic skills (pre-academic, reading accuracy, and/or reading comprehension), perception, and/or motor coordination. Again, these deficits were considered significant when a child's performance on standardized measures of such abilities fell in the Below Average range, as compared with the normative population.

Participants in this study and in the ongoing EI Study were selected from a pool of applicants applying to The Shelton School between August of 2003 and May of 2004, and were considered to be "At Risk for Language-Learning Disorders." The Shelton School in Dallas, Texas, a school for "intelligent children with learning differences," selected these participants for their Early Intervention Language-Learning Program on the basis of their pervasive delays or disorders in language and/or articulation (as defined above), attention, coordination, and perceptual skills. Exclusionary criteria were as follows: severe behavior that impedes learning in the classroom environment (i.e., prevents other children from learning), primary diagnosis of emotional or behavioral disorder (other than ADHD), and/or significant previous or concurrent general medical illness. Moreover, the number of participants was limited to 20, commensurate with the EI Study's available resources.

With respect to comorbid psychiatric diagnoses, 4 participants had an existing diagnosis of ADHD. Three of these 4 participants were on medication to address problems with inattention and/or hyperactivity; additionally, 2 other participants were taking such medication but without a documented ADHD diagnosis. (As medication may be a confounding variable in the course of this study, it will be statistically controlled for to the degree possible.) One of these 2 latter participants (on medication but without an ADHD diagnosis) has been participating in Applied Behavioral Analysis since age 3. None of the participants had a known diagnosis of any Anxiety Disorders, Mood Disorders, Behavioral/Conduct Disorders (except as noted), or Pervasive Developmental Disorders. All participants were screened for hearing and vision problems.

Measures

The measures of language, attention, and emotional/social functioning utilized in this study are listed on the following page (in Table 1) and are a selection of those measures chosen by the EI Study designers to measure participant progress and program efficacy.

Table 1
Measures and Selected Scores for Analysis

Measure	Variables
CELF-4	Core Language Score
CELF PS:2	Core Language Score
EOWPVT	EOWPVT Standard Score
ROWPVT	ROWPVT Standard Score
Brown ADD Scales	Inattention Total Score
BASC	Internalizing Problems Anxiety Somatization Depression Withdrawal Aggression Social Skills

Language measures.

1. Clinical Evaluation of Language Fundamentals – 4th ed. (CELF-4; Wiig, Secord, & Semel, 2004). The CELF-4 is an individually administered clinical tool for the identification, diagnosis, and follow-up evaluation of language and communication disorders in individuals 5-21 years of age. Its four-step assessment approach quickly identifies students with language disorders: (1) Administering 4 core subtests yields a standard, norm-referenced Core Language Score (CLS), thereby determining whether a language disorder exists. (Children ages 5-8 are administered: Concepts & Following Directions; Recalling Sentences; Formulated Sentences; Word Structure. Children ages 9-12 are administered: Concepts & Following Directions; Recalling Sentences; Formulated Sentences; Word Classes 2-Total.) (2) Administering additional subtests (with norm-referenced index scores) helps determine

the nature of the language disorder. (3) Supplementary subtests (criterion-referenced and norm-referenced measures) enable the clinician to evaluate critical underlying clinical behaviors. Finally, (4) descriptive measures of a child's language performance at school and at home enable evaluation of language and communication in context, subsequently guiding classroom language and broad-based IEP planning. Administration time for the four subtests required to complete the CLS is generally 30-45 minutes. CELF-4 yields standard scores, age equivalents, criterion scores, and percentile ranges.

Standardization and related reliability and validity studies involved more than 4,500 children, adolescents and young adults from across the country, all of whom spoke English as their primary language. Two hundred individuals were tested in each of 12 age groups, while 250 were tested in the 5-year age group of 12 to 21 years; all testing was conducted during the Spring and Summer of 2002. Norms were derived from a standardization sample that is representative of the U.S. population of individuals 5 through 21 years of age; the sample was stratified by age, race/ethnicity, geographic region, and parent education level (*parent* includes natural parent, guardian, and primary caregiver).

Test-retest reliability for CELF-4 (for repeated testing in 7-35 days, mean=16 days) has been estimated for all age bands, using Pearson's product-moment correlation coefficient; the average corrected stability coefficient for all ages ranges from .90 to .72 across subtests. Additionally, the average corrected stability coefficient of the CLS score is .92. The mean retest scores are higher than scores from the first testing, with an effect size of .24 for the CLS; subtest effect sizes range from .13 to .49. As such, score differences for the combined

age bands, primarily due to practice effects, are approximately 3.3 points for the CLS. Internal consistency reliability coefficients for the CLS ranges from .93 to .95 across ages (using Cronbach's coefficient alpha), and from .94 to .97 across ages (using split-half correlations corrected by the Spearman-Brown formula). Inter-rater reliability for subtests requiring scoring judgments ranges from .88 to .99.

With respect to validity, the CLS of CELF-4 has a high intercorrelation with other composites (.65-.97, with a mean of .80). In comparing the Core Language Scores on CELF-4 and CELF-PS:2, the corrected correlation coefficient is .69; CELF-4 subtest and composite scores have greater means than those on CELF-PS:2, partially due to higher ceilings on CELF-4. Evidence of construct validity originated and is extended from research and development previously conducted with CELF-3. Finally, to meet the goal of creating a theoretical model of language ability that includes both receptive and expressive components (indexes) nested hierarchically within the framework of a Core Language ability composite measure, multiple factor analytic studies and analyses of full structural equation models were conducted and shown to yield robust results.

2. Clinical Evaluation of Language Fundamentals; Preschool – 2nd ed. (CELF-PS:2; Semel, Wiig, & Secord, 2003). CELF-PS:2 is an individually administered clinical tool for identifying, diagnosing, and performing follow-up evaluations of language deficits in chidren ages 3-6 years. A downward extension of CELF-4, its subtests parallel those of CELF-4. In order to increase the ceiling of CELF-PS:2 and facilitate score consistency at ages 5-6 years (the ages shared by the two tests), CELF-PS:2 and CELF-4 share some subtests.

Administering 3 subtests yields a standard, norm-referenced Core Language Score (CLS) which determines whether the child has a language disorder. Subsequently, as with CELF-4, additional subtests may be administered to evaluate the nature of the disorder (using norm-referenced index scores), early classroom and literacy fundamentals (using supplementary norm-referenced measures), and communication in context (using a descriptive measure of pragmatic skills. Administration time for the three subtests required to determine the CLS is 15 to 20 minutes. CELF-PS:2 yields standard scores, age equivalents, criterion scores, and percentile ranges.

Standardization and related reliability and validity studies involved more than 1,150 children tested between June and November of 2003. The standardization sample included 100 children in each of eight 6-month age groups. English was the primary language of all participants, although 10% of the sample lived in homes in which a language other than English was also spoken. The demographic characteristics of the sample approximate the national population in 2000 for geographic region, race/ethnicity, and primary caregiver's education level.

Test-retest reliability for CELF-PS:2 (for repeated testing in 2 to 24 days, mean=9 days) has been estimated for all age bands, using Pearson's product-moment correlation coefficient; the average corrected stability coefficients for all ages ranges from .90 to .78 across subtests. Additionally, the average corrected stability coefficient of the CLS score is .91. The mean retest scores are higher than scores from the first testing, with an effect size of .48 for the CLS; subtest effect sizes range from .17 to .45. As such, score differences for the

combined age bands, primarily due to practice effects, are approximately 6.8 points for the CLS. Internal consistency reliability coefficients for the CLS range from .76 to .93 across ages (using Cronbach's coefficient alpha), with a mean of .90; split-half correlations (corrected by the Spearman-Brown formula) range from .88 to .94, with a mean of .92. Inter-rater reliability for subtests requiring scoring judgments ranges from .95 to .97.

With respect to validity, the CLS of CELF-PS:2 has a high intercorrelation with other composites (.85-.93). In comparing the Core Language Scores on CELF-PS:2 and CELF-4, the corrected correlation coefficient is .69; CELF-4 subtest and composite scores have greater means than those on CELF-PS:2, partially due to higher ceilings on CELF-4. With respect to other measures, CELF-PS:2 has been shown to correlate moderately (.73-.76) with the PLS-4, an individually administered, standardized measure of language development of young children. Finally, diagnostic validity statistics reveal excellent sensitivity at 1 SD below the mean.

3. Expressive One-World Picture Vocabulary Test (EOWPVT; Brownell, 2000a). The EOWPVT is an individually administered, norm-referenced test that provides an assessment of an individual's English speaking vocabulary, for use with individuals aged 2 years 0 months through 18 years 11 months. Administration involves presenting the examinee with a series of illustrations that each depict an object, action or concept. The examinee is asked to name each illustration, as items become progressively more difficult. Total time for administration and scoring generally takes between 15-20 minutes. Raw scores for 15 age groups can be converted to standard scores, percentile ranks, and age equivalents.

The EOWPVT was normed on 2,327 individuals from 32 U.S. states, from January through June of 1999. The sample closely approximated the demographics of the 1998 U.S. population for geographic region, race/ethnicity, gender, parent education level, residence (urban vs. rural), and disability status. All participants spoke English as their primary language. This test has been co-normed with the *Receptive One-Word Picture Vocabulary Test (ROWPVT)*, so that meaningful comparisons can be made between an individual's expressive and receptive vocabulary.

With respect to internal consistency, Cronbach's coefficient alphas range from .93 to .98 with a median of .96; split-half coefficients, corrected for the full length of the test, range from .96 to .99 with a median of .98. Corrected test-retest correlations range from .88 to .97 with a coefficient of .90 for the entire sample (average duration between first and second testing was 20 days). Standard gain scores have been found to range from 2.31 to 5.62, with an average standard score gain of 3.39 for the entire sample; the gain score is highest for the youngest students, possibly indicating a greater practice effect for young children. Inter-rater reliability is robust, with a corrected correlation of .93 between examiners.

With respect to content validity, rigorous item analysis guided item selection. With respect to criterion-related validity, the mean of the corrected correlations between the EOWPVT and alternate tests of expressive vocabulary is .81. Correlations between the EOWPVT and total scores from tests of broad language development (e.g., CELF-3, Oral and Written Language Scales (OWLS), Preschool Language Scales – Third Edition (PLS-3), Test for Auditory Comprehension of Language – Revised (TACL-R), Test of Language

Development – Primary – Third Edition (TOLD-P:3)) range from .71 to .85 with a median of .76. Correlation of raw scores to chronological age is .84 (uncorrected), indicating that older individuals, who would be expected to have more well-developed vocabularies, demonstrate greater proficiency on the EOWPVT. The corrected correlation with Reading achievement (as measured by the Woodcock Johnson - Revised) is .85, while corrected correlations with Language achievement (California Achievement Tests – Fifth Edition (CAT5), Metropolitan Achievement Test – Seventh Edition (MAT7), Stanford Achievement Test – Ninth Edition (SAT9)) range from .58 to .86 with a median of .64. Moreover, performance on the EOWPVT has been shown to correlate with cognitive ability, as evidenced by the multiple correlation of .89 between the EOWPVT and 2 composite scores (Verbal and Nonverbal) of the Otis-Lennon School Ability Test – Seventh Edition (OLSAT-7; Otis & Lennon, 1995). Finally, correlation between the EOWPVT and the ROWPVT has been shown to be .75 (uncorrected), thereby indicating a strong relationship between the performance on the two tests.

4. Receptive One-World Picture Vocabulary Test (ROWPVT; Brownell, 2000b). The ROWPVT is an individually administered, norm-referenced test that provides an assessment of an individual's English hearing, or receptive, vocabulary, for use with individuals ages 2 years 0 months through 18 years 11 months. Administration involves presenting the examinee with a series of test plates that each shows four illustrations. The examiner orally presents a stimulus word, and the examinee must identify the illustration that shows the meaning of the word; items progressively become more difficult. Total time for

administration and scoring generally takes between 15-20 minutes. Raw scores for 15 age groups can be converted to standard scores, percentile ranks, and age equivalents.

The ROWPVT was normed on 2,327 individuals from 32 U.S. states, from January through June of 1999. The sample closely approximated the demographics of the 1998 U.S. population for geographic region, race/ethnicity, gender, parent education level, residence (urban vs. rural), and disability status. All participants spoke English as their primary language. This test has been co-normed with the *Expressive One-Word Picture Vocabulary Test (EOWPVT)*, so that meaningful comparisons can be made between an individual's expressive and receptive vocabulary.

With respect to internal consistency, Cronbach's coefficient alphas range from .95 to .98 with a median of .96; split-half coefficients, corrected for the full length of the test, range from .97 to .99 with a median of .98. Corrected test-retest correlations range from .78 to .93 with a coefficient of .84 for the entire sample (average duration between first and second testing was 20 days). Standard gain scores have been found to range from 2.12 to 4.65, with an average standard score gain of 3.05 for the entire sample; the gain score is highest for the youngest students, possibly indicating a greater practice effect for young children. Inter-rater reliability has been shown to be robust, in that analysis showed 100 percent agreement between all scorers.

With respect to content validity, rigorous item analysis guided item selection. With respect to criterion-related validity, the mean of the corrected correlations between the ROWPVT and alternate tests of receptive vocabulary is .63. Correlations between the

ROWPVT and total scores from tests of broad language development (e.g., CELF-3, OWLS, PLS-3, TACL-R, TOLD-P:3) range from .62 to .84 with a median of .76. Correlation of raw scores to chronological age is .85 (uncorrected), indicating that older individuals, who would be expected to have more well-developed vocabularies, demonstrate greater proficiency on the ROWPVT. The corrected correlation with Reading achievement (as measured by WJ-R) is .84, while corrected correlations with Language achievement (CAT5, MAT7, SAT9) range from .55 to .74 with a median of .70. Moreover, performance on the ROWPVT has been shown to correlate with cognitive ability, as evidenced by the multiple correlation of .77 between the ROWPVT and 2 composite scores (Verbal and Nonverbal) of the *Otis-Lennon School Ability Test – Seventh Edition* (OLSAT-7; Otis & Lennon, 1995). As previously mentioned, correlation between the ROWPVT and the EOWPVT has been shown to be .75 (uncorrected), thereby indicating a strong relationship between performance on the two tests.

Attention measures.

1. Brown Attention-Deficit Disorder Scales for Children (Brown ADD Scales; Brown, 2001). The Brown ADD Scales for Children are utilized to quickly and comprehensively assess for ADD in children. The 40- to 50-item questionnaires are available in both parent and teacher forms, in a primary/preschool scale (ages 3–7) a school-age scale (ages 8–12), and an adolescent scale (ages 12-18). Forms generally take 10-20 minutes to complete. The Brown ADD Scales measure beyond hyperactivity to assess for less apparent impairments of executive functioning that impact academic, social, emotional and behavioral functioning. The scales address 6 clusters frequently associated with ADD: (1) *Activation:* Organizing, Prioritizing and Activating to Work; (2) *Attention:* Focusing,

Sustaining and Shifting Attention to Tasks; (3) *Effort:* Regulating Alertness, Sustaining Effort and Processing Speed; (4) *Emotion:* Managing Frustration and Modulating Emotions; (5) *Memory:* Utilizing Working Memory and Accessing Recall; (6) *Action:* Monitoring and Self-Regulating Action.

Individuals who meet DSM-IV criteria for ADHD usually have significant impairment in each of these clusters, compared to others of the same age. Those with Combined Type ADHD generally have difficulty in all 6 clusters, whereas Predominantly Inattentive Type involves impairments primarily in Clusters 1-5. Cluster Subtotal Scores are computed, at which point Clusters 1-5 are added together to yield an ADD Inattention Total Score; Cluster 6 (Action) is then added in to yield an ADD Combined Total Score. Raw scores are then converted to age-band appropriate T scores. Cluster scores and total scores indicate overall impairment from a broad range of ADD symptoms. *T* scores give an indication of how much impairment the examinee is showing on each of the clusters, relative to a normative population. Results indicate whether the individual appears to have ADD (via a clinically validated cut score) and whether a full evaluation for the disorder is warranted. T scores in the 45-54 range are considered to be in the average range (yet sometimes indicate significant concerns); T scores at or above 55 indicate the possibility of ADHD and beg a comprehensive evaluation for ADHD. T scores of 60 and above on both the ADD Inattention Total Score and the ADD Combined Total Score strongly suggest a diagnosis of ADHD, Combined Type, based on DSM-IV criteria; T scores of 60 and above on the ADD Inattention Total Score but below 60 on the ADD Combined Total Score strongly suggest a diagnosis of ADHD, Inattentive Type, based on DSM-IV criteria.

The norms for the Brown ADD Scales are based on a national standardization sample of 800 cases, representative of the 1999 U.S. population with respect to age, race/ethnicity, level of education, parent education level, and ADHD prevalence among school-age children. The linear T score transformation method was chosen to transform raw scores to standardized scores, to effect a normal distribution.

Alpha coefficients for Cluster Score ratings by teachers for children aged 3-7 years range from .80 to .93, with Total Score alpha coefficients ranging from .96 to .98. For children aged 8-12, alpha coefficients for Cluster Score ratings by teachers range from .76 to .94, with Total Score alpha coefficients ranging from .95 to .98. Corrected test-retest reliabilities (with a retest interval of 1-4 weeks) for Cluster Scores from teacher ratings of children aged 3-7 years range from .78 to .89; those from teacher ratings of children aged 8-12 years range from .84 to .91. Corrected correlations between parents and teachers for children aged 3-7 years ranges from .39 to .58 across clusters, and from .60 to .59 for Total Scores. Corrected correlations between parents and teachers for children aged 8-12 years ranges from .46 to .75 across clusters, and are .60 for Total Scores.

With respect to validity, the Brown ADD scales have very high levels of internal consistency, as measured by Cronbach's alpha and internal structure-based validity. Inter-correlations of Cluster Scores for teacher ratings range from .64 to .89 for children aged 3-7 years, and range from .72 to .90 for children aged 8-12. Furthermore, validity studies showed that teacher ratings on the Teacher Form for children aged 3-7 years differentiated the ADHD sample from the matched Control sample on all Cluster and both Total Scores at the $p < .005$ level. Effect sizes as demonstrated by Cohen's *d* were high across Cluster and

Total Scores. For the children aged 8-12 years, teacher ratings on the Teacher Form differentiated the ADHD sample from the Control sample on all Cluster and Total T Scores at the $p < .0001$ level; again, effect sizes were high across all Cluster and Total Scores.

The Brown ADD Total Scores have been shown to correlate with the *Child Behavior Checklist (CBCL)* at .54 to .63 for ages 4-7, and at .64 to .77 for ages 8-12. For younger children (aged 5-7 years), ratings on the Brown ADD Scales Teacher Form are moderately to highly correlated with ratings on the CBCL Teacher's Report form (TRF): Brown Cluster and Total Scores are highly correlated with the Attention Problems scale on the TRF (.48 to .94), and highly correlated with the Social Problems scale of the TRF (.61 to .87). For older children (aged 8-12), moderate to high correlations were also found for the Attention Problems scale of the TRF (.61 to .80). The Brown ADD Scales have also been shown to correlate moderately to highly with the *Behavior Assessment System for Children (BASC).* Total Scores for the Brown ADD Scales Teacher are highly correlated (.86 to .89) with the Attention Problems scale of the BASC Teacher Monitor Ratings (TMR) for children aged 4-7, and correlated at .76 to .88 for children aged 8-12. Finally, both the Inattention and Combined Total Scores on the Brown ADD Scales are highly correlated (.68 to .84 for aged 3-7 years and .71 to .86 for aged 8-12 years) with *the Conners' Parent Ratings Scales: Revised* ADHD index scores.

Emotional/Social measures.

1. Behavioral Assessment System for Children (BASC; Kamphaus & Reynolds, 1992). The BASC employs a comprehensive set of rating scales and forms to measure adaptive and maladaptive emotions and behaviors of children ages 2 years 6 months through

18 years. Available rating scales include the Teacher Rating Scales (TRS), Parent Rating Scales (PRS), Self-Report of Personality (SRP), Student Observation System (SOS), and Structured Developmental History (SDH); they may be utilized individually or in combination with one another, to provide a comprehensive understanding of the behaviors and emotions of children and adolescents. The Teacher Rating Scales (TRS) measure adaptive and problem behaviors in the preschool or school setting, and are available in 3 forms: preschool (ages 2:6-5), child (ages 6-11), and adolescent (ages 12-18). The forms describe specific behaviors that are rated on a 4-point scale of frequency, ranging from "Never" to "Almost Always." The TRS contains 109–148 items (depending on the child's age) and measures Adaptive Skills, Externalizing Problems, Internalizing Problems, and School Problems. These broader areas are comprised of a number of scales: Hyperactivity, Aggression, Conduct Problems, Anxiety, Depression, Somatization, Attention Problems, Learning Problems, Atypicality, Withdrawal, Adaptability, Social Skills, Leadership, and Study Skills. The TRS takes approximately 10-20 minutes to complete.

While highly useful in identifying maladaptive emotions and behaviors in children, the TRS alone is not intended to provide a comprehensive and exhaustive review of a child's overall emotional functioning. Rather, its scales provide a teacher's perspective on particular areas of a child's emotional functioning, observed within the classroom setting. As always, clinicians are advised against drawing firm conclusions based on data yielded from a single measure. The limited information yielded by the TRS, therefore, is useful not only in sampling a child's emotions and behaviors in the classroom, but also in guiding future investigations of such emotional and behavioral functioning.

The BASC is particularly suited to assessing children with LI, in that it corrects for scores that may be artificially depressed due to language-related difficulties. Specifically, the TRS of the BASC contains several language and learning items that appear on the Learning Problems and Study Skills scales, which are designed specifically to screen for problems in these areas. However, certain scales (Attention Problems, Withdrawal, Depression, and Social Skills) also contain items that could be considered language and/or learning items that could penalize children with LI. To correct for this, the BASC incorporates explicit procedures (on both TRS and PRS) to identify inordinately negative ratings: the "F index" measures a respondent's tendency to be excessively negative about the child's behaviors, many of which may be subtly LI-related (e.g., Never completes homework, Always refuses to join group activities, and Has no sense of humor). As such, this feature of the BASC is highly appropriate for the assessment of language-impaired children who, due to their limited verbal proficiency, are likely to receive pejorative judgements about their social competence from adults.

Subsequently, several of the BASC scales are of particular interest in assessing specific areas of emotional and social functioning of children with LI. As previously cited, children with LI have been shown to have increased rates of anxiety and withdrawn behavior (Baker & Cantwell, 1987a; Benaisch, Curtiss, & Tallal, 1993) and to exhibit higher rates of anxiety disorders in young adulthood (Beitchman et al., 2001) when compared with nonimpaired children. The Anxiety scale of the BASC measures a child's tendency to be nervous, fearful, or worried about real or imagined problems; children with an elevated Anxiety score may experience excessive worry (the central characteristic of anxiety disorders

(Strauss, 1990)), self deprecation ("I'm not very good at this"), nervousness, fears, and phobias. By itself, an elevated Anxiety score is not typically sufficient for supporting the diagnosis of an anxiety disorder, as such disorders are often accompanied by other symptoms (e.g., somatic complaints); moreover, it would be inappropriate to make diagnostic decisions on the basis of a singular scale of one particular measure. Nevertheless, an elevated Anxiety scale on the TRS may provide valuable insight regarding problematic levels of observed anxiety. Given the aforementioned somatic component to some anxiety disorders, a combination of elevated Anxiety and Somatization scales may provide an even more appropriate basis than the Anxiety score alone for discerning pathological levels of anxiety.

The Somatization scale of the BASC measures a child's tendency to be overly sensitive to and to complain about minor physical problems and discomforts. Typically, these complaints will have persisted for months or years, and most cannot be traced to poor physical health. Research shows considerable evidence of somaticizing tendencies among children: of the 10 to 15 percent of children who experience recurrent abdominal pain or other somatic symptoms, a medical condition can only be identified in 10 percent of these cases (Garber, Walker, & Zeman, 1991). It seems only logical, then to consider the fact that children with LI, who often suffer from increased levels of anxiety, may express their social/emotional discomfort through somatic complaints.

The Depression scale of the BASC measures a child's feelings of unhappiness, sadness, and stress that may result in an inability to carry out everyday activities (neourovegetative symptoms). The literature on the emotional functioning of children with LI makes little reference to depressive symptomatology. Nevertheless, depressive problems

have been shown to frequently occur with other disorders, including anxiety disorders (Semrud-Clikeman & Hynd, 1991), and thus warrant some consideration. Subsequently, collectively considering a child's anxiety, somatization, and depression symptoms provides a fuller picture of a child's emotional functioning than does examining the scales singularly. The Internalizing Problems composite of the BASC consists of the Anxiety, Depression, and Somatization scales, does just this and measures difficulties not marked by acting-out behavior. Children with internalizing problems typically do not disrupt others' activities, but instead monitor their own actions to excess. As such, their behaviors may not outwardly impair relationships with others, but may subtly impact their interpersonal interactions.

The Withdrawal scale measures a child's tendency to evade others to avoid social contact; items loading onto this scale involve avoiding others, refusing to join group activities, and refusing to talk. Withdrawal is also associated with being neglected or rejected by peers. This scale is therefore particularly useful in assessing language-impaired children's observed social withdrawal, as research has shown these children to participate in fewer peer interactions, to show reluctance to initiate and participate in conversations with peers, and to have difficulty gaining entry into peer activities (Craig & Washington, 1993). It is important to note that although withdrawal behavior may be a symptom of depression in some cases, the Withdrawal and Depression scales are quite distinct, as shown by their moderate intercorrelations. As such, children may be withdrawn without being depressed. This fact is consistent with the literature on the emotional functioning of children with LI, in that there is much evidence of withdrawn behavior but little evidence of depressive symptomatology.

The Aggression scale measures a child's tendency to act in a hostile manner that is verbally or physically threatening to others. The TRS and PRS Aggression scale assess both verbal aggression (e.g., arguing, name calling, criticizing, blaming, and verbally threatening others) and physical aggression (e.g., breaking others' possessions, hitting others, and being cruel to animals). The scale weights verbal aggression more heavily than it does physical aggression, however, as verbal aggression is more frequent (Kamphaus & Reynolds, 1992). Noteably, the Aggression scale tends to be elevated for children with disruptive behavior disorders (that is, ADHD, Conduct Disorder, and Oppositional Defiant Disorder).

Finally, the Social Skills scale of the BASC measures skills necessary for interacting successfully with peers and adults in home, school, and community settings. The TRS and PRS Social Skills scale emphasizes the interpersonal aspects of social adaptation; examples of these behaviors include admitting mistakes, complimenting and encouraging others, offering assistance, beginning conversations appropriately, and saying "please" and "thank you." As such, this scale is useful in examining the social skills of children with LI, who have been shown to exhibit poorer social competence (Beitchman, Brownlie, & Wilson, 1996), insensitivity to social cues (Nabuzoka & Smith; 1995), and more significant social skill deficits as compared to their nonimpaired peers.

The BASC teacher and parent rating scales were normed on an ethnically, socioeconomically, and geographically diverse sample. In contrast to many other rating scales, children with special education classifications, including children with learning disabilities and speech/language disorders, are represented in the BASC standardization. Test-retest reliability coefficients for the TRS of the BASC range from poor to excellent (.59-

.96), with most correlations around the low nineties, and a scale mean of .85. Inter-rater reliabilities for the TRS are more modest and range from .29 to .89, with a mean of .46. Some of the lower inter-rater reliabilities reported were for the Internalizing behavior scales, namely the Depression scale (.53 for the Preschool Level; .44 for the Child Level) and the Somatization scale (.65 for the Preschool Level; .66 for the Child Level). Low inter-rater reliabilities were also reported at the Preschool Level for the Aggression scale (.38) and Withdrawal scale (.29). One might attribute the lower values on these particular scales (especially Depression, Somatization, and Withdrawal) to the inherent difficulty in assessing a child's internal experience from an outside perspective (vs. assessing internal experiences from self-report measures). Internal consistency coefficients, however, range from .80 to .90 across scales, and criterion validity has been found to be acceptable.

Procedure

Prior to entering into the EI Program, all participants completed the initial procedures for the primary study including an application to and interview with The Shelton School, written informed consent by parents and the children, and hearing/vision screening. The EI Study spans August 2004 to May 2006; the first school year of intervention (i.e., the year addressed in this study) ran from August 16, 2004 to May 19, 2005, and consisted of 178 school days.

Prior to their entry, participants were divided into 2 classrooms, Beginner and Intermediate, largely on the basis of age: children aged 3-5 (with the exception of two 5-year-olds) were placed in the Beginner classroom, while those aged 6 to 9 (plus the aforementioned higher functioning two 5-year-olds) were placed in the Intermediate

classroom. As such, eight children were placed in the Beginner class, and twelve in the Intermediate class. The classrooms are Montessori in nature, offering materials, instruction, and guidelines largely consistent with the Montessori teaching method, yet modified (as mentioned previously) for the At Risk child. Furthermore, the children are instructed in the Association Method, so as to explicitly address language impairment. Class hours are from 8:30 a.m. to 2:30 p.m., Mondays through Fridays.

Assessment.

Comprehensive assessments took place twice: Pre-testing took place in September and November of 2004, and Post-testing during May and July of 2005. Specifically, the EOWPVT, ROWPVT, and Brown ADD Scales were administered in September 2004, and the BASC was administered in November 2004; the Brown ADD Scales and the BASC were administered again in May 2005, and the CELF-4, CELF-PS:2, EOWPVT, and ROWPVT were administered again in July 2005. The 2-month span during which Pre-testing and Post-testing assessments took place, respectively, is a product of the time required to administer a larger evaluation at each time period. In other words, the language, attentional, and emotional/social measures used for this investigation comprise a portion of a larger evaluation administered (for the purposes of the EI Study) that includes 26 measures in all (e.g., measures of motor skills, academic achievement, visual-spatial skills, etc.).

Participants' language evaluations were performed by 1 of 3 individuals, all of whom have a Masters in Speech-Language Pathology (MS CCC/SLP). The Beginner teacher, Intermediate teacher, and the children's parents completed the BASC and the Brown ADD Scales (Teacher and Parent Forms, respectively). During Pre-testing, participants were

excused from their classrooms one by one and evaluated. During Post-testing, participants attending EI Summer School were similarly excused from their classrooms, while participants not attending summer school were scheduled to come in for testing at a designated time/day. Evaluators spent approximately 1 to 3 hours with each participant, offering frequent breaks to the participants and instructing them to ask for breaks if needed. In the event that the participant exhibited emotional or behavioral distress that threatened test reliability/validity, the evaluator stopped the evaluation as needed, returned the participant to his/her classroom, and resumed testing on another day. Teachers and parents were provided the age-appropriate forms of the BASC and Brown ADD Scales for each child at the start of each testing period, and were asked to complete and return the forms within a 2-week time period.

Statistical Analyses

Raw data were cleaned and double entered into an SPSS 13.0 database and were checked for homogeneity during analyses and for potential outliers. Means and standard errors, or frequencies, were computed for all variables, along with confidence intervals. Distribution characteristics of all variables were examined, with suitable transformations as needed to meet the assumptions of equal variance. Preliminary analyses tested for any effects of gender, age, and IQ to determine whether these should be accounted for as covariates in the following analyses.

Initially proposed statistical analyses.

A number of the initially proposed statistical analyses were found, upon examination of the data, to be inappropriate due to small cell sizes. Consequently, these

analyses were replaced with frequency analyses and nonparametric analyses. The majority of the analyses (both the proposed analyses and those that replaced the proposed analyses) utilized participants' Reliable Change scores (RC scores), which were calculated utilizing the Reliable Change Index (RCI; Jacobson & Truax, 1991). Before reviewing the initially proposed analyses, a discussion of the RCI is warranted, as RC scores formed the basis of most analyses addressed in this study.

The RCI was selected as a means by which to measure participants' change from Pre-testing to Post-testing, given the lack of a comparative control group. As outlined by Jacobson and Truax (1991), the RCI establishes significance of any change on the difference between initial and retest scores for the normative subject sample (i.e., using the normative data listed in the measure's manual). A participant's RC score, or change score, represents meaningful change (from Pre-testing to Post-testing) if it falls outside the standard deviation of the test-retest difference in the norming sample, multiplied by the *z*-score cutoff point that defines a specified percentile of the normal distribution. For example, using a z-score cutoff point of $\pm$ 1.645, the resulting prediction or confidence interval includes 90% of normative sample individuals. This particular cutoff was chosen after a z-score cutoff point of $\pm$ 1.96, with a 95% confidence interval, proved too rigid a criteria (i.e., very few participants' RC scores exceeded $\pm$ 1.96). The equation used to calculate each participant's RC score is shown in Figure 1. RC scores thus enable one to examine a participant's change in scores over the course of a year (while accounting for test-retest effects), despite the inability of comparing his/her changes to those changes seen within a control group. RC scores meeting or exceeding $\pm$ 1.645 are considered to represent change *beyond* that which would be

expected from Pre- to Post-testing, and change that is unlikely due to random variance.

RC scores were calculated with each participant's scores on the CELF-4, CELF-PS:2, EOWPVT, ROWPVT, and on all BASC scales. Participants were then categorized based on their RC scores on each measure. Specifically, on language/vocabulary measures (e.g., CELF-4, CELF-PS:2, EOWPVT, and ROWPVT), participants whose RC scores equaled 1.645 or greater were labeled "Responders," in that their change scores were large enough to suggest improvement (or, a desirable response) on the given measure, versus random variability in scores. (As outlined above, the RCI accounts for this dichotomy by incorporating into the RC score the test-retest reliability coefficient and standard deviation of the given measure). Participants whose language/vocabulary RC scores fell between -1.645 and 1.645 were labeled "Non-Responders"; their change scores signified neither improvement nor deterioration on the given measure. Finally, although not initially anticipated, a third category was created to describe participants whose language/vocabulary RC scores fell at or below -1.645; these participants were labeled "Opposites," in that their change scores indicated a deterioration in skill (or, a response *opposite* to that which was desired) that was unlikely due to random variation in scores. Hence, with respect to the EOWPVT, for example, participants were labeled EOWPVT Responders (if their scores improved), EOWPVT Non-Responders (if their scores neither improved nor deteriorated), or EOWPVT Opposites (if their scores deteriorated).

With respect to the emotional/social scales on the BASC, the categories of Responder, Non-Responder, and Opposite were maintained, but the valence of the RC scores was reversed. In other words, higher scores on the BASC Anxiety scale indicate increasingly

high levels of anxiety (vs. higher scores on the EOWPVT indicating an improvement in expressive vocabulary skills). Specifically, if a participant's BASC Anxiety RC score met or exceeded 1.645, this signified a meaningful increase in his/her anxiety (vs. a meaningful/desirable increase in language/vocabulary skills, as discussed above). Because such a response was opposite of that which was desired, these participants were labeled "Anxiety Opposites" (or "Opposites," in general). Alternately, participants whose BASC RC scores fell at or below -1.645 were labeled "Responders," in that their change score indicated a *desirable response* (or, reduction) in emotional/social problems (whether it be in anxiety, depression, withdrawal, aggression, etc.). Finally, participants whose BASC RC scores fell between -1.645 and 1.645 were labeled "Non-Responders," in that their change scores indicated neither an increase nor decrease in emotional/social problems.

The one exception to the above described cut-scores for the BASC is for the Social Skills scale, wherein the valence is reversed once again (i.e., resembling the valence of the aforementioned language/vocabulary measures). The Social Skills scale is the only Adaptive Scale (vs. Clinical Scale) examined in the context of this study. While lower scores are desirable on the Clinical Scales (thereby indicating fewer emotional/social difficulties), higher scores are desirable on the Adaptive Scales (indicating healthier, more adaptive behaviors). Thus, participants whose Social Skills RC scores met or exceeded 1.645 were considered "Social Skill Responders," in that their change scores indicated an improvement (or, desirable response) in social skills. Alternately, participants whose Social Skills RC scores fell at or below -1.645 were considered "Social Skill Opposites," as their change scores reflected deterioration in their adaptive social skills (or, a response *opposit*e to that

which was desired). Those whose RC scores fell between -1.645 and 1.645 were labeled "Social Skill Non-Responders."

The above discussion of RC scores imparts a fuller understanding in exploring the inappropriate nature of the initially proposed statistical analyses. The initially proposed analyses are listed below, followed by an explanation of the alternate analyses adopted to replace them. To determine the extent to which participants' language scores changed over time by attention group (Attention-Impaired vs. Normal Attention) repeated-measures ANOVAs were to be conducted with the CELF-4, CELF-PS:2, EOWPVT, and ROWPVT. However, very few participants were Responders on any of the language/vocabulary measures. As such, small Responder cell sizes on the CELF-4, CELF-PS:2, EOWPVT, and ROWPVT prohibited the above proposed ANOVAs. To determine the extent to which participants' social/emotional scores changed over time by language/vocabulary response group (Responders vs. Non-Responders, as Opposites were yet to be anticipated) repeated-measures ANOVAs were to be conducted with the BASC Scales. Again, small Responder cell sizes with respect to language/vocabulary measures prohibited these ANOVAs. Independent t-tests were proposed to determine whether the mean change scores (on language measures) were significantly larger for Normal Attention participants than for Attention-Impaired participants. Similarly, independent t-tests were to be conducted to determine whether mean change scores (on social/emotional measures) were significantly larger for Responders than for Non-Responders (on each of the language/vocabulary measures). Again, these analyses were deemed inappropriate due to small Responder cell sizes. For all comparisons, $p < .05$ was to be adopted as the criterion for establishing

statistical significance. Post-hoc multiple comparison tests were to be conducted to determine whether the differences are significant. The Bonferroni correction was to be used when appropriate, to prevent an increased likelihood of a Type 1 Statistical error.

Alternate statistical analyses.

Because small cell sizes prohibited the above proposed analyses, a number of alternate statistical analyses were conducted. To supplement the anticipated categories of Responder and Non-Responder, an Opposite category was created when it became evident that numerous participants exhibited deterioration in language/vocabulary skills and/or in social/emotional functioning. The proposed repeated-measures ANOVAs were replaced with nonparametric analyses and frequency analyses (utilizing RC scores). Specific analyses will be outlined below, organized by aim. Finally, given the small number of participants, all hypotheses were tested using a $p < .10$ level of significance.

Language hypotheses (Aim 1).

For hypotheses 1.a through 1.c, an analysis utilizing the RCI was conducted with language/vocabulary scores at Pre-testing and Post-testing. For each of the 3 language/vocabulary measures listed in hypotheses 1.a through 1.c, participants were termed Responders, Non-Responders, or Opposites on the basis of their RCI scores (i.e., CELF-4 Responder, CELF-4 Non-Responder, or CELF-4 Opposite; EOWPVT Responder, EOWPVT Non-Responder, or EOWPVT Opposite; etc.). Subsequently, for hypotheses 1.a. through 1.c., frequency analyses were conducted with the Responders in each category, to identify any potential covariates. Additionally, paired samples t-tests were conducted to determine whether the group's scores on the CELF-PS:2, CELF-4, EOWPVT, or ROWPVT changed

significantly from Pre-testing to Post-testing. Detailed descriptions of these analyses and their results are discussed in Chapter III (Results), following the Language Hypotheses.

1. a. Participants' scores on the CELF-4 or CELF-PS:2 Core Language Composite will increase significantly from Pre-testing to Post-testing, thereby signaling an improvement in overall language skills.

1. b. Participants' scores on the Expressive One-Word Picture Vocabulary Test (EOWPVT) will increase significantly from Pre-testing to Post-testing (according to the RCI), thereby signaling an improvement in expressive vocabulary skills.

1. c. Participants' scores on the Receptive One-Word Picture Vocabulary Test (ROWPVT) will increase significantly from Pre-testing to Post-testing (according to the RCI), thereby signaling an improvement in receptive vocabulary skills.

Attention hypothesis (Aim 2).

2. Presence of attentional deficits at Pre-testing, as measured by the Inattention Total Score on the Teacher Form of the Brown ADD Scales, will associate significantly and inversely with improvement on language/vocabulary measures at Post-testing.

To test this hypothesis, frequency analyses (utilizing RC scores) were conducted to determine whether language/vocabulary response patterns (on the CELF-4, CELF-PS:2, EOWPVT, and ROWPVT) differed by attention group (Normal Attention vs. Impaired Attention).

Emotional/Social hypotheses (Aim 3).

For hypotheses 3.a. through 3.g, RC scores were calculated for each participant on each BASC scale, to determine whether subjects exhibited change in emotional/social

functioning. Participants were subsequently labeled Responders, Non-Responders, or Opposites with respect to each scale. Frequency analyses were then conducted in any cases wherein the Responder or Opposite groups contained at least one third of the total number of participants. Upon completing the frequency analyses, variables that appeared to be potential covariates (and met certain decision rules, to be described later in the text) were explored using chi-square analyses. Finally, paired samples t-tests were conducted to determine whether the group's scores on the BASC scales changed significantly from Pre-testing to Post-testing. All of these alternate analyses are discussed in detail in Chapter VIII (Results), following the Emotional/Social Hypotheses.

3. a. Response to early intervention, as defined by Responder vs. Non-Responder status on the CELF-4/CELF-PS:2, EOWPVT, and ROWPVT, will associate significantly with improvement in [teacher report of] emotional functioning at Post-testing, as measured by the Internalizing Problems composite of the BASC Teacher Rating Scale.

3. b. Response to early intervention, as defined by Responder vs. Non-Responder status on the CELF-4/CELF-PS:2, EOWPVT, and ROWPVT, will associate significantly with improvement in [teacher report of] emotional functioning at Post-testing, as measured by the Anxiety scale of the BASC Teacher Rating Scale.

3. c. Response to early intervention, as defined by Responder vs. Non-Responder status on the CELF-4/CELF-PS:2, EOWPVT, and ROWPVT, will associate significantly with improvement in [teacher report of] emotional functioning at Post-testing, as measured by the Somatization scale of the BASC Teacher Rating Scale.

3. d. Response to early intervention, as defined by Responder vs. Non-Responder status on the CELF-4/CELF-PS:2, EOWPVT, and ROWPVT, will associate significantly with improvement in [teacher report of] emotional functioning at Post-testing, as measured by the Depression scale of the BASC Teacher Rating Scale.

3. e. Response to early intervention, as defined by Responder vs. Non-Responder status on the CELF-4/CELF-PS:2, EOWPVT, and ROWPVT, will associate significantly with improvement in [teacher report of] emotional/social functioning at Post-testing, as measured by the Withdrawal scale of the BASC Teacher Rating Scale.

3. f. Response to early intervention, as defined by Responder vs. Non-Responder status on the CELF-4/CELF-PS:2, EOWPVT, and ROWPVT, will associate significantly with degree of improvement in [teacher report of] social functioning at Post-testing, as measured by the Aggression scale of the BASC Teacher Rating Scale.

3. g. Response to early intervention, as defined by Responder vs. Non-Responder status on the CELF-4/CELF-PS:2, EOWPVT, and ROWPVT, will associate significantly with improvement in [teacher report of] social functioning at Post-testing, as measured by the Social Skills scale of the BASC Teacher Rating Scale.

CHAPTER VIII

RESULTS

Analysis of the Data

Twenty participants enrolled in The Shelton School's Early Intervention Program were examined in the course of this study. The demographic profiles of the participants are summarized below in Table 2.

Table 2
Demographic Profile of 20 Participants

	Frequency	Descriptive Statistics
Gender		
Male	12 (60) [a]	M (age) = 5.60, SD (age) = 1.37
Female	8 (40)	M (age) = 7.19, SD (age) =1.43
Total	20 (100)	M (age) = 6.25, SD (age) = 1.57
Ethnicity		
Caucasian	15 (75)	---
African American	1 (5)	---
Other	4 (20)	---
Age at Pre-test		
3	1 (5)	---
4	4 (20)	---
5	5 (25)	---
6	2 (10)	---
7	5 (25)	---
8	2 (10)	---
9	1 (5)	---

[a] The first value in the column represents the number of participants; the second value, in parentheses, represents the corresponding percentage.

Ages at Pre-testing ranged from 3 years 8 months to 9 years 3 months. On average, the female participants were somewhat older than the males. Descriptive analyses for

participants' age at Pre-testing and baseline IQ (as measured by the Leiter-R Brief IQ) are outlined on the following page, in Table 3. It should be noted that the Leiter-R Brief IQ was used to *estimate* baseline IQ, and was selected for its ability to capture nonverbal IQ on children as young as 2 years of age.

Table 3
Descriptive Analyses of the 20 Participants' Age and IQ at Pre-testing

	Descriptive	Statistic	Std. Error
Age, in months	Mean	74.85	4.213
	Median	71.00	---
	Variance	354.976	---
	Std. Deviation	18.841	---
	Minimum	44	---
	Maximum	111	---
	Range	67	---
	Skewness	.170	.512
	Kurtosis	-.822	.992
Leiter-R Brief IQ	Mean	84.15	3.823
	Median	83.00	---
	Variance	292.239	---
	Std. Deviation	17.095	---
	Minimum	48	---
	Maximum	115	---
	Range	67	---
	Skewness	-.123	.512
	Kurtosis	-.366	.992

Table 4 (on the following page) outlines participants' baseline attention (as measured by the Inattention Total Score on the Teacher Form of the Brown ADD Scales), as well as participants' medication status (i.e., whether participants were on medication to address inattention/hyperactivity/impulsivity at any point during testing).

Table 4
Participants' Attention at Baseline and Medication Status (during 1 year of intervention)

	Frequency
Attention	
Normal	9 (45) [a]
Impaired	11 (55)
Medication Status[b]	
No medication	12 (60)
On medication	8 (40)

[a] The first value in the column represents the number of participants; the second value, in parentheses, represents the corresponding percentage.
[b] "No Medication" refers to participants who did not take any medications to address inattention/hyperactivity/impulsivity at any point during the intervention year; "On Medication" refers to participants who took medication to address the aforementioned behavioral issues at *any* point during the intervention year.

Of the 8 participants taking medications to address inattention/hyperactivity/impulsivity, four had received an ADHD diagnosis [prior to their entry to the EI Program] from a pediatrician, clinical psychologist, or psychiatrist. The remaining four participants did not have a formal diagnosis. The 8 participants on medication were taking one or a combination of the following medications: Straterra, Concerta, Adderall, Ritalin, or Focalin. Additionally, 3 of these 8 participants were also taking an antidepressant (Lexapro, Prozac, or Remeron). These characteristics are depicted in Figure 2.

Two participants were excluded from the analyses of social/emotional functioning (as measured by the BASC) on the basis of the administration dates of their Pre-testing BASC Teacher Rating Scales. Specifically, their Pre-testing BASCs were administered during the prior school year and thus could not be assumed to be reliable in their description of participants' functioning at the time of Pre-testing. Both excluded participants were male, Caucasian, of below average IQ, and with normal attention at baseline.

Hypotheses

Calculation of Reliable Change Scores

Reliable change scores were calculated using the test-retest reliability coefficients and standard deviation values below listed below in Table 5.

Table 5
Test-Retest Reliability Coefficients and SD Values used to Calculate Reliable Change Scores

	Test-Retest Reliability	Standard Deviation
CELF-4/CELF-PS:2 Core Language Score	.91	13.6
EOWPVT	.90	15.72
ROWPVT	.84	13.97
Brown ADD Scales Inattention Total Score[a] (Teacher Form)	.91	10.15
BASC[b]		
Internalizing Problems	.86	10.05
Anxiety	.89	8.75
Somatization	.71	10.45
Depression	.84	11.25
Withdrawal	.83	12.35
Aggression	.92	11.35
Social Skills	.93	7.55
Attention	.89	9.65

Note. Unless otherwise specified, reliability coefficients and SD values are those provided in the measures' manuals and encompass all ages of participants.
[a] The reliability coefficient and SD value for the Brown ADD Scales represent a statistical average of values provided in the manual for the 2 Teacher Forms (ages 3-7; ages 8-12).
[b] The reliability coefficients and SD values for the BASC represent a statistical average of values provided in the manual for the Preschool (ages 2.5-5) and Child (ages 6-11) Forms.

Language Hypotheses (Aim 1)

Given small Responder cell sizes on language/vocabulary measures, frequency analyses and nonparametric analyses were conducted in place of the proposed repeated-

measures ANOVAS. Theses analyses will be reviewed in the sections following the below listed hypotheses. To test the language hypotheses, participants were categorized as Responders, Non-Responders, or Opposites according to their RC scores on each language/vocabulary measure. As outlined previously (in the *Statistical Analyses* section of Chapter VII: Methods), categories were defined by the *z*-score cutoff of $\pm$ 1.645, a value with a corresponding 90% confidence interval (Jacobson & Truax, 1991). Participants whose RC scores on language/vocabulary measures met or exceeded 1.645 were thereby labeled Responders; accordingly, these participants' change scores reflected improvement in language/vocabulary skills. Participants whose RC scores fell between -1.645 and 1.645 were labeled Non-Responders, in that their change scores reflected neither improvement nor deterioration in language/vocabulary skills. Finally, participants whose RC scores fell at or below -1.645 were labeled Opposites, as their change scores reflected deterioration in language/vocabulary skills (or, a change *opposite* of that desired).

Findings related to the Language Hypotheses are summarized on the following page, in Table 6.

Table 6
Response Patterns for Participants Taking the CELF-4, CELF-PS:2, EOWPVT, and ROWPVT

	Responder	Non-Responder	Opposite
CELF-4 [15][a]	4 (.27) [b]	11 (.73)	---
CELF-PS:2 [11]	2 (.27)	8 (.73)	---
EOWPVT [20]	4 (.20)	16 (.80)	---
ROWPVT [20]	2 (.10)	16 (.80)	2 (.10)

Note. Responder, Non-Responder, and Opposite categories were calculated utilizing the Reliable Change Index (RCI) from "Clinical Significance: A Statistical Approach to Defining Meaningful Change in Psychotherapy Research," by N. Jacobson and P. Truax, 1991, *Journal of Consulting and Clinical Psychology, 59,* p. 12-19. A z-score cutoff of $\pm$ 1.645 was utilized, as the resulting confidence interval includes 90% of normative sample individuals. Participants whose Reliable Change scores (RC scores) met or exceeded 1.645 were labeled Responders, in that their scores indicated improvement in language/vocabulary skills. Participants whose RC scores fell between -1.645 and 1.645 were labeled Non-Responders, in that their scores reflected neither improvement nor deterioration in language/vocabulary skills. Participants whose RC scores fell at or below -1.645 were labeled Opposites, as their change scores indicated deterioration in language/vocabulary skills.

[a] Values enclosed in brackets represent the number of participants who took the designated measure.

[b] The first value in any column represents the number of participants; the second value, in parentheses, represents the corresponding percentage.

1. a. Participants' scores on the CELF-4 or CELF-PS:2 Core Language Composite will increase significantly from Pre-testing to Post-testing, thereby signaling an improvement in overall language skills.

Note: Participants' scores on the CELF-4 (n=15) were analyzed separately from participants' scores on the CELF-PS:2 (n=11). Six participants took both the CELF-4 and the CELF-PS:2, as their ages were appropriate for both tests.

Of the 15 participants who took the CELF-4, 27% (n=4) of the participants exhibited RC scores representing improvement in language scores and were thus labeled CELF-4 Responders. The remaining 73% (n=11) were Non-Responders, in that they showed neither improvement nor deterioration in their scores from Pre-testing to Post-testing. Of the 11 participants who took the CELF-PS:2, 27% (n=3) exhibited improvement and were labeled

CELF-PS:2 Responders. The remaining 73% (n=8) were Non-Responders. Two of the four CELF-4 Responders also took the CELF-PS:2. Both of these participants, however, were CELF-PS:2 Non-Responders. Utilizing the above analyses, it appears that hypothesis 1.a. is only partially supported, in that only a small percentage (27%) of participants taking the CELF-4 and CELF-PS:2 showed improvement in their overall language scores.

1. b. Participants' scores on the Expressive One-Word Picture Vocabulary Test (EOWPVT) will increase significantly from Pre-testing to Post-testing (according to the RCI), thereby signaling an improvement in expressive vocabulary skills.

Twenty percent (n=4) of the 20 participants exhibited improvement in expressive vocabulary scores; these participants were labeled EOWPVT Responders. The remaining 80% (n=16), exhibited neither improvement nor deterioration in their scores from Pre-testing to Post-testing and thus were labeled EOWPVT Non-Responders. Hypothesis 1.b. is only marginally supported, in that only 20% of participants showed a significant increase in their expressive vocabulary scores.

1. c. Participants' scores on the Receptive One-Word Picture Vocabulary Test (ROWPVT) will increase significantly from Pre-testing to Post-testing (according to the RCI), thereby signaling an improvement in receptive vocabulary skills.

Ten percent (n=2) of the 20 participants exhibited improvement in receptive vocabulary scores; these participants were labeled ROWPVT Responders. Eighty percent (n=16) showed neither improvement nor deterioration in their scores and thus were labeled ROWPVT Non-Responders. The remaining 10% (n=2) exhibited RC scores *below* -1.645, thereby exhibiting deterioration, or, change in the *opposite* direction. Consequently, these

participants were labeled ROWPVT Opposites. Using the above analyses, it appears that hypothesis 1.c. was not supported, in that only 10% of participants showed improvement in receptive vocabulary skills.

Frequency analyses and Chi-square analyses for language hypotheses.

Frequency analyses were conducted separately with the 4 CELF-4 Responders, the 2 CELF-PS:2 Responders, the 4 EOWPVT Responders, and the 2 ROWPVT Responders, to determine whether any of the following were potential covariates: attention at baseline (as measured by the Inattention Total Score on the Teacher Form of the Brown ADD Scales), medication use, gender, age, IQ, performance (as measured by RC scores) on other language/vocabulary measures, or significant change (as measured by RC scores) in any of the BASC scales considered in this study. Decision rules were established to minimize the likelihood of making Type 1 Statistical errors. Specifically, a variable was considered a potential covariate if it met the following 2 criteria: (1) the variable was present in 67% or more of the Responder sample, and (2) the frequency with which it appeared exceeded the frequency with which it appeared in the entire sample (of 20 participants) by at least 20 percentage points. For Responder groups of 4 or more participants (e.g, CELF-4 Responders and EOWPVT Responders), variables meeting both of these criteria were subsequently subjected to chi-square analyses to determine whether their observed frequency within the Responder group was significantly larger than the expected frequency within that particular Responder group. (Expected frequencies were derived from the frequencies observed in the entire sample of 20 participants.) Potential covariates (i.e., only those meeting the above decision criteria) on the CELF-4 and EOWPVT are outlined in Table 7.

Table 7
Frequency Analyses for the 4 CELF-4 Responders and 4 EOWPVT Responders

Potential Covariate for the 4 CELF-4 Responders			
	Frequency	Descriptor	
Attention at baseline	3 (.75) [a]	Impaired Attention	
	Responder	Non-Responder	Opposite
CELF-PS:2 performance [b]	---	2 (1.00)	---
BASC Responses [c]			
Depression	---	1 (.33)	2 (.67)

Potential Covariate for the 4 EOWPVT Responders			
	Frequency	Descriptor	
Leiter IQ (baseline)	4 (1.00)	Average IQ (Avg=104)	
	Responder	Non-Responder	Opposite
BASC Responses			
Internalizing Problems	---	3 (.75)	1 (.25)
Depression	---	3 (.75)	1 (.25)

Note. Responder, Non-Responder, and Opposite categories were calculated utilizing the Reliable Change Index (RCI) from "Clinical Significance: A Statistical Approach to Defining Meaningful Change in Psychotherapy Research," by N. Jacobson and P. Truax, 1991, *Journal of Consulting and Clinical Psychology, 59,* p. 12-19. A z-score cutoff of $\pm$ 1.645 was utilized, as the resulting confidence interval includes 90% of normative sample individuals. Participants whose Reliable Change scores (RC scores) met or exceeded 1.645 were labeled Responders, in that their scores indicated improvement in language/vocabulary skills. Participants whose RC scores fell between -1.645 and 1.645 were labeled Non-Responders, in that their scores reflected neither improvement nor deterioration in language/vocabulary skills. Participants whose RC scores fell at or below -1.645 were labeled Opposites, as their change scores indicated deterioration in language/vocabulary skills.

[a] The first value in any column represents the number of participants; the second value, in parentheses, represents the corresponding percentage of participants.

[b] Only 2 of the 4 CELF-4 Responders were young enough to also take the CELF-PS:2.

[c] Only 3 of the 4 CELF-4 Responders had valid BASC Pre-testing administration dates.

With respect to the CELF-4 Responder group, chi-square analyses were conducted to determine whether attention at baseline appeared significantly discrepant from the entire sample. Results did not show it to be significant, X^2 (1, n=4) = .646, p = .421. Chi-squares could not be performed on either CELF-PS:2 performance or Depression, due to empty cells.

With respect to the EOWPVT Responder group, chi-square analyses did not show Internalizing problems to be discrepant, X^2 (1, n=4) = 1.560, p = .212. Additionally, Anxiety was shown to be unremarkable, X^2 (2, n=4) = 3.429, p = .180. Chi-square analyses could not be performed on either IQ or Depression, due to empty cells.

Because the CELF-PS:2 Responder and ROWPVT Responder groups were comprised of less than 4 participants (n = 3, n = 2, respectively), chi-square analyses were not calculated for potential covariates. Frequency analyses were conducted, however. With respect to the 3 CELF-PS:2 Responders, potential covariates meeting the above described decision criteria are outlined below, in Table 8.

Table 8
Frequency Analyses for the 3 CELF-PS:2 Responders

Potential Covariate			
	Frequency	Descriptor	
Gender	2 (.67) [a]	Female	
Leiter Brief IQ	2 (.67)	Average IQ (Avg=100)	
Medication status	3 (1.00)	No medications	
	Responder	Non-Responder	Opposite
CELF-4 performance [b]	---	2 (1.00)	---
BASC Responses			
Internalizing Problems	---	3 (1.00)	---
Anxiety	---	3 (1.00)	---
Social Skills	3 (1.00)		

Note. Responder, Non-Responder, and Opposite categories were calculated utilizing the Reliable Change Index (RCI) from "Clinical Significance: A Statistical Approach to Defining Meaningful Change in Psychotherapy Research," by N. Jacobson and P. Truax, 1991, *Journal of Consulting and Clinical Psychology, 59,* p. 12-19. A z-score cutoff of ± 1.645 was utilized, as the resulting confidence interval includes 90% of normative sample individuals. Participants whose Reliable Change scores (RC scores) met or exceeded 1.645 were labeled Responders, in that their scores indicated improvement in language/vocabulary skills. Participants whose RC scores fell between -1.645 and 1.645 were labeled Non-Responders, in that their scores reflected neither improvement nor deterioration in language/vocabulary skills. Participants whose RC scores fell at or below -1.645 were labeled Opposites, as their change scores indicated deterioration in language/vocabulary skills.

[a] The first value in any column represents the number of participants; the second value, in parentheses, represents the corresponding percentage of participants.

[b] Only 2 of the 3 CELF-PS:2 Responders were old enough to also take the CELF-4.

As shown in Table 8, 2 of the 3 CELF-PS:2 Responders were female and of average baseline IQ. None were on medications (at any point during the intervention year), and none showed any significant change in CELF-4 language scores, internalizing problems, or anxiety. All showed an improvement in social skills.

With respect to the 2 ROWPVT Responders, potential covariates are outlined below, in Table 9.

Table 9
Frequency Analyses for the 2 ROWPVT Responders

Potential Covariate			
	Frequency	Descriptor	
Gender	2 (1.00) [a]	Male	
Medication status	2 (1.00)	No medications	
	Responder	Non-Responder	Opposite
EOWPVT performance	---	2 (1.00)	---
BASC Responses			
Internalizing Problems	---	---	2 (1.00)
Anxiety	---	---	2 (1.00)
Withdrawal	---	2 (1.00)	---
Aggression			2 (1.00)
Social Skills	2 (1.00)	---	---

Note. Responder, Non-Responder, and Opposite categories were calculated utilizing the Reliable Change Index (RCI) from "Clinical Significance: A Statistical Approach to Defining Meaningful Change in Psychotherapy Research," by N. Jacobson and P. Truax, 1991, *Journal of Consulting and Clinical Psychology, 59,* p. 12-19. A z-score cutoff of $\pm$ 1.645 was utilized, as the resulting confidence interval includes 90% of normative sample individuals. Participants whose Reliable Change scores (RC scores) met or exceeded 1.645 were labeled Responders, in that their scores indicated improvement in language/vocabulary skills. Participants whose RC scores fell between -1.645 and 1.645 were labeled Non-Responders, in that their scores reflected neither improvement nor deterioration in language/vocabulary skills. Participants whose RC scores fell at or below -1.645 were labeled Opposites, as their change scores indicated deterioration in language/vocabulary skills.

[a] The first value in any column represents the number of participants; the second value, in parentheses, represents the corresponding percentage of participants.

As shown in Table 9, both ROWPVT Responders were male and not taking any medications. Both exhibited increases in internalizing problems, anxiety, and aggression. Both showed an improvement in social skills. Neither showed either improvement or deterioration in expressive vocabulary skills or withdrawal.

Paired-samples t-tests for language hypotheses.

In addition to the above frequency and chi-square analyses, paired-samples t-tests were conducted comparing CELF-4, CELF-PS:2, EOWPVT, and ROWPVT scores at Pre-testing and Post-testing. These results are summarized in Table 10, below.

Table 10
Differences from Pre-testing to Post-testing on Language/Vocabulary Measures

	Particpants' Mean ± SD	Statistics	Significance
CELF-4 CLS [15] [a]	5.133 ± 4.704	t(14) = 4.227	.001
CELF-PS:2 CLS [11]	3.909 ± 8.538	t(10) = 1.519	.160
EOWPVT [20]	5.000 + 7.196	t(19) = 3.107	.006
ROWPVT [20]	.650 ± 10.659	t(19) = .273	.788

[a] Values enclosed in brackets represent the number of participants who took the designated measure.

Paired samples t-tests with Pre-testing and Post-testing scores on the CELF-4 Core Language Score revealed a significant change, $t(15) = 4.227$, $p = .001$. No significant change was detected in the CELF-PS:2 scores, $t(11) = 1.519$, $p = .160$. Utilizing this analysis, hypothesis 1.a. was partially supported, in that overall improvement in language scores was seen on the CELF-4, but not on the CELF-PS:2.

Paired samples t-tests with Pre-testing and Post-testing scores on the EOWPVT revealed a significant difference between EOWPVT Pre-testing and Post-testing scores, $t(19) = 3.107$, $p = .006$. Using this analysis, hypothesis 1.b. was supported.

Finally, a paired samples t-tests with Pre-testing and Post-testing scores on the ROWPVT revealed no significant difference between ROWPVT Pre-testing and Post-testing scores, $t(19) = .273$, $p = .788$. Consequently, according to this analysis, hypothesis 1.c. was not supported.

Attention Hypothesis (Aim II)

2. Presence of attentional deficits at Pre-testing, as measured by the Inattention Total Score on the Teacher Form of the Brown ADD Scales, will be significantly and inversely associated with improvement on language/vocabulary measures at Post-testing.

Given small Responder cell sizes on language/vocabulary measures, frequency analyses were conducted in place of the proposed repeated-measures ANOVAS. First, for each category of Responders (CELF-PS:2, CELF-4, EOWPVT, and ROWPVT), frequencies of attention at baseline were examined. Table 11 (on the following page) organizes language/vocabulary Responders by attention group.

Table 11
Attention at Baseline of CELF-4, CELF-PS:2, EOWPVT, and ROWPVT Responders

	Normal Attention	Impaired Attention
CELF-4 Responders [4] [a]	1 (.25) [b]	3 (.75)
CELF-PS:2 Responders [3]	1 (.33)	2 (.67)
EOWPVT Responders [4]	2 (.50)	2 (.50)
ROWPVT Responders [2]	1 (.50)	1 (.50)

Note. Attention was defined by a participant's Inattention Total Score on the Teacher Form of the Brown ADD Scales (Brown, 2001); participants with T-scores of 60 or higher were determined to have Impaired Attention, while those with T-scores less than 60 were determined to have Normal Attention. The Responder category (with respect to language/vocabulary measures) was created utilizing the Reliable Change Index (RCI) from "Clinical Significance: A Statistical Approach to Defining Meaningful Change in Psychotherapy Research," by N. Jacobson and P. Truax, 1991, *Journal of Consulting and Clinical Psychology, 59,* p. 12-19. A z-score cutoff of + 1.645 was utilized, as the resulting confidence interval includes 90% of normative sample individuals. Participants whose Reliable Change scores (RC scores) met or exceeded 1.645 were labeled Responders, in that their scores indicated improvement in language/vocabulary skills.
[a] Values enclosed in brackets represent the number of Responders for the designated measure. The first value in any column represents the number of participants; the second value, in parentheses, represents the corresponding percentage.
[b] The first value in any column represents the number of participants; the second value, in parentheses, represents the corresponding percentage of participants.

As shown, 50% or more of each Responder group had Impaired Attention at baseline. Utilizing this analysis, Hypothesis 2 was not supported, as attentional deficits at Pre-testing do not appear to be associated inversely with improvement in language/vocabulary at Post-testing. This important finding will be discussed further in Chapter IX (Discussion).

Next, frequency analyses were conducted with all CELF-4, CELF-PS:2, EOWPVT, and ROWPVT responses (e.g., Responder, Non-Responder, and Opposite), as organized by the Normal Attention and Impaired Attention groups, to determine whether baseline attention appeared to associate with response on language/vocabulary measures. These findings are outlined on the following page, in Table 12.

Table 12
Response Patterns on the CELF-4, CELF-PS:2, EOWPVT, and ROWPVT, by Attention group

	Normal Attention		Impaired Attention		
	Responder	Non-Resp	Responder	Non-Resp	Opposite
CELF-4 [15] [a]	1 (.17) [b]	5 (.83)	3 (.33)	6 (.67)	---
CELF-PS:2 [11]	1 (.20)	4 (.80)	2 (.33)	4 (.67)	---
EOWPVT [20]	2 (.22)	7 (.78)	2 (.18)	9 (.82)	---
ROWPVT [20]	1 (.11)	8 (.89)	1 (.09)	8 (.73)	2 (.18)

Note. Attention was defined by a participant's Inattention Total Score on the Teacher Form of the Brown ADD Scales (Brown, 2001); participants with T-scores of 60 or higher were determined to have Impaired Attention, while those with T-scores less than 60 were determined to have Normal Attention. Responder, Non-Responder, and Opposite categories were calculated utilizing the Reliable Change Index (RCI) from "Clinical Significance: A Statistical Approach to Defining Meaningful Change in Psychotherapy Research," by N. Jacobson and P. Truax, 1991, *Journal of Consulting and Clinical Psychology, 59,* p. 12-19. A z-score cutoff of $\pm$ 1.645 was utilized, as the resulting confidence interval includes 90% of normative sample individuals. Participants whose Reliable Change scores (RC scores) met or exceeded 1.645 were labeled Responders, in that their scores indicated improvement in language/vocabulary skills. Participants whose RC scores fell between -1.645 and 1.645 were labeled Non-Responders, in that their scores reflected neither improvement nor deterioration in language/vocabulary skills. Participants whose RC scores fell at or below -1.645 were labeled Opposites, as their change scores indicated deterioration in language/vocabulary skills.

[a] Values enclosed in brackets represent the number of Responders for the designated measure. The first value in any column represents the number of participants; the second value, in parentheses, represents the corresponding percentage.

[b] The first value in any column represents the number of participants; the second value, in parentheses, represents the corresponding percentage of participants.

As shown, a larger percentage (33%) of Impaired-Attention participants showed an increase in CELF-4 scores, as compared with the percentage of Normal Attention participants who showed an increase (17%). Similarly, a slightly larger percentage (33%) of Impaired Attention participants showed an increase in CELF-PS:2 scores, as compared with the percentage of Normal Attention participants who showed an increase (20%). Attention at baseline did not appear to be associated with Response patterns on the EOWPVT (22% Normal Attention vs. 18% Impaired Attention) or on the ROWPVT (11% Normal Attention vs. 9% Impaired Attention). Utilizing these analyses, attention at baseline does not appear to be associated significantly with improvement on language/vocabulary measures. Again,

these findings will be discussed further in the *Discussion* section of this paper. It may be noteworthy, however, that the only two participants who showed significant decreases in their receptive vocabulary skills had Impaired Attention at baseline.

Emotional/Social Hypotheses (Aim 3)

Due to small Responder cell sizes, frequency analyses utilizing RC scores and nonparametric analyses were conducted in place of the proposed repeated-measures ANOVAs. For hypotheses 3.a. through 3.g, RC scores were calculated for each participant on all 7 scales, to determine whether participants' emotional/social functioning improved or deteriorated. (Recall that 2 of the participants' BASCs were excluded from these analyses, due to the fact that their administration dates occurred during the previous school year.) As outlined previously (in the *Statistical Analyses* section of Chapter VII: Methods), categories were defined by the *z*-score cutoff of $\pm$ 1.645, with a corresponding 90% confidence interval (Jacobson & Truax, 1991). Participants whose RC scores on social/emotional measures fell at or below -1.645 were labeled Responders, as these participants' change scores reflected a reduction in emotional/social difficulties (e.g., anxiety, withdrawal, etc.), or, an improvement in emotional/social functioning. (Recall that lower scores on the BASC Clinical Scales indicate fewer emotional/social difficulties.) Participants whose RC scores fell between -1.645 and 1.645 were labeled Non-Responders, in that their change scores reflected neither improvement nor deterioration in emotional/social functioning. Finally, participants whose RC scores met or exceeded 1.645 were labeled Opposites, as their change scores reflected an outcome opposite of that which was desirable: in other words, their scores reflected an increase in emotional/social difficulties. Recall that the one exception to these categories is

the Social Skills scale of the BASC, wherein the valence is reversed (i.e., RC scores of 1.645+ signify an improvement in social skills, while scores at or below -1.645 signify a decline in social skills). Participants were labeled Responders, Non-Responders, or Opposites with respect to each scale.

To review, frequency analyses were conducted in any cases wherein the Responder or Opposite groups contained at least one third of the total number of participants. Upon completing the frequency analyses, variables that appeared to be potential covariates were explored using chi-square analyses. Decision rules (reviewed again below) were adopted with respect to defining potential covariates, so as to minimize the likelihood of committing a Type 1 Statistical error. Finally, paired samples t-tests were conducted to determine whether the group's scores on the BASC scales changed significantly from Pre-testing to Post-testing. All of these alternate, or secondary, analyses are discussed in separate sections following the hypotheses.

3. a. Response to early intervention, as defined by Responder vs. Non-Responder status on the CELF-4/CELF-PS:2, EOWPVT, and ROWPVT, will associate significantly with improvement in [teacher report of] emotional functioning at Post-testing, as measured by the Internalizing Problems composite of the BASC Teacher Rating Scale.

3. b. Response to early intervention, as defined by Responder vs. Non-Responder status on the CELF-4/CELF-PS:2, EOWPVT, and ROWPVT, will associate significantly with improvement in [teacher report of] emotional functioning at Post-testing, as measured by the Anxiety scale of the BASC Teacher Rating Scale.

3. c. Response to early intervention, as defined by Responder vs. Non-Responder status on the CELF-4/CELF-PS:2, EOWPVT, and ROWPVT, will associate significantly with improvement in [teacher report of] emotional functioning at Post-testing, as measured by the Somatization scale of the BASC Teacher Rating Scale.

3. d. Response to early intervention, as defined by Responder vs. Non-Responder status on the CELF-4/CELF-PS:2, EOWPVT, and ROWPVT, will associate significantly with improvement in [teacher report of] emotional functioning at Post-testing, as measured by the Depression scale of the BASC Teacher Rating Scale.

3.e. Response to early intervention, as defined by Responder vs. Non-Responder status on the CELF-4/CELF-PS:2, EOWPVT, and ROWPVT, will associate significantly with improvement in [teacher report of] emotional/social functioning at Post-testing, as measured by the Withdrawal scale of the BASC Teacher Rating Scale.

3. f. Response to early intervention, as defined by Responder vs. Non-Responder status on the CELF-4/CELF-PS:2, EOWPVT, and ROWPVT, will associate significantly with degree of improvement in [teacher report of] social functioning at Post-testing, as measured by the Aggression scale of the BASC Teacher Rating Scale.

3. g. Response to early intervention, as defined by Responder vs. Non-Responder status on the CELF-4/CELF-PS:2, EOWPVT, and ROWPVT, will associate significantly with improvement in [teacher report of] social functioning at Post-testing, as measured by the Social Skills scale of the BASC Teacher Rating Scale.

RC Analyses for emotional/social hypotheses.

Response patterns (as defined by RC scores) for all BASC scales are outlined below, in Table 13.

Table 13
Response Patterns for the 18 Participants Taking the BASC

	Responder	Non-Responder	Opposite
Internalizing Problems	---	8 (.44) [a]	10 (.56)
Anxiety	3 (.17)	2 (.22)	11 (.61)
Somatization	---	15 (.83)	3 (.17)
Depression	1 (.06)	9 (.50)	8 (.44)
Withdrawal	---	12 (.67)	6 (.33)
Aggression	1 (.06)	8 (.44)	9 (.50)
Social Skills	10 (.56)	4 (.22)	4 (.22)

Note. Responder, Non-Responder, and Opposite categories were calculated utilizing the Reliable Change Index (RCI) from "Clinical Significance: A Statistical Approach to Defining Meaningful Change in Psychotherapy Research," by N. Jacobson and P. Truax, 1991, *Journal of Consulting and Clinical Psychology, 59,* p. 12-19. A z-score cutoff of $\pm$ 1.645 was utilized, as the resulting confidence interval includes 90% of normative sample individuals. Participants whose Reliable Change scores (RC scores) met or exceeded 1.645 were labeled Responders, in that their scores indicated improvement in language/vocabulary skills. Participants whose RC scores fell between -1.645 and 1.645 were labeled Non-Responders, in that their scores reflected neither improvement nor deterioration in language/vocabulary skills. Participants whose RC scores fell at or below -1.645 were labeled Opposites, as their change scores indicated deterioration in language/vocabulary skills.

[a] The first value in any column represents the number of participants; the second value, in parentheses, represents the corresponding percentage of participants.

As shown, over half of the participants exhibited an improvement in social skills. Additionally, however, a noteworthy percentage of participants exhibited an increase in internalizing problems, anxiety, depression, withdrawal, and aggression.

Frequency analyses (Part I) for emotional/social hypotheses.

Frequency analyses for all seven BASC scales were performed from two different perspectives. First, to determine whether improvement on language/vocabulary measures

was associated with improvement in emotional/social functioning, frequency analyses were performed with the BASC response patterns of the CELF, EOWPVT, and ROWPVT Responder groups. Second, frequency analyses were conducted in any case wherein the Responder or Opposite groups contained at least one third of the total number of participants. BASC response patterns of language/vocabulary measure Responders will be reviewed first.

Frequency analyses were first conducted with the Internalizing Problems changes of the CELF, EOWPVT, and ROWPVT Responders. Results are summarized below in Table 14.

Table 14
Internalizing Problems Response Patterns of Language/Vocabulary Responders

	Internalizing Problems		
	Responder	Non-Responder	Opposite
CELF-4 Responders [4] [a, c]		1 (.25) [b]	2 (.50)
CELF-PS:2 Responders [3]		3 (1.00)	---
EOWPVT Responders [4]		3 (.75)	1 (.25)
ROWPVT Responders [2]		---	2 (1.00)

Note. The Responder category was created utilizing the Reliable Change Index (RCI) from "Clinical Significance: A Statistical Approach to Defining Meaningful Change in Psychotherapy Research," by N. Jacobson and P. Truax, 1991, *Journal of Consulting and Clinical Psychology, 59,* p. 12-19. A z-score cutoff of + 1.645 was utilized, as the resulting confidence interval includes 90% of normative sample individuals. Participants whose Reliable Change scores (RC scores) met or exceeded 1.645 were labeled Responders, in that their scores indicated improvement in language/vocabulary skills.

[a] Values enclosed in brackets represent the number of Responders for the designated measure.

[b] The first value in any column represents the number of participants; the second value, in parentheses, represents the corresponding percentage of participants.

[c] Only 3 of the 4 CELF-4 Responders have valid Pre-testing BASC administration dates.

As shown, 50% of the CELF-4 Responders, 25% of the EOWPVT Responders, and 100% of the ROWPVT Responders showed an increase in internalizing problems. The remaining participants showed no change in internalizing problems. Small cell sizes, however,

exaggerate significance at first glance (i.e., the fact that none of participants showing improvement in language/vocabulary exhibited a decrease in internalizing problems). Consequently, results are not particularly meaningful.

To explore more closely these increases in internalizing problems, frequency analyses conducted with the anxiety, somatization, and depression changes of the CELF-4, CELF-PS:2, EOWPVT, and ROWPVT Responders. The results are summarized on the following page, in Table 15.

Table 15
Specifics of Internalizing Response Patterns of Language/Vocabulary Responders

	Responder	Non-Responder	Opposite
		Anxiety	
CELF-4 Responders [4] [a,c]	---	1 (.25) [b]	2 (.50)
CELF-PS:2 Responders [3]	---	3 (1.00)	---
EOWPVT Responders [4]	2 (.50)	1 (.25)	1 (.25)
ROWPVT Responders [2]	---	---	2 (1.00)
		Somatization	
CELF-4 Responders [4] [c]	---	2 (.50)	1 (.25)
CELF-PS:2 Responders [3]	---	3 (1.00)	---
EOWPVT Responders [4]	---	3 (.75)	1 (.25)
ROWPVT Responders [2]	---	2 (1.00)	---
		Depression	
CELF-4 Responders [4] [c]	---	1 (.25)	2 (.50)
CELF-PS:2 Responders [3]	1 (.33)	2 (.67)	---
EOWPVT Responders [4]	---	3 (.75)	1 (.25)
ROWPVT Responders [2]	---	1 (.50)	1 (.50)

Note. The Responder category was created utilizing the Reliable Change Index (RCI) from "Clinical Significance: A Statistical Approach to Defining Meaningful Change in Psychotherapy Research," by N. Jacobson and P. Truax, 1991, *Journal of Consulting and Clinical Psychology, 59,* p. 12-19. A z-score cutoff of + 1.645 was utilized, as the resulting confidence interval includes 90% of normative sample individuals. Participants whose Reliable Change scores (RC scores) met or exceeded 1.645 were labeled Responders, in that their scores indicated improvement in language/vocabulary skills.

[a] Values enclosed in brackets represent the number of Responders for the designated measure.

[b] The first value in any column represents the number of participants; the second value, in parentheses, represents the corresponding percentage of participants.

[c] Only 3 of the 4 CELF-4 Responders have valid Pre-testing BASC administration dates.

As outlined in the table, 50% of the CELF-4 Responders, 25% of the EOWPVT Responders, and 100% of the ROWPVT Responders exhibited an increase in anxiety. Fifty percent (n=2) of the EOWPVT Responders experienced a reduction in anxiety. With respect

to somatization, only marginal increases were seen. Rather, the majority of language/vocabulary responders showed neither increases nor decreases in somatization. Finally, with respect to depression, 50% of the CELF-4 and ROWPVT Responders exhibited an increase in depression. The majority of the remaining Responders did not exhibit any meaningful change in depression.

Frequency analyses conducted with the withdrawal and aggression changes of the CEL-4, CELF-PS:2, EOWPVT, and ROWPVT Responders yielded the following results, summarized on the following page, in Table 16.

Table 16
Withdrawal and Aggression Response Patterns of Language/Vocabulary Responders

	Responder	Non-Responder	Opposite
		Withdrawal	
CELF-4 Responders [4] [a, c]	---	2 (.50) [b]	1 (.25)
CELF-PS:2 Responders [3]	---	2 (.67)	1 (.33)
EOWPVT Responders [4]	---	2 (.50)	2 (.50)
ROWPVT Responders [2]	---	2 (1.0)	---
		Aggression	
CELF-4 Responders [4] [c]	---	1 (.25)	2 (.50)
CELF-PS:2 Responders [3]	---	2 (.67)	1 (.33)
EOWPVT Responders [4]	---	2 (.50)	2 (.50)
ROWPVT Responders [2]	---	---	2 (1.00)

Note. The Responder category was created utilizing the Reliable Change Index (RCI) from "Clinical Significance: A Statistical Approach to Defining Meaningful Change in Psychotherapy Research," by N. Jacobson and P. Truax, 1991, *Journal of Consulting and Clinical Psychology, 59,* p. 12-19. A z-score cutoff of + 1.645 was utilized, as the resulting confidence interval includes 90% of normative sample individuals. Participants whose Reliable Change scores (RC scores) met or exceeded 1.645 were labeled Responders, in that their scores indicated improvement in language/vocabulary skills.

[a] Values enclosed in brackets represent the number of Responders for the designated measure.

[b] The first value in any column represents the number of participants; the second value, in parentheses, represents the corresponding percentage of participants.

[c] Only 3 of the 4 CELF-4 Responders have valid Pre-testing BASC administration dates.

As outlined in the table, increases in withdrawal were observed in 25% of the CELF-4 Responders, 33% of CELF-PS:2 Responders, and 50% of the EOWPVT Responders. All other Responders showed no change in withdrawal. An increase in aggression was observed in an even larger proportion of language/vocabulary Responders. Fifty percent of CELF-4 Responders, 33% of CELF-PS:2 Responders, 50% of EOWPVT Responders, and 100% of

ROWPVT Responders showed an increase in aggression. All remaining Responders showed no change in aggression.

Finally, frequency analyses were conducted with the social skills changes of the CELF-4, CELF-PS:2, EOWPVT, and ROWPVT Responders. Results are outlined below in Table 17.

Table 17
Social Skills Response Patterns of Language/Vocabulary Responders

	Social Skills		
	Responder	Non-Responder	Opposite
CELF-4 Responders [4] [a,c]	2 (.50) [b]	1 (.25)	---
CELF-PS:2 Responders [3]	3 (1.00)	---	---
EOWPVT Responders [4]	2 (.50)	---	2 (.50)
ROWPVT Responders [2]	2 (1.00)	---	---

Note. The Responder category was created utilizing the Reliable Change Index (RCI) from "Clinical Significance: A Statistical Approach to Defining Meaningful Change in Psychotherapy Research," by N. Jacobson and P. Truax, 1991, *Journal of Consulting and Clinical Psychology, 59,* p. 12-19. A z-score cutoff of + 1.645 was utilized, as the resulting confidence interval includes 90% of normative sample individuals. Participants whose Reliable Change scores (RC scores) met or exceeded 1.645 were labeled Responders, in that their scores indicated improvement in language/vocabulary skills.

[a] Values enclosed in brackets represent the number of Responders for the designated measure.

[b] The first value in any column represents the number of participants; the second value, in parentheses, represents the corresponding percentage of participants.

[c] Only 3 of the 4 CELF-4 Responders have valid Pre-testing BASC administration dates.

As shown, social skills appeared to improve among language/vocabulary Responders. Specifically, improvements were observed in half of the CELF-4 and EOWPVT Responders, and in all of the CELF-PS:2 and ROWPVT Responders.

Frequency analyses (Part II) and Chi-square analyses for emotional/social hypotheses.

As mentioned previously, frequency analyses were also performed in any case wherein a Responder or Opposite group (on any of the BASC scales) contained at least 33% of the total number of participants. In such cases, frequency analyses were conducted with the Responder/Opposite group to determine whether any of the following were potential covariates: attention at baseline, medication use, gender, age, baseline IQ, performance (as measured by RC scores) on any of the language/vocabulary measures, or change (as measured by RC scores) in any of the other BASC scales considered in this study.

As outlined in exploring potential covariates among the language/vocabulary Responder/Opposite groups, a variable was explored as a potential covariate if it met the following 2 conditions: (1) the variable was observed in at least 67% of the Responder/Opposite group (e.g., if 67% of any Responder group was male, gender was explored as a potential covariate for that Responder group); and (2) the frequency with which the variable was observed in the Responder/Opposite group exceeded the frequency with which it was observed in the entire sample (n=20) by 20 percentage points. Again, these decision rules were adopted to minimize the likelihood of committing a Type 1 Statistical error. Any variables meeting both of the above criteria were then subjected to a chi-square analysis, to determine whether its prevalence among the Responder/Opposite group was statistically meaningful. With respect to the chi-square statistic, the *expected* number of participants in the Responder/Opposite group was derived from the observed number of participants in the entire sample (of 20) who exhibited the variable under examination. The

tables below include only those variables for which chi-square statistics were computed (i.e., only those variables explored as potential covariates).

Frequency analyses were performed with the Internalizing Problems Opposites because 56% (n=10) of the participants evidenced an increase in internalizing problems. Of the aforementioned variables, the potential covariates are summarized in Table 18, below.

Table 18
Frequency Analyses for the 10 Internalizing Problems Opposites

Potential Covariate			
	Frequency	Descriptor	
Age group	7 (.70) [a]	Older age group (ages 6-9)	
	Responder	Non-Responder	Opposite
BASC Responses			
Anxiety	---	---	10 (1.00)
Depression	---	2 (.20)	8 (.80)

Note. The Opposite category was created utilizing the Reliable Change Index (RCI) from "Clinical Significance: A Statistical Approach to Defining Meaningful Change in Psychotherapy Research," by N. Jacobson and P. Truax, 1991, *Journal of Consulting and Clinical Psychology, 59,* p. 12-19. A z-score cutoff of + 1.645 was utilized, as the resulting confidence interval includes 90% of normative sample individuals. Participants whose Reliable Change scores (RC scores) met or exceeded 1.645 were labeled Opposites, in that their scores indicated increase in emotional/social difficulties (or, a response opposite to that desired).

[a] The first value in any column represents the number of participants; the second value, in parentheses, represents the corresponding percentage of participants.

Chi-square statistics were computed for age group, but this variable was not found to be significantly discrepant from that expected, X^2 (1, n=10) = 1.600, p = .206. Chi-squares could not be calculated for either Anxiety or Depression, due to empty cells.

Because 61% (n=11) of participants evidenced an increase in anxiety, frequency analyses were conducted with the 11 Anxiety Opposites. Potential covariates are outlined below in Table 19.

Table 19
Frequency Analyses for the 11 Anxiety Opposites

Potential Covariate	Responder	Non-Responder	Opposite
BASC Responses			
Internalizing Problems	---	1 (.09) [a]	10 (.91)
Depression	---	3 (.27)	8 (.73)

Note. The Opposite category was created utilizing the Reliable Change Index (RCI) from "Clinical Significance: A Statistical Approach to Defining Meaningful Change in Psychotherapy Research," by N. Jacobson and P. Truax, 1991, *Journal of Consulting and Clinical Psychology, 59,* p. 12-19. A z-score cutoff of + 1.645 was utilized, as the resulting confidence interval includes 90% of normative sample individuals. Participants whose Reliable Change scores (RC scores) met or exceeded 1.645 were labeled Opposites, in that their scores indicated increase in emotional/social difficulties (or, a response opposite to that desired).

[a] The first value in any column represents the number of participants; the second value, in parentheses, represents the corresponding percentage of participants.

As shown, internalizing problems and depression appears to be potential covariates with respect to anxiety. Chi-square statistics showed internalizing problems to be significantly more prevalent than expected, X^2 (1, n=11) = 5.440, p = .020. This is not particularly meaningful, however, because the Anxiety scale loads onto the Internalizing Problems composite. A chi-square statistic could not be calculated for Depression, due to empty cells.

Because 44% (n=8) of the participants evidenced an increase in depression, frequency analyses were conducted with the 8 Depression Opposites. Potential covariates are outlined on the following page in Table 20.

Table 20
Frequency Analyses for the 8 Depression Opposites

Potential Covariate			
	Frequency	Descriptor	
Age group	7 (.88)	Older age group (ages 6-9)	
	Responder	Non-Responder	Opposite
BASC Responses			
Internalizing Problems	---	---	8 (1.00)
Anxiety	---	---	8 (1.00)

Note. The Opposite category was created utilizing the Reliable Change Index (RCI) from "Clinical Significance: A Statistical Approach to Defining Meaningful Change in Psychotherapy Research," by N. Jacobson and P. Truax, 1991, *Journal of Consulting and Clinical Psychology, 59,* p. 12-19. A z-score cutoff of + 1.645 was utilized, as the resulting confidence interval includes 90% of normative sample individuals. Participants whose Reliable Change scores (RC scores) met or exceeded 1.645 were labeled Opposites, in that their scores indicated increase in emotional/social difficulties (or, a response opposite to that desired).

[a] The first value in any column represents the number of participants; the second value, in parentheses, represents the corresponding percentage of participants.

The chi-square statistic for age group was not significant, X^2 (1, n=8) = 3.222, p = .073. Chi-square analyses could not be performed with either Internalizing Problems or Anxiety, due to empty cells.

Because 33% (n=6) of the participants evidenced an increase in withdrawal, frequency analyses were conducted with the 6 Withdrawal Opposites. Potential covariates are outlined on the following page, in Table 21.

Table 21
Frequency Analyses for the 6 Withdrawal Opposites

Potential Covariate			
	Frequency	Descriptor	
Gender	5 (.83) [a]	Female	
Age group	5 (.83)	Older age group (ages 6-9)	
	Responder	Non-Responder	Opposite
ROWPVT performance	---	6 (1.00)	---
BASC Responses			
Depression	---	2 (.33)	4 (.67)

Note. The Opposite category was created utilizing the Reliable Change Index (RCI) from "Clinical Significance: A Statistical Approach to Defining Meaningful Change in Psychotherapy Research," by N. Jacobson and P. Truax, 1991, *Journal of Consulting and Clinical Psychology, 59,* p. 12-19. A z-score cutoff of + 1.645 was utilized, as the resulting confidence interval includes 90% of normative sample individuals. Participants whose Reliable Change scores (RC scores) met or exceeded 1.645 were labeled Opposites, in that their scores indicated increase in emotional/social difficulties (or, a response opposite to that desired).

[a] The first value in any column represents the number of participants; the second value, in parentheses, represents the corresponding percentage of participants.

As shown, the majority of participants evidencing an increase in withdrawal were female and in the older age group. Chi-square statistics were computed for gender and age group. Gender was found to be significantly discrepant, X^2 (1, n=6) = 4.694, p = .030, but age was not, X^2 (1, n=6) = 1.819, p = .177. None of the 6 Withdrawal Opposites showed any change in receptive vocabulary skills. Due to empty cells in both ROWPVT categories and Depression categories, chi-square statistics could not be computed for these potential covariates.

Because 50% (n=9) of the participants evidenced an increase in aggression, frequency analyses were conducted with the 9 Aggression Opposites. No potential covariates were found. Although not statistically significant, it may be noteworthy that 7 of the 9 Aggression

Opposites were male. Because 56% (n=10) of the participants exhibited an improvement in social skills, frequency analyses were conducted with the 10 Social Skills Responders. Again, no potential covariates were found. Table 22 (below) summarizes all chi-square analyses listed above.

Table 22

Chi-square Statistics for Potential Covariates of BASC Opposite Groups

Opposite Group Potential Covariate	X^2	df	*p*
Internalizing Opposite [10] [a]			
Age	1.600	1	.206
Anxiety Opposite [11]			
Internalizing Problems*	5.440	1	.020
Depression Opposite [8]			
Age	3.222	1	.073
Withdrawal Opposite [6]			
Gender*	4.694	1	.030
Age	1.819	1	.177

[a] Values enclosed in brackets represent the number of Opposites for the designated measure.
* Potential covariate for which chi-square confirmed significance.

Paired-samples t-tests for emotional/social hypotheses.

Finally, paired-samples t-tests were performed with Pre-testing and Post-testing scores on all seven BASC scales, to determine whether the group's scores changed significantly over the course of 1 year of intervention. Results are outlined on the following page, in Table 23.

Table 23
Differences from Pre-testing to Post-testing on BASC Emotional/Social Scales (Teacher Rating Scale)

	Particpants' Mean ± SD	Statistics	Significance
Internalizing Problems	6.833 ± 8.466	t(17) = 3.424	.003
Anxiety	5.389 ± 12.142	t(17) = 1.883	.077
Somatization	3.889 ± 6.790	t(17) = 2.430	.026
Depression	7.333 ± 9.822	t(17) = 3.168	.006
Withdrawal	6.556 ± 9.076	t(17) = 3.064	.007
Aggression	6.889 ± 9.196	t(17) = 3.178	.006
Social Skills	2.222 ± 9.662	t(17) = .976	.343

Utilizing this analysis, participants (as a whole) were shown to exhibit a significant increase in internalizing problems, depression, withdrawal, and aggression. No significant changes from Pre-testing to Post-testing were observed with respect to the group's levels of anxiety, somatization, or social skills.

Exploratory analyses for emotional/social hypotheses.

To ensure that RC score-based analyses appropriately captured participants' responses on BASC scales, frequency analyses exploring categorical changes on the BASC were conducted. Specifically, participants scores at Pre-testing and Post-testing were categorized according to the cut-offs provided in the BASC manual. Scores on the Clinical Scales (e.g., Internalizing Problems, Anxiety, Somatization, Depression, Withdrawal, and Aggression) are delineated as follows: Clinically Significant (70 and above); At-Risk (60-

69); Average (41-59); Low (31-40); Very Low (30 and below). Scores on the Adaptive Scales (e.g., Social Skills) are defined inversely: Clinically Significant (30 and below); At-Risk (31-40); Average (41-59); High (60-69); Very High (70 and above). A categorical change was defined by a participant shifting by one or more categories over the course of 1 year (e.g., from At-Risk to Average, or from At-Risk to Clinically Significant). Figure 3 depicts the overlap of participants whose change was captured by RC analyses versus categorical analyses.

Although categorical analyses captured several participants whose changes in Pre-testing to Post-testing scores (on the BASC) were not captured by RC analyses, closer examination undermined the significance of these shifts. For example, categorical analyses captured one participant's shift in withdrawal from Average (at Pre-testing) to At-Risk (at Post-testing). Upon closer examination, however, this participant's standard score on the Withdrawal scale increased by only 3 points from Pre-testing to Post-testing, or, from 58 to 61. Such a categorical shift hardly appears clinically significant. This participant's RC score, however, was a modest 0.42. RC analyses thus appeared to more accurately and consistently capture participants' significant changes from Pre-testing to Post-testing.

CHAPTER IX

DISCUSSION

The primary findings of this study were to explore the changes in children's language/vocabulary skills over the course of one year of early intervention, as related to the suspected impact of attention deficits at baseline. Although these findings indeed explore the impact of attention deficits on response to early intervention, the data lent itself more readily to the secondary aim of this study: exploring the social and emotional changes associated with undergoing an intensive year of early intervention. The participants were 20 children with LI who were also considered to be At-Risk for developing additional learning disabilities. They comprised the population of a larger, ongoing research initiative, entitled The Early Intervention Program (EI Program), which explores The Shelton School's experimental intervention aimed at children with moderate to severe language impairments.

The language/vocabulary and social/emotional measures utilized in this study were selected from a larger battery (of 26 measures) administered to the participants as part of the EI Program. The CELF-4 and CELF-PS:2 (widely accepted language measures) were selected for their Core Language Score, which served as a measure of overall language ability. The EOWPVT and ROWPVT were selected for their abilities to quickly and concisely capture expressive and receptive vocabulary, respectively. Moreover, these two tests are co-normed, thereby facilitating comparisons between the two. The Inattention Total Score of the Brown ADD Scales (Teacher Form) was utilized to measure attention at baseline. This measure had been selected by the EI Program (over other attention measures, e.g., the Conners') for its attention to executive functioning. Finally, the seven BASC

elements (the Internalizing Problems composite and the Anxiety, Depression, Somatization, Withdrawal, Aggression, Social Skills scales) were chosen to measure those emotional/social constructs reviewed in the literature to be problematic among children with LI. The BASC Teacher Rating Scales (vs. Parent Rating Scales or Self-Report) were chosen to capture young participants' emotions/behaviors in the environment wherein the early intervention took place.

Language/Vocabulary Functioning

The hypotheses that participants' scores on the CELF-4 or CELF-PS:2 Core Language Score, EOWPVT, and ROWPVT would increase significantly from Pre-testing to Post-testing (thereby signaling an improvement in overall language skills) were only partially supported. As discussed previously in this text, the small sample size and lack of a control group begged the need for analyses sensitive to both individual change and to test-retest factors. The Reliable Change Index (RCI; Jacobson & Truax, 1991) was selected for its ability to measure individual change on a given measure, while incorporating the measure's test-retest reliability and standard deviation (as observed in the normative sample). This index, when utilized with measures normed by ages (e.g., CELF-4, CELF-PS:2, EOWPVT, ROWPVT, and BASC), defines scores exceeding an established cut score ($\pm$1.645) as representative of change *beyond that which would be expected* given the passing of time between Pre-testing and Post-testing (or random variance in scores).

Utilizing Reliable Change (RC) analyses to determine/categorize each participant's response on the CELF-4, CELF-PS:2, EOWPVT, and ROWPVT, findings demonstrate that less than one third of participants exhibited improvement in language/vocabulary scores.

Specifically, 27% of CELF-4 and CELF-PS:2 participants, 20% of EOWPVT participants, and only 10% of ROWPVT participants showed increases in their language/vocabulary skills. The majority of the remaining participants did not show any meaningful change in language/vocabulary skills. Of course, one would hope that over the course of one year of intensive early intervention for LI, children's language/vocabulary skills would increase.

Because the language/vocabulary measures utilized in this study are age-normed, some might argue that this "lack of improvement" may in fact represent a small amount of improvement that *would be expected* as the child progresses from one year to the next. To illustrate, consider a non-impaired child's performance on language measures from one year to the next: hypothetically, he or she may score in the average range on a particular language measure at age 6 (e.g., earn a standard score of 100 on a measure whose $\underline{M}$=100, SD=15), and then earn the same score (of 100) one year later, at age 7. To have earned the same score one year later hardly indicates that the child has not developed any additional language skills over the course of one year. Rather (because the hypothetical measure is age-normed), one would conclude that the child's language skills have improved "proportionately" to his chronological growth. In other words, he or she has improved to the degree expected (as compared with the normal population), and thus continues to fall in the average range of language functioning.

Although the above described scenario begs the question of whether the language/vocabulary Non-Responders may have, in fact, improved marginally (i.e., to an age-appropriate degree) in their language/vocabulary skills, limitations of the current study prohibit conclusive findings. Most importantly, one cannot draw reliable conclusions

without comparing to a control group. (Design limitations will be discussed more comprehensively later in this chapter). Moreover, one cannot ignore the broader intent of intervention, in that early intervention is aimed at *significantly* improving a child's skills. Ideally, a successful intervention for an impaired child would improve the child's functioning (or, accelerate his/her development) beyond that which would be expected in an age-matched, non-impaired peer. Again, however, the lack of a control group prohibits conclusive findings regarding the relative efficacy of this particular early intervention.

Despite the general lack of improvement in language/vocabulary skills as described by RC analyses, paired-samples t-tests showed significant differences between the group's Pre-testing and Post-testing means on the CELF-4 and EOWPVT (i.e., the group's scores improved significantly). Although at first glance, this might seem contradictory to the fact that there were so few CELF-4 and EOWPVT Responders (n=4, n=4, respectively), one must keep in mind that a paired-samples t-test does not take into account two key variables: (1) the fact that considerable change by one or two participants may artificially inflate the group's Post-testing mean, and (2) the fact that scores may be impacted by practice effects. Thus, although the group's Pre-testing and Post-testing means (on the CELF-4 and EOWPVT) are significantly different, this doesn't necessarily signal *clinically* significant improvement across the group. The modest number of language/vocabulary Responders (in comparison to the t-tests' indication of significantly different Post-testing means) may be in part explained by the fact that the RC equation incorporates the test-retest reliability and standard deviation of any given measure. Hence, RC analyses are more likely to capture clinically significant improvement (or lack thereof) than are paired-samples t-tests.

Because so few participants showed changes in language/vocabulary functioning, frequency analyses were the most appropriate means by which to explore characteristics of the Responder groups. Interestingly, participants who improved on the CELF-4 showed no change on the CELF-PS:2 (n=2). Alternately, those who showed improvement on the CELF-PS:2 did not show any change on the CELF-4 (n=2). These findings are puzzling, and reflect the greater variability observed within the participants' scores. Alternately, the former finding could reflect ceiling effects, while the latter may reflect differences in the difficulty of the two measures. Frequency analyses with the 4 EOWPVT Responders revealed that all four were of average IQ at baseline (with an average IQ of 104, as *estimated* by the Leiter-R Brief IQ). Consequently, one might conjecture that having an average (vs. below average) IQ at baseline may bode well for responding to intervention aimed at increasing expressive vocabulary. Small sample sizes, however, prohibit conclusive findings. With respect to the 2 ROWPVT Responders, neither of the participants showed any significant change in expressive vocabulary skills. The phenomenon that receptive vocabulary may increase independently of expressive language is consistent with the literature's review of explicit approaches designed to address specific deficits in language/vocabulary (Fey, Catts, & Larrivee, 1995; van Kleeck, Gillam, & McFadden, 1998).

In sum, with respect to changes in language/vocabulary functioning over the course of one year of intervention, little support can be derived from the data. RC analyses revealed that the majority of participants exhibited no change in language/vocabulary functioning. In fact, the largest percentage of participants observed to exhibit improvements was the 27% that exhibited improvement on the CELF-4 (n=4) and on the CELF-PS:2 (n=2). Even fewer

participants exhibited improvement on the EOWPVT and ROWPVT. Paired-samples t-tests, however, revealed a significant increase in the group's CELF-4 and EOWPVT scores from Pre-testing to Post-testing. Small languge/vocabulary Responder cell sizes prohibited any statistically-robust exploration of potential covariates. Although most participants did not appear to show improvement in language/vocabulary measures (as measured by RC analyses), the lack of a control group and a small number of participants prohibits any definitive findings. Additionally, one must consider whether alternate language/vocabulary measures might have yielded different results. Unfortunately, there appears to be little consensus in the literature as to which language/vocabulary measures are most appropriate for measuring early intervention.

Impact of Attention on Language/Vocabulary Changes

The hypothesis that attention deficits at baseline would be significantly and inversely associated with improvement on language/vocabulary measures at Post-testing was not supported. Again, due to small cell sizes, frequency analyses were the most appropriate means by which to explore the suspected impact of attention deficits on language/vocabulary acquisition. Frequency analyses with the CELF-4, CELF-PS:2, EOWPVT, and ROWPVT Responder groups revealed that, contrary to expectation, at least half of all language/vocabulary Responders had Impaired Attention at baseline (see Table 11). Hence, within this very small sub-population, Impaired Attention did not appear to associate inversely with improvement on language/vocabulary measures. Additional frequency analyses with all 20 participants explored language/vocabulary responses as they differed for participants with Normal Attention versus Impaired Attention at baseline (see Table 12, p.

122). Of the 15 participants taking the CELF-4 and the 11 taking the CELF-PS:2, a marginally larger percentage of Impaired Attention participants were Responders, as compared with the percentage of Normal Attention participants who were Responders on these two measures. The small number of participants taking the CELF-4 and CELF-PS:2, however, renders such findings inconclusive. With respect to the 20 participants taking the EOWPVT and ROWPVT, Normal Attention and Impaired Attention participants appeared to perform analogously on the these two measures, with the exception of the fact that the only two participants who showed *decreases* in vocabulary scores exhibited Impaired Attention at baseline. Thus, contrary to expectation, attention at baseline did not appear to impact participants' response to language/vocabulary intervention. The lack of significant findings may be in part due to the small sample size.

Alternately, the lack of association between attention and response to intervention could be related to the choice of the Brown ADD Teacher Rating Scale as the measure of baseline attention. Of course, there are two variables with respect to this choice: the choice of the Brown ADD Scales as the measure (vs. The Conners', for example), and the choice of the Teacher Rating Scale (vs. the Parent Rating Scale). This issue will be addressed more comprehensively under the *Limitations* section later in this chapter. Finally, the results could likely be interpreted more meaningfully if the sample were compared to a control group of non-impaired peers. Subsequently, attention, as it relates to language/vocabulary changes among children with LI could be explored comparatively, as it relates to language/vocabulary changes among children without LI.

For exploratory purposes, Pearson correlation coefficients were computed between the Inattention Total Score on the Teacher Form of the Brown ADD Scales (i.e., the measure used to delineate normal from impaired attention at baseline) and the Attention scale of the BASC TRS, both at Pre-testing and at Post-testing. Results showed that the two attention measures were significantly correlated both at Pre-testing, $r(16) = .67$, $p = .003$, and also at Post-testing, $r(16) = .61$, $p = .008$. Additionally, RC analyses were conducted with the Attention scale of the BASC, to determine whether participants' attention changed over the course of the intervention year. Eighty-nine percent (n=16) of participants did not exhibit a change in attention, while 11% (n=2) exhibited an increase in attention problems. Frequency analyses were then conducted with the CELF-4, CELF-PS:2, EOWPVT and ROWPVT Responders, as well as with the BASC Responder/Opposite groups, to determine whether attention appeared to be a potential covariate. No significant results were found.

As discussed above in the literature review, researchers have recently begun to wonder about the overlap between LI and ADHD. It is well-documented in the literature that children with LI are often shown to suffer from attentional deficits, even in the absence of an ADHD diagnosis (McInnes et al., 2003). Some have begun to argue that ADHD symptoms may be an epiphenomenon of LI (Cohen at al., 2000). Specifically, researchers have more recently begun to wonder whether impairments in some aspects of language functioning may be integral to ADHD, rather than a correlate or comorbid disorder (McInnes et al., 2003). Nevertheless, few studies have separated the effects of ADHD and LI (Cohen, 2000).

This study's findings of prominent attentional deficits (at baseline) among language-impaired children is not surprising; rather, the fact that 55% (n=11) of participants were

found to exhibit Impaired Attention at baseline is consistent with findings from clinic and community studies citing overlap between ADHD and speech/language impairment. Specifically, the literature shows the co-occurrence of ADHD and speech/language impairments to range from 8 to 90%, with most studies suggesting overlap in the range of 20-60% (for review, see Cantwell and Baker, 1991; Cohen, 1996; Cohen et al., 2000; Tannock & Schachar, 1996).

The fact that attentional deficits did not appear to associate inversely with improvement in language/vocabulary functioning (within this small but unique sample), is a potentially critical finding. This finding begs the question of whether, despite the suspected overlap of LI and attentional deficits, persisting LI may have little to do with attention per se. Rather, persisting LI (and successful remediation of such) may be associated with alternate constructs impaired in children with ADHD, such as working memory or executive functioning.

As discussed previously, one critical cognitive deficit in ADHD is the dysfunction of behavioral inhibition, which presumably interferes with executive functioning (Barkley, 1997b; Borkowski, 1996; Hayes, Gifford, and Ruckstuhl, 1996; Pennington & Ozonoff, 1996). More specifically, working memory is one aspect of executive functioning implicated in recent theories of ADHD (Barkley, 1997b; Brown, 2000; Cohen et al., 2000; Kempton et al., 1999; Martinussen & McInnes, 2001). Working memory is central to current theories of language comprehension (Kintsch, 1998; Williams, Scott, Goodyer, & Sahakian, 2000; Zwaan & Radvansky, 1998), and has also been linked with language functioning in children, such as reading comprehension ability (Nation, Adams, Bowyer-Crane, & Snowling, 1999;

Swanson, 1999), vocabulary acquisition (Baddeley, Gathercole, & Papagno, 1998), and early academic achievement (Gathercole & Pickering, 2000). Consequently, one must wonder whether alternate deficits implicated in ADHD (e.g., working memory deficits) may be more closely linked to a child's response to early intervention than would *attention*. Future studies isolating the impact of various executive functioning deficits would thus be helpful in predicting a child's response to early intervention.

Emotional/Social Functioning

The hypotheses suggesting that response to early intervention (as defined by change in language/vocabulary scores) would associate significantly with improvement in emotional/social functioning, were not supported, except with respect to social skills. (The social skills findings, like all other findings in this study, must be interpreted with caution due to small cell sizes.) Perhaps the richest findings in this study, however, center on the participants' changes in emotional and social functioning over the course of one year of early intervention. Most notable were the percentages of participants who (according to their RC scores) showed increases in anxiety (61%), internalizing problems (56%), aggression (50%), depression (44%), and withdrawal (33%), over the course of one year. On the other hand, over half of the participants exhibited improvement in social skills. To explore the finding that many participants exhibited increases in aggression and withdrawal, while also exhibiting improvement in social skills, frequency analyses were performed with those participants showing increases in these three scales. Improved social skills were observed in half of the participants exhibiting increased aggression and in two-thirds of participants exhibiting increased withdrawal. Thus, neither aggression nor withdrawal appears to be

inversely related to a participant's social skills (in this particular sample). The issue of procedural and/or measurement error as pertinent to these findings will be addressed later in the text.

As was the case with participants' changes in language scores, paired-samples t-tests captured the BASC data from a slightly different angle. Specifically, t-tests showed the group's Post-testing means to be significantly higher than the Pre-testing means on the Internalizing Problems composite, and on the Depression, Withdrawal, and Aggression scales. These findings were largely consistent with the RC-based findings, in that there were no Internalizing Problems or Withdrawal Responders, and only 1 Responder on each of the Depression and Aggression scales. Surprisingly, however, although 61% of participants were Anxiety Opposites (i.e., exhibited RC scores indicating an increase in anxiety from Pre- to Post-testing), paired-samples t-tests did not reveal a significant difference in the group's anxiety from Pre- to Post-testing. This may be due to the fact that there were 3 Anxiety Responders whose anxiety decreased significantly (i.e., exhibited RC scores of -3.17, -4.14, and -4.39), thereby skewing the group's Post-testing mean and rendering t-test results unremarkable. Similarly, although 56% of participants were Social Skills Responders, paired-samples t-tests neglected to find a significant difference between the group's Pre- and Post-testing means. Again, this may be due to the fact that four participants exhibited significant decreases in social skills, one of whom exhibited an extremely sizeable decrease (i.e., RC scores were -1.77, -1.77, -3.19, and -8.85.)

The findings of increased anxiety and withdrawal among this sample are consistent with findings from clinic and community studies reporting increased rates of anxiety and

withdrawn behavior among language impaired children as they age, even into adolescence (Baker & Cantwell, 1987a; Benaisch, Curtiss, & Tallal, 1993). Moreover, the prevalence of emotional problems discovered in this study is consistent with findings fact that children with LI have been shown to experience considerable performance anxiety and poor peer relationships (Falik, 1995), in addition to exhibiting low self-esteem, social skill deficits, demoralization, and depression (Kauffman, 1997; Kavale & Forness, 1995).

Consequently, the Montessori Method appears particularly suited for language impaired children, in that it anticipates emotional difficulties in the context of learning. As outlined previously, Montessori presentations may be structured for success, thereby minimizing a child's frustration and enabling him/her to experience positive feedback. Central to the Montessori teachings is the understanding that frustrating an already confused child will incur "secondary" emotional problems including hostility, bullying, bossiness, and/or withdrawal (Pickering, 1988). One must keep in mind, however, that while the Montessori Method anticipates and attends to emotional difficulties, no intervention can be expected to eradicate such difficulties in the context of learning new and often challenging material.

The suspected impact of language intervention on emotional/social functioning.

Although a number of factors may contribute to a child's increase in anxiety over the course of one year of intervention, one must consider whether intervention itself may wield emotional consequences as well as academic ones. Despite the high prevalence of emotional/social difficulties among children with LI, combined with researchers' and providers' interest in the efficacy of early intervention, few (if any) studies have explicitly

explored the impact of early intervention on a child's emotional/social functioning. Webster's New World Dictionary defines the verb "intervene" as follows: "to come or be between; or, to come between as an influencing force" (Guralnik, 1982). By its very nature, intervention comes between a child and his/her established methods of coping or managing, albeit to develop more adaptive methods. In other words, regardless of the fact that intervention is aimed at *improving* a child's skills, understanding, or functioning, it nevertheless comes between the child and his/her existing way of "getting by." It seems understandable, then, that when a child is asked to abandon whatever means on which he/she has relied in the past, the child may experience an increase in anxiety.

Consequently, one might wonder whether children who respond to early intervention for LI (i.e., exhibit improved scores on language/vocabulary measures) exhibit any particular patterns with respect to changes in their emotional/social functioning. Although this study originally hypothesized that children exhibiting improvement on language/vocabulary measures would show a reduction in emotional/social problems, this hypothesis was not supported. Of the CELF-4, CELF-PS:2, EOWPVT, and ROWPVT Responders, two participants showed a reduction in anxiety, and one showed a reduction in depression. All other language/vocabulary Responders showed either no change or opposite change (i.e., an increase in emotional/social difficulties) across all BASC scales, except in the case of the Social Skills scale. Because the language/vocabulary Responder cell sizes are considerably small (n=2 to 4), the data is inconclusive beyond this broad finding. For exploratory purposes, a point-biserial correlation was calculated to explore whether CELF-4 scores at Pre-testing correlated with participants' changes (Non-Responder vs. Opposite) on the

Internalizing Problems composite over the course of one year. Results showed a low negative correlation, r_{pb} = -.39. Again, results must be interpreted cautiously, as only 13 participants' scores were encompassed in this correlation.

Improvement in language/vocabulary may be related, however, to improvement in social skills. Namely, both ROWPVT Responders and all three CELF-PS:2 Responders exhibited significant improvement in social skills, as did half of the CELF-4 and EOWPVT Responders. Again, small cell sizes necessitate cautious interpretation of these findings. The fact that social skills improved in 56% (n=10) of the participants may speak to the benefit of the Montessori Method's attention to improving practical life skills. Specifically, the Practical Life Schema, one of the core and organizing curricula of Montessori teachings, focuses on improving such skills as greeting a friend, talking softly, joining a friend, and saying "excuse me" (Pickering, 1988). Hence, with a larger sample size, one might be able to make more robust conclusions regarding the efficacy of Montessori-based early intervention with respect to increasing social skills among children with LI.

Potential covariates with respect to emotional/social change.

Frequency and chi-square analyses were relatively inconclusive with respect to exploring BASC Opposite or Responder groups for potential covariates. Although numerous variables appeared at first glance to be potential covariates, most of these variables ceased to appear significant when their prevalence was compared to that in the entire sample of 20 participants. For example, it initially appeared meaningful that 7 of the 9 Aggression Opposites were male (78% male). Sixty percent of all participants were male, however,

which thereby detracted from the variable's significance within the Aggression Opposite group.

Frequency and chi-square analyses did confirm one meaningful potential covariate on one BASC scale: gender appeared significant in the context of withdrawal response, as more female participants [than what would have been expected, based on the number of females in the population of 20] exhibited an increase in withdrawal. The BASC does not consider gender-based differences with respect to its clinical scales, but merely defines withdrawal as a child's tendency to evade others to avoid social contact (Kamphaus & Reynolds, 1992). Moreover, it measures a child's tendency to be (or feel) neglected or rejected by peers. The finding that gender may be a covariate with respect to withdrawal must be interpreted cautiously, given the very small sample size. With respect to whether withdrawal implies depression, as stated previously, withdrawal may be a symptom of depression but does not necessarily imply the co-occurrence of depressive symptoms. The Withdrawal and Depression scales on the BASC are quite distinct, as shown by their moderate intercorrelations (Kamphaus & Reynolds, 1992).

In addition to identifying gender as a potential covariate with respect to withdrawal, chi-square analyses identified internalizing problems as a potential covariate with respect to anxiety. This finding, however, is confounded by the fact that the Anxiety scale loads onto the Internalizing Problems composite of the BASC. Consequently, this finding is not particularly meaningful.

Limitations in measuring emotional/social functioning.

Finally, in considering the findings from this study, one must consider how procedural and/or measurement error may have impacted the results. Specifically, one must consider how the means of assessing a child's emotional/social change may have impacted the findings. Of course, observational measures will undoubtedly yield different results about a child's emotional/social functioning than would self-report measures. Moreover, observational measures conducted by teachers will likely differ from those conducted by parents or care-givers. Because self-report measures would be inappropriate for children ages 3-9 – and perhaps unsuited for children with moderate to severe LI – observational measures appear to be the logical choice with which to measure emotional/social functioning. Additionally, numerous such measures are well-supported in the literature.

One might wonder, however, about the impact of observer bias in measuring participants' emotional/social functioning. Specifically, teachers are more likely to be familiar with a child's emotional difficulties and social struggles after one year of teaching the child. Consequently, teachers are likely more attuned to these difficulties at Post-testing than they were at Pre-testing, and therefore more likely to rate their functioning as significantly problematic. In other words, teachers may be able to characterize more accurately a child's behavior after one year of working with him/her. Alternately, teachers may expect a certain degree of improvement in emotional/social functioning, and measure Post-testing behaviors against this expected level of functioning (thereby perceiving the same behaviors as increasingly dysfunctional at Post-testing).

For exploratory purposes, Pearson correlations were calculated with the *parents' and teachers'* ratings at Pre- and Post-testing, across all seven BASC scales, to determine whether parents and teachers rated the participants' behaviors consistently. Results are listed below, in Table 24.

Table 24
Correlations Between Participants' Parent and Teacher BASC Rating Scales, at Pre- and Post-testing

	Pre-testing Statistic (Significance)	Post-testing Statistic (Significance)
Internalizing Problems	.326 (.202)	-.090 (.722)
Anxiety	.342 (.178)	.219 (.383)
Somatization	.649 (.005)**	.678 (.002)**
Depression	.424 (.090)	-.174 (.490)
Withdrawal	.429 (.086)	.519 (.027)*
Aggression	.038 (.884)	.353 (.150)
Social Skills	.075 (.774)	.021 (.934)

* Correlation is significant at the 0.05 level (2-tailed).
** Correlation is significant at the 0.01 level (2-tailed).

As shown, the Parent Ratings Scales and Teacher Rating Scales are not significantly correlated, except in rating Pre- and Post-testing Somatization and in rating Post-testing Withdrawal. This lack of correlation between parent and teacher ratings may be explained in part by observer bias, as described above. Alternately, one must keep in mind the crucial fact that in rating participants, parents and teachers were observing the children in very different

environments (e.g., home vs. school, respectively). The demands of a school environment (and the subsequent impact of these demands on a child's emotional and social functioning) are very distinct from the demands of a home environment. Subsequently, teachers and parents may rate the same child differently with respect to their emotional/social functioning.

Finally, to determine whether parents rated participants' *changes* in emotional/social functioning differently than did the participants' teachers, paired-samples t-tests were conducted with the group's Pre-testing and Post-testing means on all BASC scales. Interestingly, none of these t-tests revealed any significant differences in emotional/social functioning from Pre-testing to Post-testing. Results are listed below in Table 25.

Table 25
Differences from Pre-testing to Post-testing on BASC Emotional/Social Scales (Parent Rating Scale)

	Particpants' Mean ± SD	Statistics	Significance
Internalizing Problems	1.632 ± 6.440	t(19) = 1.104	.284
Anxiety	.474 ± 8.445	t(19) = .244	.810
Somatization	.895 ± 8.151	t(19) = .478	.638
Depression	2.368 ± 6.593	t(19) = 1.566	.135
Withdrawal	1.368 ± 6.211	t(19) = .960	.350
Aggression	2.368 ± 5.756	t(19) = 1.793	.090
Social Skills	-.684 ± 7.572	t(19) = -.394	.698

Note. All 20 participants' BASC *Parent* Rating Scales were administered within the designated testing time frames.

Of course, one must also consider whether an alternate form of observer bias may impact parents' ratings of participants' emotional/social functioning. Specifically, the parents' emotional (and financial) investment in the efficacy of the intervention and in their child's well-being may result in a more lenient (optimistic?) review of their child's functioning after one year of intervention.

Conclusions

Of the 20 participants undergoing an experimental early intervention designed for children with LI, only a small percentage of participants showed improvement (as measured by Reliable Change analyses) in language/vocabulary scores over the course of one year. Due to these small percentages, the majority of the proposed analyses were found to be unsuitable. Rather, various frequency analyses and nonparametric analyses were performed for each of the 11 hypotheses proposed in this study. Frequency analyses comprised the majority of the supplementary analyses, and were employed primarily to explore the data for response trends and potential covariates. Chi-square statistics were computed for all potential covariates whose cell sizes permitted a chi-square analysis. Additionally, paired-samples t-tests were conducted to determine whether participants' means (on language/vocabulary and social/emotional measures) differed significantly from Pre-testing to Post-testing.

Although the small sample size and lack of a control group beg cautious interpretation of results, three broad findings warrant discussion and future investigation. First, contrary to expectation, response on language/vocabulary measures did not appear inversely related to the presence of attentional deficits at baseline. Roughly half of the

participants exhibited attentional deficits at baseline (as measured by the BASC TRS). This high prevalence of attention deficits is consistent with the literature documenting the preponderance of attentional deficits among children with LI (Cantwell & Baker, 1991b; Cohen et al., 2000). Nevertheless, attentional deficits at baseline did not appear to predict poorer response (as measured by language/vocabulary outcomes) to early intervention. Despite the large body of research citing the overlap between LI and attention deficits (see McInnes et al., 2003), (and keeping in mind the small sample size), this finding may suggest that attention and language among children with LI may be more discrete than related. Alternately, research exploring the potential link between executive functioning deficits (e.g., working memory deficits) and LI (Cohen et al., 2000; Williams, Scott, Goodyer, & Sahakian, 2000) may provide direction for future studies regarding children's response to early intervention.

Second, over half of the participants (56%; n=10) exhibited an improvement in social skills (as determined by the Reliable Change Index). This increase in social skills is particularly promising, given that social skills deficits are well-documented in the literature investigating children with language impairment (Beitchman, Brownlie, & Wilson, 1996; Craig & Washington, 1993; Nabuzoka & Smith, 1995; Ozols & Rourke, 1985) and may impact relationships into adolescence and adulthood (Rutter & Mawhood, 1991). Moreover, this noteworthy increase in social skills may speak to the efficacy of a Montessori-based intervention for children with LI. As discussed previously, the Montessori Method's Practical Life curricula aims to improve interpersonal relationship skills (among other skills)

(Pickering, 1988). Thus, this program may be particularly well-suited to working with children who characteristically suffer from social skills deficits.

The third broad finding of this study concerns the changes in participants' emotional/social functioning over the course of one year of intervention. In sum, many participants exhibited an increase in internalizing problems, anxiety, depression, withdrawal, and aggression. Although undesirable, these findings are not particularly inconsistent with the literature on the emotional/social functioning of children with LI. As reviewed previously in this text, children with LI have been shown to exhibit low self-esteem, demoralization, and depression (Kauffman, 1997; Kavale & Forness, 1995), in excess of that observed in their non-impaired peers. Moreover, longitudinal research emphasizes that children with LI often exhibit poor long-term emotional and social outcomes (Beitchman, Brownlie et al., 1996; Beitchman, Wilson et al., 1996; Cantwell & Baker, 1991b; Rutter & Mawhood, 1991). Thus, it is not surprising to find evidence of emotional/social difficulties in this sample of language-impaired children, nor is it surprising to witness increases in their observed emotional/social difficulties over the course of one year. This finding is meaningful not only to the parents, teachers, and caregivers of language-impaired children undergoing early intervention, but also to those who design early interventions for LI. Interventions should anticipate (and attend to) the likely exacerbation of existing emotional/social difficulties in the context of language remediation. Although the Montessori Method is particularly suited to anticipating such difficulties, the persisting increases (in anxiety, depression, etc.) found in this study warrant additional attention to emotional and social outcomes.

With respect to specific statistical findings, paired-samples t-tests revealed a significant difference between participants' CELF-4 and EOWPVT scores at Pre- and Post-testing. This finding appears contradictory to the fact that very few participants exhibited RC scores indicating improvement on the CELF-4 and EOWPVT, and may be in part explained by the fact that RC scores incorporate the test-retest reliability coefficient of the measure utilized. Paired-samples t-tests conducted with Pre- and Post-testing scores on the BASC scales revealed significant differences (increases) in internalizing problems, depression, withdrawal, and aggression. Chi-square analyses found gender to be a potential covariate among participants exhibiting a significant increase in withdrawal (5 of the 6 were female). In sum, findings were variable and relatively limited, in large part due to the small sample size, the lack of a control group, and the varying deficits and characteristics among this unique population.

Limitations

Admittedly, this study includes numerous and significant limitations. The unique characteristics of the population (i.e., children with identified LI who are also At-Risk for developing Learning Disabilities) warrant exploratory analysis while limiting the sample size. Moreover, the sample was not normally distributed, in that 75% of participants were Caucasian, 60% were male, and 60% exhibited Below Average IQ at baseline (as measured by the Leiter-R).

The age range of the sample was particularly limiting, and for a number of reasons. First, because the sample included children ages 3-9 at baseline, the selection of measures was limited. For example, although the Test of Nonverbal Intelligence, Third Edition

(TONI-3) and the Ravens Progressive Matrices are more widely utilized and respected (than is the Leiter-R) in measuring nonverbal IQ, their norms begin at age 6. Subsequently, these measures were unsuitable for the population. Other measures necessitated the administration of distinct tests in order to encompass the age range (e.g., CELF-4 and CELF-PS:2). Still others necessitated the administration of different forms to cover all ages (e.g., BASC Preschool and BASC Child forms). Second, the large age range of the sample is problematic in the context of measuring change over the course of one year. Although RC-based frequency analyses take into account each participant's individual change, a 3-year-old's response to intervention is unlikely to resemble that of a 9-year-old's response. Consequently, there is little basis for comparison in examining either of these two participants' responses.

With respect to comparisons, another noteworthy limitation of this study is its lack of a control group. Without a matched control group, it is difficult to derive meaning from the participants' changes in language/vocabulary scores and emotional/social functioning. Of course, it is unlikely that one could compare this sample's changes to those that might be observed in a similar LI population *not* undergoing an intervention. Comparing this population to a sample of normally developing peers, however, would at least provide the opportunity to explore differences in Pre-testing and Post-testing attention and emotional/social functioning. Even with the small sample, comparing the findings to a control group would enable more robust statistical analyses, thereby potentiating any subsequent findings. Nevertheless, the lack of a control group is best compensated for by this study's incorporation of the Reliable Change Index, wherein a participants' change score

is considered significant if it falls outside the standard deviation of the test-retest difference in the norming sample, multiplied by the z-score cutoff point that defines a specified percentile of the distribution (Jacobson & Truax, 1991). Consequently, Reliable Change analyses incorporate into participants' scores not only the normative data of the given measures, but also the measures' test-retest reliability coefficients. Although these analyses may not be as robust as those performed with a control group, they compensate to the degree possible.

Medication issues.

Another limitation of this study is that medication for inattention/hyperactivity/impulsivity (I/H/I) could not be cohesively described, much less controlled for. Forty percent (n=8) of participants were on I/H/I medications at *some* point during the intervention year, whether it be at Pre-testing, Post-testing, or both. Specifically, 2 participants stopped taking medication during the intervention year. Frequency analyses performed on these 2 participants yielded the following information (changes were measured by RC analyses): the first participant exhibited neither improvement nor deterioration in his language/vocabulary skills, but exhibited an increase in internalizing problems, anxiety, and depression. The second participant who discontinued medication exhibited improvement on the CELF-4 and EOWPVT, no change on the CELF-PS:2, and deterioration on the ROWPVT. He exhibited an increase in aggression, but a reduction in anxiety. Both participants exhibited improved social skills at Post-testing.

Alternately, 1 participant began taking medication during the year. Frequency analyses with this participant revealed the following results: improvement on the CELF-4 (no

change in other language/vocabulary measures), and increases in anxiety, depression, and withdrawal over the course of the year. This participant did, however, exhibit an improvement in social skills.

One participant changed medications from Pre-testing to Posting, while another changed medications during the 2-month Post-testing period. Still others changed dosages throughout the year and/or augmented with mood stabilizers. Again, due to the small sample size, the medication issue was condensed and dichotomized: any child who took medication at any point during the year was designated as *On Medication*, while those who did not take any medications throughout the year were designated as *Not On Medication*. Clearly, such a dichotomization neglects potentially significant qualitative data. As outlined previously, the 8 participants on medication were taking one or a combination of the following medications: Straterra, Concerta, Adderall, Ritalin, or Focalin. Additionally, 3 of these 8 participants were also taking an antidepressant (Lexapro, Prozac, or Remeron). These characteristics are depicted in Figure 2. Furthermore, because medication could not be controlled at the start of the study, one cannot rule out the possibility that participants' responses (either on language/vocabulary or on emotional/social measures) are not in part due to starting, stopping, or changing medications.

Limitations of measures.

Revisiting the aforementioned discussion regarding choice of measures, another limitation of the study involves the choice of language/vocabulary measures. With respect to assessing language/vocabulary functioning, one must keep in mind that a myriad of measures exist, and that studies to date utilize any number of these measures. Thus, it becomes

difficult to compare findings when one study utilizes a particular measure to explore core language skills, while the next uses a slightly different one. Although the ROWPVT and EOWPVT are not particularly complex or extensive in their assessment of vocabulary skills, they were chosen (from the greater selection of 26 measures) in part because they are co-normed with each other. Additional, more robust testing of expressive and receptive *language* would be desirable, and with a larger sample of participants.

Another limitation involves the definition of attentional deficits at baseline. Although the Teacher Form of the Brown ADD Scales was chosen for its attention to executive functioning problems (often seen among children with LI), it may not capture attentional deficits as fully as would the Conners', for example. The Brown ADD Scales and the Conners' *are* highly correlated, however (Brown, 2001). Furthermore, one must guard against making conclusions based on any singule measure. Administration of a different measure, or of a collection of measures aimed at assessing attentional deficits (e.g., collecting teacher and parent ratings and self-report measures), may have altered the groupings of baseline attention. Delineating the participants by whether they hold an official ADHD diagnosis might yield even more robust results. However, such an inclusion criterion would require a significantly larger sample size, and would likely be confounded by variable (and often questionable) diagnostic processes.

Finally, limitations arise from the reliability of observational rating scales in measuring a participant's internal emotional experience. Although the BASC TRS encourages the use of verbal cues (e.g., "Says, 'Nobody likes me'") and observable behavioral cues (e.g., "Cries easily") to assess a child's emotional experience, one must

acknowledge the possibility that observational rating scales may not accurately reflect an individual's emotional functioning. Certain BASC interrater reliability coefficients beg this question. For example, the Depression scale of the Preschool BASC TRS has an interrater reliability coefficient of 0.53, and Withdrawal scale has one of 0.29. On the *Child* BASC TRS, the Depression coefficient is 0.44, while the Withdrawal coefficient increases to 0.64. Hence, it appears that raters may have difficulty accurately assessing a child's emotional experience or internalizing problems (e.g., anxiety, depression, somatization, withdrawal, etc.). Consequently, one must question the validity of the construct within this context. Additionally, one must keep in mind that the BASC is not intended to be used as a comprehensive measure of emotional/social functioning. Rather, it is used to provide a succinct overview of relatively narrow aspects of functioning and to uncover any potentially problematic areas in need of further assessment. Consequently, findings with respect to changes in emotional functioning must be interpreted cautiously.

Implications for Future Research

Although this study did not reveal any significant findings with respect to the impact of attention deficits on response to early intervention for language impairment, this topic warrants further empirical investigation. As previously mentioned, future studies should incorporate matched control groups (for age, IQ, gender, and attention at baseline), to improve upon the methodology of the current investigation. Moreover, future studies should investigate larger and more diverse samples, while restricting the age range of participants within each study (e.g., ages 3-5, 6-8, etc.).

As mentioned previously, additional measures of attention and/or more discriminating criteria for defining Impaired Attention at baseline should be used in the future, so as to more effectively discern the impact of attention on response to remediation. As speech/language studies begin to reach a consensus on what language/vocabulary measures are most discerning and comprehensive, future studies should incorporate these findings in exploring the impact of attention on language/vocabulary acquisition among children with LI.

Finally, future studies may wish to focus more explicitly on the changes in internalizing problems observed in the context of early intervention. While existing literature documents the observed increase in such problems as children with LI progress into adolescence (Baker & Cantwell, 1987a; Benaisch, Curtiss, & Tallal, 1993), the literature has neglected to address these increases as they relate specifically to intervention. Such information would be clinically valuable not only to children with LI participating in early intervention, but also to the teachers, speech-language pathologists, clinicians, and educators working to remediate their deficits.

APPENDIX A

FIGURES

Figure 1.

Reliable Change Index (RCI) Equation

$$RCI = \frac{X_2 - X_1}{S_{diff}}$$

$$S_{diff} = \sqrt{2(S_E)^2}$$

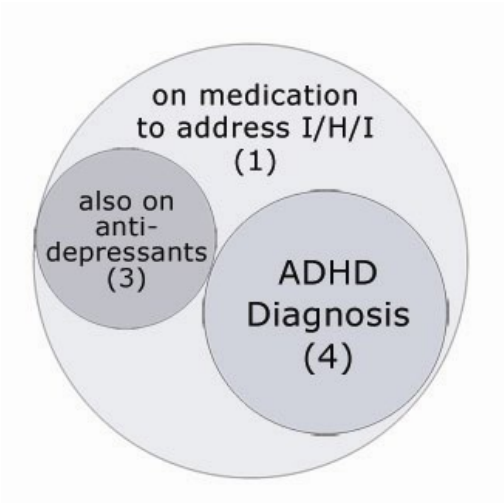
$$S_E = SD\sqrt{1 - r_{xx}}$$

Symbol	Definition
X_1	Pre-treatment score of subject
X_2	Post-treatment score of subject
SD	Std. dev. of normal population
r_{xx}	Test-retest reliability of measure

Note. The Reliable Change Index (RCI) is taken from "Clinical Significance: A Statistical Approach to Defining Meaningful Change in Psychotherapy Research," by N. Jacobson and P. Truax, 1991, *Journal of Consulting and Clinical Psychology, 59,* p. 12-19. Responder, Non-Responder, and Opposite categories were calculated utilizing a z-score cutoff of $\pm$ 1.645, thereby invoking a 90% confidence interval.

Figure 2

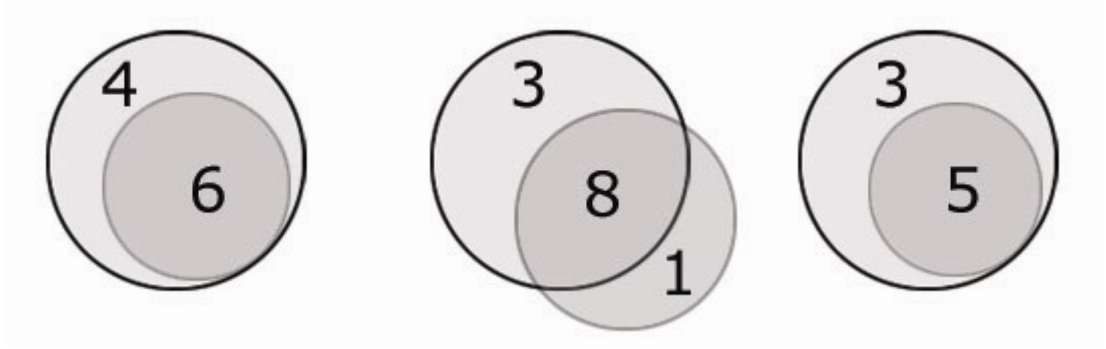
Diagnostic and Medication Characteristics of the 8 Participants on Medication for Inattention/Hyperactivity/Impulsivity



Note. Participants "on medication to address I/H/I" were taking one (or a combination) of the following medications at some point during the intervention year: Straterra, Concerta, Adderall, Ritalin, or Focalin. Three of these 8 participants were also taking an antidepressant (Lexapro, Prozac, or Remeron) at some point during the intervention year.

Figure 3

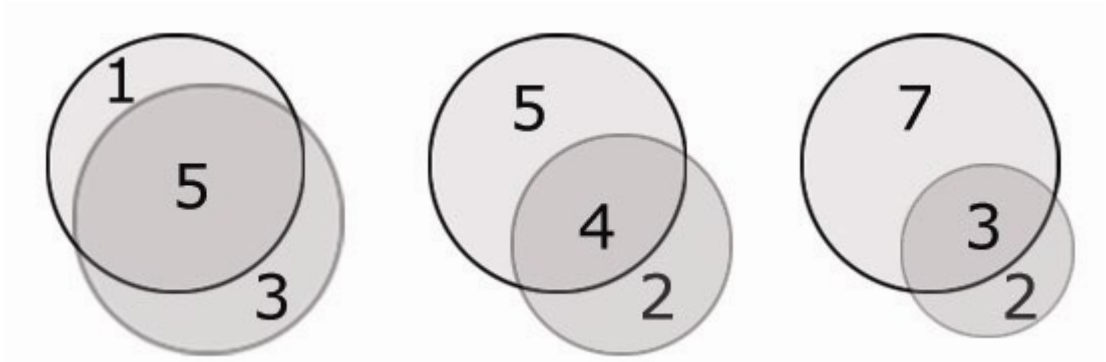
Participants' BASC Responses as captured by the Reliable Change Index vs. Categorical Analyses



Internalizing Opposites
10 RCI
6 Categories

Anxiety Opposites
11 RCI
9 Categories

Depression Opposites
8 RCI
5 Categories



Withdrawal Opposites
6 RCI
8 Categories

Aggression Opposites
9 RCI
6 Categories

Social Skills Responders
10 RCI
5 Categories

Note. The Opposite category was calculated utilizing the Reliable Change Index (RCI) from "Clinical Significance: A Statistical Approach to Defining Meaningful Change in Psychotherapy Research," by N. Jacobson and P. Truax, 1991, *Journal of Consulting and Clinical Psychology, 59,* p. 12-19. A z-score cutoff of ± 1.645 was utilized, as the resulting confidence interval includes 90% of normative sample individuals. Participants whose Reliable Change scores (RC scores) met or exceeded 1.645 were labeled Opposites, in that their scores indicated an increase in emotional/social difficulties (or, an *opposite* change of that desired). The Responder category (for Social Skills) encompasses participants whose RC scores met or exceeded 1.645, in that their scores indicated an improvement (or positive response) in social skills. Categorical Analyses utilized the cut-scores published in the BASC manual (Kamphaus & Reynolds, 1992). Participants were labeled as having made a categorical change if their BASC score moved from one band of scores into another (from Pre- to Post-testing).

REFERENCES

Adams, M. J. (1990). *Beginning to read: Thinking and learning about print*. Cambridge, MA: MIT press.

Al Otaiba, S., & Fuchs, D. (2002). Characteristics of children who are unresponsive to early literacy intervention. *Remedial and Special Education, 23*, 300-316.

Algozzine, B., Ysseldyke, J., & Shinn, M. (1982). Identifying children with learning disabilities: when is a discrepancy severe? *Journal of School Psychology, 20*, 298-305.

American Psychiatric Association. (2000). *Diagnostic and Statistical Manual of Mental Disorders, 4th Edition, Text Revision.* (4th Ed.). Washington, DC: American Psychiatric Association.

Andrews, H., Goldberg, D., Wellen, N., Pittman, B., & Struening, E. (1995). Prediction of special education placement from birth certificate data. *American Journal of Preventive Medicine, 11*(3), 55-61.

Aram, D. M., Ekelman, B. L., & Nation, J. E. (1984). Preschoolers with language disorders: 10 years later. *Journal of Speech and Hearing Research, 27*, 232-224.

Aram, D. M., & Hall, N. E. (1980). Preschool language disorders and subsequent language and academic difficulties. *Journal of Communication Disorders, 13*, 159-170.

Arnold, D. (1997). Co-occurence of externalizing behavior problems and emergent academic difficulties in young high-risk boys: A preliminary evaluation of patterns and mechanisms. *Journal of Applied Developmental Psychology, 18*, 317-330.

Asher, S. R., & Gazelle, H. (1999). Loneliness, peer relations and language disorder: ten years later. *Journal of Speech and Hearing Research, 27*, 232-244.

Baddeley, A. D., Gathercole, S., & Papagno, C. (1998). The phonological loop as a language learning device. *Psychological Review, 105*, 158-173.

Baker, L., & Cantwell, D. P. (1982). Psychiatric disorder in children with different types of communication disorders. *Journal of Communication Disorders, 15*, 113-126.

Baker, L., & Cantwell, D. P. (1985). Psychiatric and learning disorders in children with speech and language disorders: A critical review. *Advances in Learning and Behavioral Disabilities, 4*, 1-28.

Baker, L., & Cantwell, D. P. (1987a). A prospective psychiatric follow-up of children with speech/language disorders. *Journal of the American Academy of Child & Adolescent Psychiatry, 26*, 546-553.

Baker, L., & Cantwell, D. P. (1991). *Psychiatric and Developmental Disorders in Children with Communication Disorder*. Washington, D.C.: American Psychiatric Association.

Baker, L., & Cantwell, D. P. (1992). Attention deficit disorder and speech/language disorders. *Comprehensive Mental Health Care, 2*, 3-16.

Barkley, R. (1997a). *ADHD and the nature of self-control*. New York: Guilford Publications, Inc.

Barkley, R. (1997b). Behavioral inhibition, sustained attention, and executive functions: Constructing a unifying theory of ADHD. *Psychological Bulletin, 121*, 65-94.

Barkley, R. (1998). Attention-deficit hyperactivity disorder. *Scientific American, 179*, 44-49.

Bashir, A. S., & Scavuzzo, A. (1992). Children with language disorders: Natural history and academic success. *Journal of Learning Disabilities, 25*(1), 53-65.

Bashir, A. S., Wiig, E. H., & Abrams, J. C. (1987). Language disorders in childhood and adolescence: Implications for learning and socialization. *Pediatric Annals, 16*(145-156).

Beery, M. T. (1969). *Language disorders of children: the bases of diagnosis*. New York: Appleton-Century-Crofts.

Beitchman, J., Brownlie, E., Inglis, A., Wild, J., Ferguson, B., & Schachter, D. (1996). Seven-year follow-up of speech/language impaired and control children: Psychiatric outcome. *Journal of the American Academy of Child & Adolescent Psychiatry, 37*, 961-970.

Beitchman, J., Brownlie, E., Inglis, A., Wild, J., Mathews, R., Schachter, D., et al. (1994). Seven-year follow up of speech/language impaired and control children: Speech/language stability and outcome. *Journal of the American Academy of Child & Adolescent Psychiatry, 33*, 1322-1330.

Beitchman, J., Brownlie, E., & Wilson, B. (1996). Linguistic impairment and psychiatric disorder: Pathways to outcome. In J. H. Beitchman, N. J. Cohen, M. M. Konstantareas & R. Tannock (Eds.), *Language, learning, and behavior disorders:*

Developmental, biological, and clinical perspectives (pp. 493-514). New York: Cambridge University Press.

Beitchman, J., Hood, J., & Inglis, A. (1990). Psychiatric risk in children with speech and language disorders. *Journal of Abnormal Child Psychology, 18*(3), 283-296.

Beitchman, J., Nair, R., Clegg, M., Ferguson, B., & Patel, P. G. (1986). Prevalence of psychiatric disorders in children with speech and language disorders. *Journal of the American Academy of Child & Adolescent Psychiatry, 25*, 528-535.

Beitchman, J., Wilson, B., Brownlie, E., Walters, H., Inglis, A., & Lancee, W. (1996). Long-term consistency in speech/language profiles: II. Behavioral, emotional, and social outcomes. *Journal of the American Academy of Child & Adolescent Psychiatry, 35*, 815-825.

Beitchman, J., Wilson, B., Brownlie, E., Walters, H., & Lancee, W. (1996). Long-term consistency in speech/language profiles: I. Developmental and academic outcomes. *Journal of the American Academy of Child & Adolescent Psychiatry, 35*, 804-814.

Beitchman, J., Wilson, B., Johnson, C., Atkinson, L., Young, A., Adlaf, E., et al. (2001). Fourteen-year follow-up of speech/language-impaired and control children: Psychiatric outcome. *Journal of the American Academy of Child & Adolescent Psychiatry, 40*, 75-82.

Beitchman, J., & Young, A. (1997). Learning disorders with a special emphasis on reading disorders: a review of the past 10 years. *American Academy of Child and Adolescent Psychiatry, 36*, 1020-1032.

Benaisch, A. A., Curtiss, S., & Tallal, P. (1993). Language, learning, and behavioral disturbances in childhood: a longitudinal perspective. *Journal of the American Academy of Child & Adolescent Psychiatry, 32*, 585-594.

Biederman, J., Newcorn, J., & Sprich, S. E. (1991). Comorbidity of attention deficit hyperactivity disorder (ADHD). *American Journal of Psychiatry, 148*, 564-577.

Bird, J., Bishop, D., & Freeman, N. H. (1995). Phonological awareness and literacy development in children with expressive phonological impairments. *Journal of Speech and Hearing Research, 38*, 446-462.

Bishop, D. (1994). Is specific language impairment a valid diagnostic category? Genetic and psycholinguistic evidence. *Philos Trans R Soc Lond, 346*, 105-111.

Bishop, D., & Adams, C. (1990). A prospective study of the relationship between specific language impairment, phonological disorders, and reading retardation. *Journal of Child Psychology and Psychiatry, 21*, 1027-1050.

Bishop, D., & Edmundson, A. (1987). Language impaired 4-year-olds: Distinguishing transient from persistent impairment. *Journal of Speech and Hearing Disorders, 52*, 156-173.

Bishop, D., North, T., & Donlan, C. (1995). Genetic basis of specific language impairment: Evidence from a twin study. *Developmental Medicine & Child Neurology, 37*, 56-71.

Blachman, B., Schatschneider, C., Fletcher, J., Francis, D., Clonan, S., Shaywitz, B., et al. (2004). Effects of Intensive Reading Remediation for Second and Third Graders and a 1-Year Follow-Up. *Journal of Educational Psychology, 96*, 444-461.

Blachman, B., Tangel, D., Ball, E., Black, R., & McGraw, C. (1999). Developing phonological awareness and word recognition skills: A two-year intervention with low-income, inner-city children. *Reading and Writing, 11*, 239-273.

Blackman, J., Westervelt, V., Stevenson, R., & Welch. (1991). Management of preschool children with Attention Deficit-Hyperactivity Disorder. *Topics in Early Childhood Special Education, 11*, 91-104.

Borkowski, J. G., & Burke, J. E. (1996). Theories, models, and measurements of executive functioning. In G. R. Lyon & N. A. Krasnegor (Eds.), *Attention, memory, and executive function* (pp. 235-261). Baltimore: Paul H. Brookes.

Boudreau, D. M., & Hedberg, N. L. (1999). A comparison of early literacy skills in children with specific language impairment and their typically developing peers. *American Journal of Speech-Language Pathology, 8*, 249-260.

Brown, T. (2001). *Brown Attention-Deficit Disorder Scales*. San Antonio, TX: The Psychological Corporation.

Brown, T. (Ed.). (2000). *Attention deficit disorders and comorbidities in children, adolescents, and adults*. Washington, DC: American Psychiatric Press.

Brownell, R. (Ed.). (2000a). *Expressive One-Word Picture Vocabulary Test–Second Edition* (2nd ed.). Novalto, CA: Academic Therapy Publications.

Brownell, R. (Ed.). (2000b). *Receptive One-Word Picture Vocabulary Test-Second Edition* (2nd ed.). Novalto, CA: Academic Therapy Publications.

Brutten, M., Richardson, S., & Mangel, C. (1973). *Something's wrong with my child*. New York: Harcourt Brace Jovanovich.

Byrne, B., Fielding-Barnsley, R., Ashley, L., & Larsen, K. (1997). Assessing the child's and the environments contribution to reading acquisition: What we know and what we don't know. In B. Blachman (Ed.), *Foundations of Reading Acquisition and Dyslexia: Implications for Early Intervention*. Mahwah, NJ: Lawrence Erlbaum Associates.

Byrne, B., & Fielding-Barnsley, R. F. (1991). *Sound foundations*. New South Wales, Australia: Leyden Educational.

Campbell, S. (1995). Behavior problems in preschool children: A review of recent research. *Journal of Child Psychology & Psychiatry, 36*, 113-149.

Campbell, S., & Ewing, L. (1990). Follow-up of hard-to-manage preschoolers: Adjustment at age 9 and predictors of continuing symptoms. *Journal of Child Psychology & Psychiatry, 31*, 871-889.

Campbell, S., Ewing, L., Breaux, A., & Szumowski, E. (1986). Parent-referred problem three-year-olds: Follow-up at school entry. *Journal of Child Psychology & Psychiatry, 27*, 473-788.

Cantwell, D., & Baker, L. (1987a). *Developmental Speech and Language Disorders*. New York: Guilford.

Cantwell, D., & Baker, L. (1987b). Prevalence and types of psychiatric disorders in three speech and language groups. *Journal of Communication Disorders, 20*, 151-160.

Cantwell, D., & Baker, L. (1991a). Association between Attention Deficit-Hyperactivity Disorder and Learning Disorders. *Journal of Learning Disabilities, 24*, 88-95.

Cantwell, D., & Baker, L. (1991b). *Psychiatric and developmental disorders in children with communication disorder*. Washington, DC: American Psychiatric Press.

Cantwell, D., Baker, L., & Mattison, R. (1980). Prevalence, type and correlates of psychiatric diagnoses in 200 children with communication disorders. *Developmental and Behavioral Pediatrics, 2*, 131-136.

Catts, H. W. (1993). The relationship between speech-language impairments and reading disabilities. *Journal of Speech and Hearing Research, 36*, 948-958.

Catts, H. W., Fey, M. E., Zhang, X., & Tomblin, J. B. (1999). Language bases of reading and reading disabilities: Evidence from a longitudinal investigation. *Scientific Studies of Reading, 3*, 331-362.

Catts, H. W., Fey, M. E., Zhang, X., & Tomblin, J. B. (2001). Estimating the risk of future reading difficulties in kindergarten children: A research-based model and its clinical instrumentation. *Language, Speech, and Hearing Services in Schools, 32*, 38-50.

Cicci, R. (1995). *What's Wrong With Me? Learning Disabilities at Home and School*. Portland: York Press.

Clarizio, H., & Phillips, S. (1989). Defining severe discrepancy in the diagnosis of learning disabilities: a comparison of methods. *Journal of School Psychology, 27*, 383-391.

Cohen, N. (1996). Unsuspected language impairments in psychiatrically disturbed children: Developmental issues and associated conditions. In J. H. Beitchman, N. J. Cohen, M. M. Konstantareas & R. Tannock (Eds.), *Language, learning, and behavior disorders*. New York: Cambridge University Press.

Cohen, N. (2001). *Language imipairment and psychopathology in infants, children, and adolescents*. Thousand Oaks, CA: Sage.

Cohen, N., Barwick, M. A., Horodezky, N. B., Vallance, D. D., & Im, N. (1998). Language, achievement, and cognitive processing in psychiatrically disturbed children with previously identified and unsuspected language impairments. *Journal of Child Psychology & Psychiatry, 39*, 865-877.

Cohen, N., Davine, M., Horodezky, N., Lipsett, L., & Isaacson, L. (1993). Unsuspected language impairment in psychiatrically disturbed children: Prevalence and language and behavioral characteristics. *Journal of the American Academy of Child & Adolescent Psychiatry, 32*, 595-603.

Cohen, N., & Lipsett, L. (1992). Recognized and unrecognized language impairment in psychologically disturbed children: Child symptomatology, maternal depression, and family dysfunction: Preliminary report. *Canadian Journal of Behavioral Science, 23*, 376-389.

Cohen, N., Menna, R., Vallance, D., Barwick, M., Im, N., & Horodetsky, N. (1998). Language, social cognitive processing, and behavioral characteristics of psychiatrically disturbed children with previously identified and unsuspected language impairments. *Journal of Child Psychology and Psychiatry, 39*, 853-864.

Cohen, N., Vallance, D., Barwick, M., Im, N., Menna, R., Horodezky, N., et al. (2000). The interface between ADHD and language impairment: An examination of language, achievement, and cognitive processing. *Journal of Child Psychology & Psychiatry, 41*, 353-362.

Craig, H., & Washington, J. (1993). The access behaviors of children with specific language impairment. *Journal of Speech and Hearing Research, 36*, 322-337.

Crick, N. R., & Dodge, K. A. (1994). A review and reformulations of social information-processing mechanisms in children's social adjustment. *Psychological Bulletin, 115*, 74-101.

Critchley, M. (1964). *Developmental dyslexia*. London: W. Heineman Medical Books, Ltd.

Dale, P. (1996). Language and emotion: A developmental perspective. In J. H. Beitchman, N. J. Cohen, M. M. Konstantareas & R. Tannock (Eds.), *Language, learning, and behavior disorder: Developmental, biological, and clinical perspectives* (pp. 5-22). New York: Cambridge University Press.

Daneman, M., & Carpenter, P. (1980). Individual differences in working memory and reading. *Journal of Verbal Learning and Verbal Behavior, 19*, 450-466.

deAjuriaguerra, J., Jaeggi, A., Guignaro, F., Kocher, F., Mauard, M., Roth, S., et al. (1976). The development and prognosis of dysphasia in children. In D. Morehead & A. Morehead (Eds.), *Normal and deficient child language* (pp. 345-385). Baltimore: University Park Press.

Denckla, M. B. (1977). Minimal brain dysfunction and dyslexia: Beyond diagnosis by exclusion. In M. Blaw, I. Rapin & M. Kinsborne (Eds.), *Topics in child neurology* (pp. 79-86). New York: Spectrum Publications.

Dodd, B. (1995). *Differential diagnosis and treatment of children with speech disorders*. San Diego, CA: Singular Press.

Dodge, K., Pettit, G., McClaskey, C., & Brown, M. (1986). Social competence in children. *Monographs of the Society for Research in Child Development, 51*, 213-221.

Dubard, E., & Martin, M. (1997). *Teaching language deficient children*. Cambridge, MA: Educators Publishing Service, Inc.

Duchan, J. (2001). History of speech-pathology in America. Retrieved September 17, 2005, from http://www.acsu.buffalo.edu/~duchan/history_subpages/mildredmcginnis.html

Egeland, B., Kalkoske, M., Gottesman, N., & Erickson, M. (1990). Preschool behavior problems: Stability and factors accounting for change. *Journal of Child Psychology & Psychiatry, 31*, 891-909.

Eisenson, J. (1972). *Aphasia in children*. New York: Harper & Row.

Evans, L. (1990). A conceptual overview IQ and achievement scores. *Journal of Learning Disabilities, 23*, 406-412.

Falik, L. H. (1995). Family patterns of reaction to a child with a learning disability: a mediational perspective. *Journal of Learning Disabilities, 28*, 335-341.

Fey, M. E., Catts, H. W., & Larrivee, L. S. (1995). Preparing preschoolers for the academic and social challenges of school. In M. E. Fey, J. Windsor & S. F. Warren (Eds.), *Language intervention: Preschool through the elementary years* (pp. 3-38). Baltimore: Paul H. Brookes.

Finkelstein, N., & Ramey, C. (1980). Information from birth certificates as a risk index for educational handicap. *American Journal of Mental Deficiency, 84*(6), 546-552.

Fischel, J., Whitehurst, G., Caulfield, M., & DeBaryshe, B. (1989). Language growth in children with expressive language delay. *Pediatrics, 82*, 218-227.

Fischer, M., Barkley, R., Edelbrock, C., & Smallish, L. (1990). The adolescent outcome of hyperactive children diagnosed by research criteria: II. *Journal of Consulting and Clinical Psychology, 58*, 580-588.

Forness, S., & Kavale, K. (1996). Treating social skill deficits in children with learning disabilities: a meta-analysis. *Journal of Learning Disabilities, 19*, 80-89.

Furstenberg, F., Brooks-Gunn, J., & Chase-Lansdale, L. (1989). Teenaged pregnancy and childbearing. *American Psychologist, 44*(2), 313-320.

Garber, J., Walker, L., & Zeman, J. (1991). Somatization symptoms in a community sample of children and adolescents: Further validation of the Children's Somatization Inventory. *Psychological Assessment, 3*, 588-595.

Gathercole, S., & Pickering, S. (2000). Working memory deficits in children with low achievements in the national curriculum at 7 years of age. *British Journal of Educational Psychology, 70*, 177-194.

General Information about Speech and Language Disorders. (1996). Retrieved October 1, 2005, from http://www.ldonline.org/ld_indepth/speech-language/asha_lateblooming.html

Gillon, G. T. (2000). The efficacy of phonological awareness intervention for children with spoken language impairment. *Language, Speech, and Hearing Services in Schools, 31*, 126-141.

Girolametto, L., Wiigs, M., Smyth, R., Weitzman, E., & Pearce, P. S. (2001). Children with a history of expressive vocabulary delay: Outcomes at 5 years of age. *American Journal of Speech-Language Pathology, 10*, 358-369.

Goldberg, D., McLaughlin, M., Grossi, M., Tytun, A., & Blum, S. (1992). Which newborns in New York City are at risk for special education placement? *American Journal of Public Health, 82*(3), 438-440.

Goulandris, N. K., Snowling, M. J., & Walker, I. (2000). Is dyslexia a form of specific language impairment? A comparison of dyslexic and language impaired children as adolescents. *Annals of Dyslexia*.

Greenberg, P. E., Sisitsky, T., & Kessler, R. C. (1999). The economic burden of anxiety disorders in the 1990s. *Journal of Clinical Psychiatry, 60*, 427-435.

Gualtieri, C. T., Koriath, U., Van Bourgondien, M., & Saleeby, N. (1983). Language disorders in children referred for psychiatric services. *Journal of the American Academy of Child & Adolescent Psychiatry, 22*, 165-171.

Gurlanik, D. (Ed.). (1982). *Webster's New World Dictionary* (2 ed.). New York: Simon and Schuster.

Hall, P., & Tomblin, B. (1978). A follow-up study of children with articulation and language disorders. *Journal of Speech & Hearing Disorders, 43*, 227-241.

Hallahan, D., & Kauffman, J. (1997). *Exceptional Learners: Introduction to Special Education* (7th ed.). Boston: Allyn & Bacon.

Hallahan, D., Kauffman, J., & Lloyd, J. (1996). *Introduction to Learning Disabilities* (3rd ed.). Englewood Cliffs, NJ: Prentice Hall

Halsey, C., Collin, M., & Anderson, C. (1993). Extremely low birth weight children and their peers: a comparison of preschool performance. *Pediatrics, 91*(4), 807-811.

Hammill, D. (1990). On defining learning disabilities: an emerging consensus. *Journal of Learning Disabilities, 23*, 74-84.

Hayes, S. C., Gifford, E. V., & Ruckstuhl, L. E., Jr. (1996). Relational frame theory and executive function. In G. R. Lyon & N. A. Krasnegor (Eds.), *Attention, memory, and executive function* (pp. 279-305). Baltimore: Paul H. Brookes.

Hazel, J. S., & Schumaker, J. B. (1988). Social skills and learning disabilities: Current issues and recommendations for future research. In J. F. Kavanagh & T. J. Truss (Eds.), *Learning disabilities: Proceedings of the national conference* (pp. 293-344). Parkton, MD: York Press.

Hedge, M. (1996). *Pocket Guide to Treatment in Speech-Language Pathology*. San Diego: Singular Publishing Group.

Hinshaw, S. (1992). Externalizing behavior problems and academic under-achievement in childhood and adolescence: causal relationships and underlying mechanisms. *Psychological Bulletin, 111*, 127-155.

Hoff-Ginsberg, E. (1998). The relation of birth order and socioeconomic status to children's language experience and language development. *Applied Psycholinguistics, 19*(4), 603-629.

Horn, W., & Packard, T. (1985). Early identification of learning problems: A meta-analysis. *Journal of Educational Psychology, 77*, 597-607.

Humphries, T., Koltun, H., Malone, M., & Roberts, W. (1994). Teacher-identified oral language difficulties among boys with attention problems. *Developmental and Behavioral Pediatrics, 15*, 92-98.

Hunt, J. (1968). *Revisiting Montessori: Early Childhood Education Rediscovered*. New York: Holt, Rinehart & Winston.

Jacobson, N. & Truax, P. (1991). Clinical significance: A statistical approach to defining meaningful change in psychotherapy research. *Journal of Consulting and Clinical Psychology, 59, 12-19.*

Jensen, P., Arnold, L., & Richters, J. (1999). A 14-month randomized clinical trial of treatment strategies for children with attention-deficit/hyperactivity disorder. *Archives of General Psychiatry, 56*, 1073-1086.

Johnson, C., Beitchman, J., Young, A., Escobar, M., Atkinson, L., Wilson, B., et al. (1999). Fourteen-year follow-up of children with and without speech/language impairments: Speech/language stability and outcomes. *Journal of Speech, Language, & Hearing Research, 42*, 744-760.

Johnson, D., & Myklebust, H. (1967). *Learning Disabilities*. New York: Grune & Stratton.

Johnston, D. (1982). The language disordered child. In N. A. Lass, L. V. McReynolds, J. L. Northern & D. E. Yoder (Eds.), *Speech, language, and hearing, Vol II: Pathologies of speech and language* (pp. 780-801). Philadelphia: W.B. Saunders.

Justice, L. M. (2003). Emergent literacy intervention for vulnerable preschoolers: Relative effects of two approaches. *American Journal of Speech-Language Pathology, 12,* 320-332.

Kaminska, A. (1995). Exploratory emotion decoding tasks. Unpublished doctoral dissertation, Toronto, ON: Ontario Institute for Studies in Education.

Kamphaus, R., & Reynolds, C. (1992). *Behavioral Assessment Scale for Children*. New York: AGS Publishing.

Karatekin, C., & Asarnow, R. F. (1998). Working memory in childhood onset schizophrenia and attention-deficit hyperactivity disorder. *Psychiatry Research, 80*, 165-176.

Kauffman, J. (1997). *Characteristics of Emotional and Behavioral Disorders of Children and Youth* (6th ed.). Englewood Cliffs, NJ: Prentice Hall

Kavale, K., & Forness, S. (1995). *The Nature of Learning Disabilities: Critical Elements of Diagnosis and Classification*. Mahwah, NJ: Erlbaum

Kavale, K., Forness, S., & Lorsbach, T. (1991). Definition for definitions of learning disabilities. *Journal of Learning Disabilities, 14*, 257-268.

Kavale, K., Fuchs, D., & Scruggs, T. (1994). Setting the record straight on learning disability and low achievement: implications for policy making. *Learning Disabilities Research and Practice, 9*, 70-77.

Kempton, S., Vance, A., Maruff, E., Luk, E., Costin, C., & Pantelis, C. (1999). Executive function and attention deficit hyperactivity disorder: stimulant medication and better executive function performance in children. *Psychological Medicine, 29*, 527-538.

Kessler, R. C., MccGonagle, K. A., & Zhao, S. (1994). Lifetime and 12-month prevalence of DSM-III-R psychiatric disorders in the United States: results from the National Comorbidity Study. *Archives of General Psychiatry, 51*, 8-19.

King, R. R., Jones, C., & Lasky, E. (1982). In retrospect: A fifteen-year follow-up report of speech-language-disordered children. *Language, Speech and Hearing Services in Schools, 13*, 24-32.

Kintsch, W. (1998). *Comprehension. A paradigm for congnition*. Cambridge, UK: Cambridge University Press.

Kochanek, T., Kabacoff, R., & Lipsitt, L. (1990). Early identification of developmentally disabled and at-risk preschool children. *Exceptional Children, 56*(6), 528-538.

Ladd, G., Birch, S., & Buhs, E. (1999). Children's social and scholastic lives in kindergarten: Related spheres of influence? *Child Development, 70*, 1373-1400.

Lahey, M., & Edwards, J. (1995). Specific language impairment: Preliminary investigation of factors associated with family history and with patterns of language performance. *Journal of Speech and Hearing Research, 38*, 643-657.

Lam, C., & Beale, I. (1991). Relations among sustained attention, reading performance, and teachers' ratings of behavior problems. *Remedial and Special Education, 12*, 40-47.

Larrivee, L. S., & Catts, H. W. (1999). Early reading achievement in children with expressive phonological disorders. *American Journal of Speech-Language Pathology, 8*, 118-128.

Lavigne, J., Gibbons, R., Christoffel, K., Arend, R., Rosenbaum, D., & Binns, H. (1996). Prevalence rates and correlates of psychiatric disorders among preschool children. *Journal of the American Academy of Child & Adolescent Psychiatry, 35*, 204-214.

Law, J., Boyle, J., Harris, F., Harkness, A., & Nye, C. (2000). Prevalence and natural history of primary speech and language delay: findings from a systematic review of the literature. *International Journal of Language & Communication Disorders, 35*, 165-188.

Layton, L., Deeny, K., Upton, G., & Tall, G. (1998). A pre-school training programme for children with poor phonological awareness: Effects on reading and spelling. *Journal of Research in Reading, 21*, 36-52.

Lewis, B., & Thomson, L. (1992). A study of developmental speech and language disorders in twins. *Journal of Speech and Hearing Research, 35*, 1086-1094.

Lundberg, L., Frost, J., & Peterson, O. (1988). Effects of an extensive program for stimulating phonological awareness in preschool children. *Reading Research Quarterly, 23*, 263-284.

Lyon, G. R. (1996). Special Education for Students with Disabilities. *The Future of Children, 6*.

Maag, J., & Reid, R. (1994). The phenomenology of depression among students with and without learning disabilities: more similar than different. *Learning Disabilities Research and Practice, 9*, 91-103.

Majsterek, D. J., Shorr, D. N., & Erion, V. L. (2000). Promoting early literacy through rhyme detection activities during Head Start circle time. *Child Study Journal, 30*, 143-151.

Martinussen, R., & McInnes, A. (2001). *Visual spatial memory in attention-deficit/hyperactivity disorder: Subtype differences and stimulant effects.* Paper presented at the Society for Research in Child Development Biennial Meeting, Minneapolis, Minnesota.

Mattis, S., French, J. H., & Ralph, I. (1975). Dyslexia in children and young adults: Three independent neuropsychological syndromes. *Developmental Medicine & Child Neurology, 17*, 150-163.

McGee, R., Partridge, F., Williams, S., & Silva, P. A. (1991). A twelve-year follow-up of preschool hyperactive children. *Journal of the American Academy of Child & Adolescent Psychiatry, 30*, 224-232.

McGee, R., Prior, M., Williams, S., Smart, D., & Sanson, A. (2002). The long-term significance of teacher-rated hyperactivity and reading ability in childhood: Findings from two longitudinal studies. *Journal of Child Psychology & Psychiatry, 43*, 1004-1017.

McGee, R., & Share, D. (1988). Attention Deficit Disorder-Hyperactivity and academic failure: Which comes first and what should be treated? *Journal of the American Academy of Child & Adolescent Psychiatry, 27*, 318-325.

McInnes, A., Humphries, T., Hogg-Johnson, S., & Tannock, R. (2003). Listening comprehension and working memory are impaired in attention-deficit hyperactivity disorder irrespective of language impairment. *Journal of Abnormal Child Psychology, 31*, 427-443.

Merrell, K., & Wolfe, T. (1998). The relationship of teacher-rated social skills deficits and ADHD characteristics among kindergarten-age children. *Psychology in the Schools, 35*, 101-109.

Miller, B., & Moore, K. (1990). Adolescent sexual behavior, pregnancy, and parenting: Research through the 1980s. *Journal of Marriage and the Family, 52*, 1025-1044.

Montessori. (2005). Retrieved October 2, 2005, from http://www.montessori.edu

Myers, P., & Hammill, D. (1992). *Learning Disabilities: Basic Concepts, Assessment Practices, and Instructional Strategies* (4th ed.). Austin, TX: PRO-ED.

Myklebust, H. (1954). *Auditory disorders in children: A manual for differential diagnosis*. New York: Grune & Stratton.

Nabuzoka, D., & Smith, P. K. (1995). Identification of expression of emotions by children with learning disabilities. *Learning Disabilities Research and Practice, 10*, 91-100.

Nation, K., Adams, J. W., Bowyer-Crane, C. A., & Snowling, M. J. (1999). Working memory deficits in poor comprehenders reflects underlying language impairments. *Journal of Experimental Child Psychology, 73*, 139-158.

Neils, J., & Aram, D. (1986). Family history of children with developmental language disorders. *Perceptual And Motor Skills, 63*, 655-658.

Nelson, J., Benner, G., & Gonzales, J. (2003). Learner characteristics that influence the treatment effectiveness of early literacy interventions: A meta-analytic review. *Learning Disabilities Research and Practice, 18*, 255-267.

O'Connor, R. E., Jenkins, J. R., Leicester, N., & Slocum, T. A. (1993). Teaching phonological awareness to young children with learning disabilities. *Exceptional Children, 59*, 532-546.

Olswang, L., Long, S., & Fletcher, P. (1997). Verbs in the emergence of word combinations in young children with specific expressive language impairment. *European Journal of Disorders of Communication, 32*, 15-33.

Olswang, L., Rodriguez, B., & Timler, G. (1998). Recommending intervention for toddlers with specific language learning difficulties: We may not have all the answers, but we know a lot. *American Journal of Speech-Language Pathology, 7*, 23-32.

Oram, J., Fine, J., Okamoto, C., & Tannock, R. (1999). Assessing the language of children with attention deficit hyperactivity disorder. *American Journal of Speech-Language Pathology*.

Ozols, S., & Rourke, B. P. (1985). Dimensions of social sensitivity in two types of learning-disabled children. In B. P. Rourke (Ed.), *Neuropsychology of learning disabilities* (pp. 281-301). New York: Guilford Press.

Paul, R. (1991). Profiles of toddlers with slow expressive language development. *Topics in Language Disorders, 11*, 1-13.

Paul, R. (1996). Clinical implications of the natural history of slow expressive language development. *American Journal of Speech-Language Pathology, 5*, 5-21.

Paul, R. (2001). *Language disorders from infancy through adolescence: Assessment and intervention* (2nd ed.). New York: Mosby.

Paul, R., & Alforde, S. (1993). Grammatical morpheme acquisition in 4-year-olds with normal, impaired, and late developing language. *Journal of Speech and Hearing Research, 36*, 1271-1275.

Paul, R., Looney, S., & Dahm, P. (1991). Communication and socialization skills at ages 2 and 3 in "late-talking" young children. *Joumal of Speech and Hearing Research, 34*, 858-865.

Pennington, B. F., & Ozonoff, S. (1996). Executive functions and developmental psychopathology. *Journal of Child Psychology and Psychiatry, 37*, 51-87.

Pickering, J. (October 1988). *Montessori Applied to Children at High Risk.* Paper presented at the Orton Dyslexia Society, Tampa.

Pickering, J. (2003). Montessori and Learning Differences. *Montessori Life, 15*, 13.

Pickering, J. (2004a). The At Risk child: How the Montessori classroom enhances learning: Part 1. *Montessori Life, 16,* 8-11.

Pickering, J. (2004b). The At Risk Child: How the Montessori Classroom Enhances Learning: Part 2. *Montessori Life, 16,* 8-11.

Pine, J. (1995). Variation in vocabulary development as a function of birth order. *Child Development, 66*, 272-281.

Prizant, B. M., Audet, L. R., Burke, G. M., Hummel, L. J., & et al. (1990). Communication disorders and emotional/behavioral disorders in children and adolescents. *Journal of Speech & Hearing Disorders, 55*, 179-192.

Purvis, K. L., & Tannock, R. (1997). Language Abilities in Children with Attention Deficit Hyperactivity Disorder, Reading Disabilities, and Normal Controls. *Journal of Abnormal Child Psychology, 25*, 133-144.

Rabiner, D., Coie, J. D., & theConductProblemsPreventionResearchGroup. (2000). Early attention problems and children's reading achievement: A longitudinal investigation. *Journal of the American Academy of Child & Adolescent Psychiatry, 39*, 859-867.

Ramey, C., & Campbell, F. (1984). Preventive education for high-risk children: Cognitive consequences of the Carolina Abecedarian Project. *American Journal of Mental Deficiency, 88*, 515-523.

Rescorla, L. (1993). *Outcome of toddlers with specific expressive delay (SELD) at ages 3, 4, 5, 6, 7, & S.* Paper presented at the biennial meeting of the Society for Research.

Rescorla, L., Hadicke-Wiley, M., & Escarce, E. (1993). Epidemiological investigation of expressive language delay at age two. *First Language, 13*, 5-22.

Rescorla, L., Roberts, J., & Dahlsgaard, K. (1997). Latetalkers at 2: Outcomes at age 3. *Journal of Speech Language and Hearing Research, 40*, 556-566.

Rescorla, L., & Schwartz, E. (1990). Outcome of toddlers with specific expressive language delay. *Applied Psycholinguistics, I*, 393-407.

Ribner, S. (1978). The effects of special class placement on the self-concept of exceptional children. *Journal of Learning Disabilities, 11*, 319-323.

Rice, M., Spitz, R., & O'Brien, M. (1999). Semantic and morphosyntactic language outcomes in biologically at-risk children. *Journal of Neurolinguistics, 12*, 213-234.

Rissman, M., Curtiss, S., & Tallal, P. (1990). School placement outcomes of young language impaired children. *Journal of Speech Language Pathology and Audiology, 14*, 49-58.

Rowland, A., Lesesne, C., & Abramowitz, A. (2002). The epidemiology of attention-deficit/hyperactivity disorder (ADHD): a public health view. *Mental Retardation Developmental Disability Research Review*(8), 162-170.

Russell, R. L., Greenwald, S., & Shirk, S. R. (1991). Language change in child psychotherapy: A meta-analytic review. *Journal of Consulting and Clinical Psychology, 59*, 916-919.

Rutter, M., & Mawhood, L. (1991). The long-term psychosocial sequelae of specific developmental disorders of speech and language. In M. Rutter & P. Casaer (Eds.), *Biological risk factors for psychosocial disorders* (pp. 233-259). Cambridge: Cambridge University Press.

Rvachew, S. (2003). Phonological awareness and phonemic perception in 4-year-old children with delayed expressive phonology skills. *American Journal of Speech-Language Pathology*.

Scarborough, H. (1990). Very early language deficits in dyslexic children. *Child Development, 61*, 1728-1743.

Scarborough, H., & Dobrich, W. (1990). Development of children with early language delay. *Journal of Speech and Hearing Research, 33*, 70-83.

Selman, R. L., & Demorest, A. (1984). Observing troubled children's interpersonal negotiating strategies: Implications of and for a developmental model. *Child Development, 55*, 288-304.

Semel, E., Wiig, E., & Secord, W. (2003). *Clinical Evaluation of Language Fundamentals Preschool-Second Edition*. New York The Psychological Corporation.

Semel, E., Wiig, E. H., & Secord, W. (1987). *Clinical Evaluation of Language Fundamentals-Revised*. New York: The Psychological Corporation, Harcourt Brace Jovanovitch.

Semrud-Clikeman, M., & Hynd, G. (1991). Review of issues and measures in childhood depression. *School Psychology International, 12*, 275-298.

Share, D. (1995). Phonological recoding and self-teaching: Sine qua non of reading acquisition. *Cognition, 55*, 151-218.

Shaw, S., Cullen, J., McGuire, J., & Brinckerhoff, L. (1995). Operationalizing a definition of learning disabilities. *Journal of Learning Disabilities, 28*, 586-597.

Shaywitz, B., Fletcher, J., Holahan, J., & Shaywitz, S. (1992). Discrepancy compared to low achievement definitions of reading disability: Results from the Connecticut Longitudinal Study. *Journal of Learning Disabilities, 25*, 639-648.

Shedd, C. L. (1967). Some characteristics of a specific perceptual motor disability. *Journal of the Medical Association of Alabama, 37*, 150-162.

Spira, E., & Fischel, J. (2005). The impact of preschool inattention, hyperactivity, and impulsivity on social and academic development: a review. *Journal of Child Psychology & Psychiatry, 46*, 755-773.

Spitz, R., Tallal, P., Flax, J., & Benasich, A. (1997). Look who's talking: A prospective study of familial transmission of language impairments. *Journal of Speech, Language, & Hearing Research, 40*, 990-1001.

Stacey, K. (1994). Language as an exclusive or inclusive concept: Reaching beyond the verbal. *The Australian and New Zealand Journal of Family Therapy, 16*, 123-132.

Stanford, L., & Hynd, G. (1994). Congruence of behavioral symptomatology in children with ADD/H, ADD/WO, and learning disabilities. *Journal of Learning Disabilities, 27*, 243-253.

Stanovich, K. E. (1988). Explaining the differences between the dyslexic and the garden-variety poor reader: The phonological-core variable-difference model. *Journal of Learning Disabilities, 21*, 590-604.

Stanton-Chapman, T., Chapman, D., Bainbridge, N., & Scott, K. (2002). Identification of early risk factors for language impairment. *Research in Developmental Disabilities, 23*, 390-405.

Stark, R. E., & Tallal, P. (1988). *Language, speech, and reading disorders in children: Neuropsychological studies*. Boston, MA: A College-Hill Publication.

Staub, E., & Eisenberg, N. (1981). Social cognition, affect, and behavior: An essay and review of Robert Selman's The growth of interpersonal understanding: Developmental and clinical analyses. *Developmental Review, 1*, 385-400.

Strauss, C. (1990). Anxiety disorders of childhood and adolescence. *School Psychology Review*(19), 142-157.

Strominger, A. Z. (1983). A follow-up of reading and linguistic abilities in language-delayed children: Unpublished doctoral dissertation, Boston University.

Sullivan, A., & Perigoe, C. (2001). The Association Method for children with hearing loss and special needs. *The Volta Review, 104*, 339-348.

Swanson, H. (1991). *Handbook on the Assessment of Learning Disabilities: Theory, Research and Practice*. Austin, TX: PRO-ED.

Swanson, H. (1999). Reading comprehension and working memory in learning disabled readers: Is the phonological loop more important than the executive system? *Journal of Experimental Child Psychology, 72*, 1-31.

Tallal, P. (1988). Developmental language disorders. In J. F. Kavanagh & T. J. Truss, Jr. (Eds.), *Learning disabilities: Proceedings of the national conference* (pp. 181-272). Parkton, MD: York Press.

Tallal, P., Ross, R., & Curtiss, S. (1989). Family aggregation in specific language impairment. *Journal of Speech, Hearing and Language Research, 27*, 987-998.

Tannock, R. (1998). Attention deficit hyperactivity disorder: Advances in cognitive, neurobiological, and genetic research. *Journal of Child Psychology & Psychiatry, 39*, 65-100.

Tannock, R., Purvis, K. L., & Schachar, R. J. (1993). Narrative abilities in children with attention deficit disorder and normal peers. *Journal of Abnormal Child Psychology, 21*, 103-117.

Tannock, R., & Schachar, R. (1996). Executive dysfunction as an underlying mechanism of behavior and language problems in attention deficit hyperactivity disorder. In N. C. J. H. Beitchman, M. M. Konstantareas, & R. Tannock (Ed.), *Language learning and behavior disorders: Developmental, biological, and clinical perspectives* (pp. 128-155). Cambridge, England: Cambridge University Press.

Thal, D., & Katich, J. (1996). Predicaments in early identification of specific language impairment: Does the early bird always catch the worm? In K. Cole, P. Dale & D. Thal (Eds.), *Assessment of communication and language* (pp. 1-28). Baltimore: Paul H. Brookes.

Thal, D., Oroz, M., Evans, D., Katich, J., & Leasure, K. (1995). *From first words to grammar in late-talking toddlers.* Paper presented at the annual Symposium on Research in Child Language Disorders, Madison, WI.

Thal, D., & Tobias, S. (1992). Communicative gestures in children with delayed onset of oral expressive vocabulary. *Journal of Speech and Hearing Research, 35*, 1281-1289.

Tomblin, J. (1989). Familial concentration of developmental language impairment. *Journal of Speech & Hearing Disorders, 54*, 287-295.

Tomblin, J., Hardy, J., & Hein, H. (1991). Predicting poor-communication status in preschool children using risk factors present at birth. *Journal of Speech & Hearing Research, 34*, 1096-1105.

Tomblin, J., Records, N., Buckwalter, P., Zhang, X., Smith, E., & O'Brien, M. (1997). Prevalence of specific language impairment in kindergarten children. *Journal of Speech, Language, and Hearing Research, 40*, 1245-1260.

Tomblin, J., Smith, E., & Zhang, X. (1997). Epidemiology of specific language impairment: Prenatal and perinatal risk factors. *Journal of Communication Disorders, 30*, 325-344.

Torgesen, J. (1990). *Cognitive and Behavioral Characteristics of Children With Learning Disabilities*. Austin, TX: PRO-ED.

Torgesen, J., Wagner, R., & Rashotte, C. (1994). Longitudinal studies of phonological processing and reading. *Journal of Learning Disabilities, 27*, 276-286.

Vadasy, P., Jenkins, J., Antil, L., Wayne, S., & O'Connor, R. (1997). Community-based early reading intervention for at-risk first-graders. *Learning Disabilities Research and Practice, 12*, 29-39.

Vallance, D. D., & Cohen, N. J. (1997). *Association between pragmatic competence and language impairments in psychiatrically referred children*.Unpublished manuscript.

Vallance, D. D., Im, N., & Cohen, N. J. (1999). Discourse deficits associated with psychiatric disorders and with language impairments in children. *Journal of Child Psychology & Psychiatry, 40*, 693-704.

Van der Lely, H., & Stollwerk, L. (1996). A grammatical specific language impairment in children. An autosomal dominant inheritance? *Brain and Language, 52*, 484-504.

van Kleeck, A., Gillam, R. B., & McFadden, T. U. (1998). A study of clasroom-based phonological awareness training for preschoolers with speech and/or language disorders. *American Journal of Speech-Language Pathology, 7*, 65-76.

Vaughn, S., Hogan, A., Kouzekani, K., & Shapiro, S. (1990). Peer acceptance, self-perceptions, and social skills of learning disabled students prior to identification. *Journal of Educational Psychology, 82*, 101-106.

Vaughn, S., Hogan, A., Lancelotta, G., Shapiro, S., & Walker, J. (1992). Subgroups of children with severe and mild behavior problems: Social competence and reading achievement. *Journal of Clinical Child Psychology, 21*, 98-106.

Ward, S. (1999). An investigation into the effectiveness of an early intervention method for delayed language development in young children. *International Journal of Language & Communication Disorders, 34*, 243-264.

Warr-Leeper, G., Wright, N. A., & Mack, A. (1994). Language disabilities of antisocial boys in residential treatment. *Behavior Disorders, 19*, 159-169.

Weiner, P. S. (1985). The value of follow-up studies. *Topics in Language Disorders, 5*, 78-92.

Weismer, S., Murray-Branch, J., & Miller, J. (1993). A comparison of two methods for promoting productive vocabulary in late talkers. *Journal of Speech and Hearing Research, 36*, 1037-1050.

Whitehurst, G. J., & Fischel, J. E. (1994). Practitioner review: Early developmental language delay: What, if anything, should the clinician do about it? . *Journal of Child Psychology and Psychiatry, 35*, 613-648.

Whitehurst, G. J., Fischel, J. E., Lonigan, C. J., Valdez-Menchaca, M. C., Arnold, D. S., & Smith, M. (1991). Treatment of early expressive language delay: If, when, and how. *Topics in Language Disorders, 11*, 55-68.

Widerstrom, A. (1997). Newborns and infants at-risk for or with disabilities. In A. Widerstrom, B. Mowder & S. Sandall (Eds.), *Infant development and risk* (2nd ed., pp. 3-18). Baltimore, MD: Paul H. Brookes Publishing Co.

Wiig, E., Secord, W., & Semel, E. (2004). *Clinical Evaluation of Language Fundamentals-Fourth Edition*. San Antonio, TX: Harcourt Assessment, Inc.

Williams, D., Stott, C. M., Goodyer, I. M., & Sahakian, B. J. (2000). Specific language impairment with or without hyperactivity: Neuropsychological evidence for frontostriatal dysfunction. *Developmental Medicine & Child Neurology, 42*, 368-375.

Wittchen, H. U., & Beloch, E. (1996). The impact of social phobia on quality of life. *International Journal of Clinical Psychopharmacology, 11 (suppl 3)*, 15-23.

Wong, B. (1989). Is IQ necessary in the definition of learning disabilities? Introduction to the special series. *Journal of Learning Disabilities, 22*, 468-520.

Zwaan, R., & Radvansky, G. A. (1998). Situation models in language comprehension and memory. *Exceptional Children, 60*, 143-153.

VITAE

Kristen M. Ohlenforst was born in Irving, TX, on April 25, 1978, to Dr. Patrick M. Ohlenforst and Cynthia M. Ohlenforst, who are currently enjoying their 35th year of marriage. She is the older sister to Lauren J. Ohlenforst, a rising second year student at Baylor College of Dentistry, and to Megan K. Ohlenforst, a rising senior at the University of Notre Dame. After graduating high school from Ursuline Academy of Dallas, TX, she attended the University of Notre Dame, where she received her Bachelor of Arts in Studio Art and Design, with a minor in Art History. Upon graduating summa cum laude from Notre Dame in May of 2000, she moved back to Dallas to work as a web designer. One year later, disenchanted with the corporate cubicle, she spent a year taking psychology courses at The University of Texas at Dallas and at The University of North Texas. During this year, she was accepted into the Clinical Psychology Doctoral Program of the Graduate School of Biomedical Sciences at The University of Texas Southwestern Medical Center at Dallas. She entered the program in August of 2002. She created and sold oil paintings on commission throughout her graduate studies, an endeavor which served not only to balance her right and left hemispheres, but also to fund her education. She is very excited to have accepted a Postdoctoral Fellowship in Child/Adolescent Psychology at Stanford University School of Medicine, which will begin on September 1, 2006.

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