

ASSESSING LEARNING DISABILITIES:
EFFECTIVENESS OF THE SYMBOL LANGUAGE AND COMMUNICATION BATTERY
(SLCB)

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This study examined whether the Symbol Language and Communication Battery (SLCB), a measure of learning disabilities (Lds), could identify children with Lds. In addition, possible behavioral differences were examined between unidentified and identified children. Eighty-five students (26 with school identified Lds; 59 unidentified) in the 4th and 5th grade participated in the study. Results indicated that the SLCB has good potential as a supplemental/screening measure of Lds. The SLCB was most effective in identifying children when SLCB diagnoses were restricted to the areas of reading, math, and writing. This study also found that teachers reported more behavioral problems in children with an SLCB diagnosis than children without a diagnosis, whereas unidentified children with SCLB diagnoses reported more behavioral problems than identified children.

TABLE OF CONTENTS

	Page
LIST OF TABLES.....	iv
Chapter	
1. INTRODUCTION.....	1
Overview	
Development of the Construct of LD	
Diagnosing LD	
Methods of assessment	
Assessment measures	
Issues with the Construct of LD	
Assumptions of LD	
Alternate Theory of LD	
SLCB	
Development of the SLCB	
Use of the SLCB	
WISC-R and symbol skills	
Statement of Problem	
Hypotheses	
Supplementary Hypotheses	
2. METHOD.....	31
Participants	
Materials	
Scoring of the SLCB	
Behavioral Assessment System for Children	
Procedure	
3. RESULTS.....	42
Sample Characteristics	
Hypotheses Results	
Hypothesis 1.	
Hypothesis 2.	

Hypothesis 3.
Hypothesis 4.
Supplementary Analyses

4. DISCUSSION.....	52
APPENDIX A.....	61
APPENDIX B.....	80
APPENDIX C.....	84
APPENDIX D.....	95
APPENDIX E.....	112
REFERENCES.....	116

LIST OF TABLES

Table		Page
1.	Definitions and Age Ranges of Symbol Skills.....	62
2.	Summary of Specific Syndromes and Functions.....	64
3.	Descriptions of Specific LDs Included in the Current Paradigm and Corresponding DSM-IV Diagnoses.....	66
4.	Developmental Specific Learning Disabilities.....	68
5.	Winston School Learning Disability Diagnoses.....	70
6.	Demographics.....	71
7.	Pearson Correlations for SLCB Variables.....	72
8.	Pearson Correlations Between BASC Composite Variables.....	74
9.	Pearson Correlations Between SLCB Sections and WISC-III Subtests.....	75
10.	Estimates of Diagnostic Validity Based Upon the Use of the SLCB in Public and Private Schools.....	77
11.	Estimates of Diagnostic Validity Based Upon the Use of the SLCB in Public Schools.....	78
12.	SCHOOL-LD Children Unidentified by the SLCB.....	79

CHAPTER 1

INTRODUCTION

Overview

Learning disabilities (LDs) have been an interest to the scientific community since the 1800s. However, it was not until 1968 that LDs were officially designated as a handicapping condition. Since that time, children in U.S. public schools who have been diagnosed with LDs have received special services. Despite fervent interest in and research on LDs, confusion still exists as to the best way to identify and assist children with these disorders. Thus, the purpose of this investigation was to determine whether one specific measure of LDs, the Symbol Language and Communication Battery (SLCB), could be used in public and private schools to identify children with LDs.

In this paper, a brief history of the construct of LD will be presented. In particular, the development of LD as a federally recognized field will be highlighted. Legislative definitions, diagnostic criteria, and methods for the assessment of LD will also be presented. The paper will then discuss criticisms and controversial issues with the present definition and typical assessment procedures. Current theories developed to address those criticisms will be discussed, with emphasis placed on a particular neurologic theory of

LDs which led to the development of the SLCB. The SLCB will be discussed as a proposed adjunct to the assessment of LDs, and a validation study designed to show that the SLCB would help public and private schools in the identification of children with LDs will be described.

Development of the construct LD

Multiple theories and rationales for the construct of LDs have been defined throughout the past two centuries. Summarizing the evolution of LDs helps to conceptualize the present state of the field, since the study of LDs is not a recent phenomenon. As early as 1800, scientists became interested in language and learning difficulties. During the “foundation phase” (1800-1930), theories were formulated by studying behavioral characteristics of brain damaged adults (Dworkin, 1985). For example, at the beginning of the nineteenth century, Joseph Gall described a patient in whom brain damage resulted in the loss of the specific ability to use spoken language (Torgesen, 1991). Much work was done during this phase documenting the loss of various speech and language functions. Among the most well known studies are those of Bouillaud, Broca, Jackson, Wernicke, and Head (Wiederholt, 1974). Such studies led to the establishment that brain damage to isolated regions of the brain could result in specific types of mental impairment (Torgesen, 1991).

Although early studies focused on adults, interest surfaced in the early 1900s on children unable to read. For example, Hinshelwood (1904) described an incident in

which, despite adequate schooling and intellect, a 12- year-old boy was unable to read. In fact, despite the reading difficulties, Hinshelwood documented that the 12-year-old had otherwise normal intellectual abilities (Hinshelwood, 1904). Hinshelwood reported that the student had difficulty storing the visual memory of words (Hinshelwood, 1904), and he coined the boy's problems as "congenital word blindness," resulting from brain damage to a specific area that stored visual memories of words (Hinshelwood, 1904).

Samuel Orton was the next major figure to study LDs in children, and his explanation for reading disability differed from that of Hinshelwood (Orton, 1937). Orton posited that a delay or failure of establishing dominance for language in the left hemisphere of the brain caused the reading disability. The children with reading disabilities, as he saw them, had difficulties differentiating letters such as b and d, p and q, as well as trouble reading reversible words such as not and ton. He defined this difficulty as "strephosymbolia" and, believed it to be a more appropriate term for a reading disability than congenital word blindness (Orton, 1937). His ideas that reversals were symptomatic of a reading disability have not been supported by later research (Lieberman et al., 1971).

In the mid-1900s (1930-1960) psychologists and educators demonstrated their interest in LDs by implementing remedial programs advocated by Hinshelwood and Orton; however, the theories underlying the treatment programs were not well accepted by the educational community (Torgesen, 1991). There was considerable agreement

among the scientific community that there must be central nervous system dysfunctioning in many cases of LD (McIntosh & Dunn, 1973). However, education text-books cited the LD of reading to more often be the result of other factors (Durrell 1940, Vernon, 1957). Thus, instead of attributing reading disability to brain dysfunction, educators and psychologists attributed children's disabilities to environmental, attitudinal, and educational factors (Torgesen, 1991). Environmental factors included ineffective parents, inadequate home language, and lack of cultural opportunities (McIntosh & Dunn, 1973). Attitudinal factors included poor student motivation and learning characteristics, while examples of recognized educational factors were poor instructors, teacher/pupil rejection, and failure experiences (McIntosh & Dunn, 1973).

From approximately 1960 to the present, rapid growth of educational programs for LDs has occurred. This growth is due, in part, to the federal recognition and formal establishment of the field of LD. During this era of development, researchers such as Werner and Strauss were influential in the formal organization of the field (Torgesen, 1991). Werner and Strauss used the terms "cripple-brained, deficient children" or "brain damaged" to describe a group of children, who, despite no physical handicap had brain lesions that resulted in a psychological defects (Strauss, 1943). These psychological defects would be known today as distractibility, hyperactivity, visual-perceptual, and perceptual-motor problems (Torgesen, 1991). According to Werner and Strauss it was such defects as well as their impact on learning that differentiated children with such

defects from the “true feebleminded and mentally crippled” (mentally retarded) children. Based upon their research with brain damaged children, Werner and Strauss developed educational recommendations (i.e. seating children by themselves at large tables, developing individual education plans, no recess, frequent changes in educational material to maintain interest and motivation) (Strauss, 1943). Such recommendations were used in the 1960s in support of the separate identity of LDs from other fields of education such as mental retardation (Torgesen, 1991).

The LDs movement formally began in 1963 when Samuel Kirk proposed the term "learning disabilities." He stated:

Recently, I have used the term "learning disabilities" to describe a group of children who have disorders of development in language, speech, and reading and associated communication skills needed for social interaction. In this group, I do not include children who have sensory handicaps such as blindness or deafness because we have developed methods of training the deaf and blind. I have also excluded from this group children who have generalized mental retardation (Kirk, 1963).

Terms such as "minimal brain dysfunction," and "central processing dysfunction" were proposed, but the term "learning disability" proposed by Kirk was most accepted. In

1968, LD was first recognized as a federally designated handicapping condition and defined by the National Advisory Committee on Handicapped Children by the following:

Children with specific learning disabilities exhibit a disorder in one or more of the basic psychological processes involved in understanding or using spoken or written language. These may be manifested in disorders of listening, thinking, talking, reading, writing, spelling, or arithmetic. They include conditions which have been referred to as perceptual handicaps, brain injury, minimal brain dysfunction, dyslexia, developmental aphasia, and so forth. They do not include learning problems which are due primarily to visual, hearing, or motor handicaps, to mental retardation, emotional disturbance, or to environmental disadvantage (National Advisory Committee on Handicapped Children, 1968).

This definition has been included in such legislation as the Children with Learning Disabilities Act of 1969 (Public Law 91-320) which authorized the U.S. Office of Education to establish programs for students with LDs. It has also been included in the Education of the Handicapped Act of 1975 (Public Law 94-142) which requires all U.S. school districts to provide free and appropriate education to children identified as learning disabled (Dworkin, 1985). The definition has remained unaltered in the recent amendments (P.L. 105-17, 1997) of the Individuals with Disabilities Education Act (IDEA), which is the most recent renaming of The Education of the Handicapped Act.

Legislation such as P.L. 94-142 and actions of advocacy groups have resulted in heightened awareness and emphasis on the identification and treatment of LDs (Dworkin, 1985). Since its inception, the number of identified students with LDs has increased by 156% and nearly half of all children in special services in U.S. schools are now classified as having a learning disability (Moats & Lyon, 1993; Torgesen, 1991). Since 1980 there has been broadened LD parameters, increased service provisions, new remedial techniques, and a growth of professional organizations (Kavale & Forness, 1995).

As seen above, LDs are largely defined by the current legislative mandate. However, different fields use different methods of identifying children with “a disorder in one or more of the basic psychological processes.” Currently, the two fields which diagnose LDs most frequently are psychology and education.

Diagnosing LD

In the United States, the DSM-IV is the diagnostic system most widely utilized by mental health professionals (DSM-IV; American Psychiatric Association, 1994). According to the DSM-IV, a learning disorder is diagnosed when the individual’s achievement on individually administered, standardized tests in reading, mathematics, or written expression is substantially below that expected for age, schooling, and level of intelligence (DSM-IV; American Psychiatric Association, 1994). This criteria further characterizes “substantially below” as usually defined by a discrepancy of more than two standard deviations between achievement and IQ. Utilizing this criteria, a diagnosis of

Reading Disorder, Mathematics Disorder, and Disorder of Written Expression can be made. The DSM-IV also allows for the diagnosis of Learning Disorder Not Otherwise Specified for disorders in learning that do not meet the above criteria.

Although not listed as such in the DSM-IV, motor skills and communication disorders are often thought of as LDs. Developmental Coordination Disorder, with its essential feature of marked impairment in the development of motor coordination, is included under the heading Motor Skills Disorder. Expressive Language Disorder, Mixed Receptive-Expressive Language Disorder, Phonological Disorder, Stuttering, and Communication Disorder Not Otherwise Specified are included as communication disorders. The Expressive and Receptive-Expressive language disorders criteria include a discrepancy between performance on measures of language performance and measures of nonverbal intellectual capacity (DSM-IV; American Psychiatric Association, 1994). All of these disorders, with the exception of stuttering, are usually described as LDs in various presentations of LDs (e.g. Deuel, 1995; Voeller, 1995; Fennell, 1995)

In the United States, each state must use the federal guidelines and mandated definition of LD. Of interest for the current study is the Texas Education Agency's (TEA) guidelines. According to TEA, a student must meet the criteria of the present IDEA definition of LD (see above). In contrast to the DSM-IV definitions, TEA requires that a student's achievement fall one SD below the IQ score for educational service eligibility (TEA, 1996).

Methods of assessment. As all states follow federally mandated LD guidelines, the methods are typically similar from state to state. Specifically, in the state of Texas two legally defined methods of assessment exist (TEA, 1996). "Method 1" requires the demonstration of a severe discrepancy between intellectual and achievement ability in one or more of the following areas: oral expression; listening comprehension; written expression; basic reading skill; reading comprehension; mathematics calculation; or mathematics reasoning. Severity is defined as achievement being at least one standard deviation below intellectual ability. In contrast, "Method 2" allows the diagnosis of LD without numerical evidence of a discrepancy. Method 2 states that if the existence of a severe discrepancy cannot be established due to (a) the lack of appropriate assessment instruments or (b) the assessors belief that a severe discrepancy exists without the student meeting the one standard deviation criteria, the assessor may diagnose an LD. In concordance with Method 2, assessors must specify the LD and the degree of the discrepancy between intellectual ability and achievement (TEA, 1996). Method 2 allows for the diagnosis of motor skills and communication disorders as LDs, which are defined in the DSM-IV, but are not valid in the Method 1 criteria.

In the state of Texas, schools are legally bound to using the above described methods to diagnose LDs. Generally, assessors use Method 1 over Method 2. This may be due to the more subjective nature of Method 2, and/or the need to control funding and curtail the rising number of identified students with LDs. Conversely, the less frequent

use of Method 2 may be due to assessors being more familiar with the more “typical” LDs (e.g. reading, math) than the ones which legally must fall under Method 2 (e.g. non-verbal LD).

Assessment measures. In the State of Texas, as in most states, LD is assessed in children by administering intelligence tests (e.g., the Wechsler Intelligence Scale for Children, Stanford-Binet Intelligence Scale, Kaufman Assessment Battery for Children) and an achievement test (e.g., the Woodcock-Johnson Psycho-Educational Battery, Peabody Individual Achievement Test). Intelligence quotients are compared to achievement and if a significant difference exists (with IQ - achievement greater than or equal to 1 standard deviation), LD is diagnosed. This method allows the assessor an empirical method in which to determine whether a discrepancy exists between intellectual ability and achievement.

The most commonly administered intelligence test is the Wechsler Intelligence Scale for Children (Wechsler, 1991). Subtests are categorized as either relating to verbal or performance intelligence. Verbal subtests include Information, Similarities, Arithmetic, Vocabulary, Comprehension, and Digit Span. They tap into the ability to process verbal information and include assessment of such specific abilities as range of knowledge (Information), auditory sequencing (Digit Span), and numerical reasoning (Arithmetic) (Sattler, 1992). Performance subtests include Picture Completion, Coding, Picture Arrangement, Block Design, Object Assembly, Symbol Search, and Mazes.

Performance subtests tap into nonverbal reasoning including such abilities as visual recognition (Picture Completion), and visual-motor coordination or dexterity (Coding, Mazes) (Sattler, 1992).

Issues with the construct of LD

Given the significant growth of the field of LD, one would anticipate advances in the understanding and definition of LD. Unfortunately, the current definitions of LD lack specificity and rarely describe more than an academic learning difficulty (Morris, 1988). As Moats and Lyon (1993) state, "LD remains one of the least understood yet most debated disabling conditions that affect children in the United States." According to some researchers, a research-based operational definition of LD is warranted (Rosenberg, 1997). Likewise, it is argued that scientific research relating to diagnosis and assessment should accompany the gains made in public recognition of LD (Moats & Lyon, 1993).

Due to the lack of consensus on how best to define LD, the federal definition of LD has not changed significantly since 1968. There has been considerable criticism and debate as to how best to define LD. Kavale & Forness (1985) summarized the concerns of McIntosh and Dunn (1973) and stated that "the definition specifies no level of severity of the disability; the conditions associated with LD are not specified (the definition provides only examples); and the definition relies upon exclusion to define the population with LDs, even though children classified in other traditional handicapping conditions may also have a specific learning disability" (p. 47). Likewise, in a report to the U.S.

Congress, the Interagency Committee on LD (1987) identified four problems with the definition:

(1) it does not indicate clearly enough that learning disabilities are a heterogeneous group of disorders; (2) it fails to recognize that learning disabilities frequently persist and are manifest in adults as well as in children; (3) it does not clearly specify that, whatever the cause of learning disabilities, the “final common path” is inherent alterations in the way information is processed; and (4) it does not adequately recognize that persons with other handicapping or environmental limitations may have a learning disability concurrently with these conditions (Torgesen, 1991, p. 21).

Unfortunately, multi disciplinary research in the field of LDs has not been successful in resolving these criticisms.

In particular, the exclusion of learning problems “due primarily to visual, hearing, or motor handicaps, to mental retardation, emotional disturbance, or to environmental disadvantage” is debatable and warrants further discussion. Importantly, children with LDs often have concomitant handicapping conditions. For example, the comorbidity of LDs with other disorders (e.g. Attention Deficit Hyperactivity Disorder (ADHD), Depressive Disorder, Conduct Disorder) has been well documented (Fisher, 1998;

Dykman & Ackerman, 1991; Purvis & Tannock, 1997; Rock, Fessler, & Church, 1997). Although it is well understood that each can occur alone, the relationship between these diagnoses is unclear and determining the “primary” problem can be difficult. Clear, specific definitions of LDs should allow professionals to identify LDs regardless of the primary problem. Meanwhile, the recognition of possible comorbid conditions as well as their interaction is important in the evaluation of children.

It is possible that asking a child with a learning disability to perform school tasks that they are unable to perform can result in lowered self-esteem and the induction of a behavior disorder (Brumback & Weinberg, 1990). It has long been posited that students with LDs and behavioral problems are more likely to be noticed by their teachers (Berry, Shaywitz, & Shaywitz 1985). This purported selective identification may lead to an over recognition of children with behavior disorders who also have LDs. In addition, behavior disorders are more often diagnosed in boys than girls, leading some to posit that this may lead to more boys than girls being identified as having an LD (Berry et al., 1985).

Regardless of the reason for referral, children in Texas, as well as in most states, are assessed utilizing methods that follow legislative guidelines. However, problems exist with the use of such methods. Specifically, a growing number of researchers have questioned the comparison of intellectual ability and achievement for assessing LD and it is unclear that such a comparison identifies an LD (Lyon, 1989; Siegel, 1989). Also, it is unknown how and if the two constructs, achievement and IQ may overlap. In addition,

subtests of intelligence tests (i.e. Vocabulary, Arithmetic) may be adversely affected by a history of learning problems thus lowering IQ test scores and precluding a diagnosis of LD (Lyon, 1989). Furthermore, tests of intelligence may be measuring the same underlying cognitive deficits related to LD (Fletcher & Satz, 1985), thus resulting in the suppression of both intellectual and achievement test scores. If both scores are suppressed, a discrepancy would not exist and children with LDs would go undetected.

In addition, statistical problems are evident in the implementation of the discrepancy method. Discrepancy calculations are susceptible to measurement error (Lyon, 1989) and the common method of comparing standard scores of achievement and IQ tests is criticized for overlooking regression between ability and achievement (Wood, 1991).

A somewhat related issue involves students whose achievement falls slightly less than one standard deviation below that of their intellectual ability. It may be that criteria could be met by using Method 2. However, students are often denied services in order to curtail the number of students receiving special services (Morris, 1988). Thus, in common practice, discrepancy criteria is often used to exclude rather than include children in special services (Morris, 1988).

Assumptions of LDs

The fundamental assumption about LDs at present is that they result from neurological impairment affecting specific brain functions (Torgesen, 1991). A definition

proposed in 1988 by the National Joint Committee on LD (NJCLD), argued by Hammill (1990) to represent the broadest consensus in the field states:

Learning disabilities is a general term that refers to a heterogeneous group of disorders manifested by significant difficulties in the acquisition and use of listening, speaking, reading, writing, reasoning, or mathematical abilities.

These disorders are intrinsic to the individual, presumed to be due to central nervous system dysfunction, and may occur across the life span. Problems in self-regulatory behaviors, social perception, and social interaction may exist with learning disabilities but do not by themselves constitute a learning disability. Although learning disabilities may occur concomitantly with other handicapping conditions (for example, sensory impairment, mental retardation, serious emotional disturbance) or with extrinsic influences (such as cultural differences, insufficient or inappropriate instruction), they are not the result of those conditions or influences. (Hammill, 1990, p. 77)

With the assumption of “central nervous dysfunction,” it seems appropriate to view LD as a deficit in one or more higher cortical functions. In children, learning disability (on a developmental basis) can be seen as equivalent to a deficit in higher brain function that is caused by a destructive lesion (such as stroke) in an adult (Brumback, 1995). Thus, many researchers recognize the need to assume that LDs reflect underlying brain dysfunction (Fennell, 1995). Reflecting a recognition of underlying brain dysfunction, neuroimaging techniques are currently being utilized to examine neurological differences in children with developmental disorders (Logan, 1999; see Lyon & Rumsey, 1996, for a review). It can thus be extrapolated that the field needs a neurologically focused definition of LD that is more related to brain function than to arbitrary laws.

Researchers recognize that more restrictive definitions of LDs are needed (Torgesen, 1991) and it may be that more energy should be devoted to defining specific, subtypes of LD rather than searching for a consensus of a broad definition. Specifically, the heterogeneity of LDs may preclude the attainment and usefulness of such a broad definition. Subtype criteria that recognizes the heterogeneity of LD may decrease the exclusion of children with learning disabilities from obtaining diagnoses.

In contrast to an educationally driven or federally mandated definition of LDs, child neuropsychologists state that assessment should be approached from a developmental perspective recognizing age-appropriate brain functions (Fennell, 1995)

Such a perspective supports the notion that a model of LD should emphasize the developmental progression of the higher brain functions of symbol skills (i.e. reading, spelling, writing) (Weinberg, 1975; Weinberg, 1982; Weinberg, Harper, & Brumback, 1995a; Weinberg, Harper, & Brumback 1998). Measuring these functions from a developmental perspective could prove useful in evaluating LDs.

Alternate theory of LD

Given the large number of disagreements with the current definition of LD, it should not be surprising that alternate classification models exist. Likewise, the multi-disciplinary interest in the field of LD has led to the development of many classification models. Models have developed from medical, psychoeducational, neuropsychological, behavioral, linguistic, and cognitive frameworks (Lyon & Moats, 1988). The field of LD has shifted from serving children with neurological difficulties to serving a variety of children with other problems (Chalfant, 1989). Perhaps the shift from viewing LD as neurological deficiencies to a larger more heterogeneous group of LD is due to reasons of a sociopolitical nature. For example, it may be that non-neurological definitions of LD are more palatable (McIntosh & Dunn, 1973). However, models recognizing a neurological basis to LDs could increase our understanding of the cause of LDs and improve identification of LD. One such model is that of Weinberg and colleagues (Weinberg, 1975; Weinberg, 1982; Weinberg & McLean, 1986; Weinberg et al., 1995a; Weinberg, Harper, & Brumback, 1995b; Weinberg et al., 1998). This theoretical model

presents criteria for the recognition, evaluation, and diagnosis of developmental specific LDs.

Researchers have found that the higher brain functions used in an educational environment include symbol skills and their properties, verbal communication skills, and symbolization. The four classic symbols that humans use in the process of learning and communication are colors, geometric shapes, numbers, and letters. The skills that utilize these symbols (symbol skills) are reading, spelling, arithmetic, drawing, printing, and writing (Weinberg & McLean, 1986; Weinberg et al., 1995a; Weinberg et al., 1998).

Weinberg (1975) developed age ranges for the development of symbol skills based upon prior developmental skills inventories (Ireton & Thwing, 1972; Frankenburg & Dodds, 1969; Jastak & Jastak, 1969) as well as clinical experience with children presenting for neurological evaluation. Weinberg noted that these skills develop in an age-dependent sequential fashion. Specifically, skills develop in the order of the ability to match, then recognize, and finally recall from memory printed symbols. Literacy is defined as the ability to read high and middle frequency polysyllabic words and normally occurs between the ages of 9 ½ to 11 years. Appendix A, Table 1 has been adapted from Weinberg et al. 1995a and describes the various symbol skills in more detail, as well as the respective ages for emergence and literacy of the symbol skills (see also Appendices B & C).

These symbol skills have necessary underlying properties that include nominal recall, sequencing of letters, numbers, basic shapes, syntax and grammar; and spatial relations of the primary symbols on paper (Weinberg et al., 1995a; Weinberg et al., 1998). Nominal recall is the naming or recall of proper nouns and can be evaluated by asking 5.5 to 7 year old children to state their birth date. For children aged 6 to 8 years, nominal recall is evaluated by testing the ability to recall monosyllabic proper nouns. The number of syllables given increases with age: a bisyllabic proper noun is used for children 8 to 10 years; a three-syllable name for children ages 10 to 12 years; and a four-syllable proper noun for children 12 years and older.

Sequencing is the ability of a child to organize himself or herself and to complete multi-step tasks. Asking a child to perform tasks such as counting backward, stating the days of the week backward, and stating the months of the year backward enable the assessor to evaluate sequencing ability. “A child age 6 years unable to count backward, a child age 8 years unable to state without error the days of the week backward, and a child age 11 years unable to state the months of the year backward without error are disorganized and will have difficulties completing assignments in school and chores at home and will require frequent reminders”(Weinberg et al., 1995a). These tasks are considered to be a good indication of how a child will function given other tasks (i.e., completing assignments) that require order/organization.

Reversals and spatial orientation of symbols on paper can be evaluated by examining the child's ability to align and place geometric shapes, numbers, letters, words, and phrases correctly on paper. "Reversals (strephosymbolia) between ages 6 and 9 years suggest latent difficulties with grammar, punctuation, sentence structure, and graphic writing skills (dysgraphia). Often these young people, with aging, will prefer to print rather than use cursive writing" (Weinberg et al., 1995a).

As stated earlier, verbal communication skills are considered higher brain functions and include listening (word reception and phonemic recall); prosody (affective and interactive quality of gestures and speech); phasic verbal expression (recalling and using with appropriate prosody or emotionality common nouns and action verbs in speaking); phasic written expression (expressing ideas through writing); inner vocabulary (word storage, word-to-word definitions, and word finding); and inner speech (understanding the spoken word and word-to-picture representation) (Weinberg et al., 1995a; Weinberg et al., 1998). As this model recognizes a neurological basis to LDs, it is important to not only define such higher brain functions but discuss their neuroanatomic localization. Thus, the localization of these verbal communication skills as well as symbol skills and their properties have been hypothesized by Weinberg and colleagues. These hypotheses developed based upon prior research such as cerebral cortical cytoarchitecture maps, computerized localization studies in adults with known brain

lesions, as well as the clinical assessment of neurologic dysfunctions (Weinberg et al. 1995b; Weinberg et al. 1998).

Left temporal and parietal lobe functions include reading, listening comprehension, oral and written expression, nominal recall, and the storage and recall of words and graphemes and phonemes for letters (spelling) and for numbers (arithmetic). The sequencing of letters and numbers, reiterative numeric language tasks, and spatial design of geometric shapes and the graphomotor (mechanical) skill of writing are right parietal lobe functions. Appropriate, competent communication requires right cerebral hemisphere functioning, including the ability to recognize the visual (pictorial/symbolic) environment, with appropriately meaningful picture-to-picture and picture-to-word storage and representation (symbolization). Likewise, the right hemisphere functions of prosody, timing, context, order, coordination (praxias), vigilance, logic, wit, humor, diligence, and volition must be intact (Weinberg, et al. 1995a; Weinberg et al. 1998).

Dysfunction of specific cortical areas results in deficits in respective symbol and verbal skills. A Developmental Specific LD (DSLD) is diagnosed when normally-intelligent children do not perform symbol tasks at an age-appropriate level (Weinberg & McLean, 1986). A deficit or DSLD may be noted in a symbol skill, underlying property, or verbal communication skill and they are posited to be on a continuum of deficits. Appendix A, Table 2 presents a summary of these deficits (syndromes) as well as their corresponding higher brain functions. If one deficit exists, it is likely that others also exist

but in varying quantities, and some are more likely to occur together (Weinberg & McLean, 1986). Thus, a paradigm of developmental specific LDs based upon this model has evolved through the examination and presentation of deficits of higher brain functions in children and adults and includes, among others (see Appendix A, Table 2), receptive and phonemic recall dysphasia, nominal recall dysphasia, specific word finding after reading dysphasia, inner vocabulary dysphasia, developmental pure dyslexia, dysgraphia, dyscalculia, developmental Gerstmann syndrome, dyslexia plus the developmental Gerstmann syndrome, developmental disorder of global sequencing, developmental disorder of events sequencing, hyperdysprosodia, and hypodysprosodia (Weinberg & McLean, 1986; Weinberg et al. 1998). Appendix A, Table 3 describes the specific DSLDs. Also included in Appendix A, Table 3 are corresponding DSM-IV diagnoses in order to illustrate the extrapolation of SLCB diagnoses to the DSM-IV. Appendix A, Table 4 provides a summary of the specific DSLDs detailing higher brain functions as well as hemispheric localization. By noting deficit(s) in symbol skills, their properties, and/or verbal communication skills a diagnosis can be made.

The most common clinical presentations of the LDs presented in Appendix A, Table 4 are: phonemic recall dysphasia for letters (spelling) or numbers (arithmetic), nominal recall dysphasia, and dysgraphia (orthographic or dysphasic). Dyslexia is least common (Weinberg & Schraufnagel, unpublished data; Weinberg & Rehmet, 1983).

In contrast to the legal definition of LD, the theory of LD described above recognizes the neurological basis of LD and the age-dependent progression of higher brain functions, and provides definitions of specific subtypes of LDs. When conducting research of children with LDs, it is useful to narrowly define the specific population of interest (Torgesen, 1991). In order to accomplish specificity, measures are needed that are developed from strong theoretical models and allow for the identification of specific LDs. The Symbol Language Communication Battery is one such measure and is based upon and developed with the above described theoretical model.

SLCB

As noted above, it is hypothesized that all children, both with and without LDs, progress through age-dependent development of symbol skills. The SLCB items are developed from this orderly progression of skills. The SLCB presents tasks related to the symbol skills, their properties, and verbal communication in the manner described above. Tasks of nonverbal communication skills as well as the encouragement of the examiner to observe wit, humor, elemental logic, mood, affect, vigilance, diligence, and volition are included in the SLCB (Weinberg et al., 1995a; Weinberg et al., 1998) in contrast to measures such as the Wechsler Intelligence Scale for Children - III and the Woodcock Johnson Achievement Test - Revised. The skills measured by the SLCB are recognized as functions of specific brain areas and the malfunctioning of these areas are said to produce a deficit. Given normal intelligence (the child's ability to interact with his or her

environment in a meaningful way), when symbol skills, as measured by the SLCB, are performed below the age-appropriate level (one or more grade levels), an LD is diagnosed. The Symbol Language and Communication Battery has been successful in a clinic setting for diagnosing LDs in children referred for neurological evaluation for school failure or difficulty. Although the SLCB has not been used in other settings, it has the potential to identify children in a variety of clinical and academic settings.

Development of the SLCB. The SLCB was developed by pediatric behavioral neurologist Warren A. Weinberg, M.D. and is based on over 30 years of clinical experience with children and adolescents who were performing poorly in school (Weinberg et al., 1995a; Weinberg et al., 1998). The SLCB is a method of assessing cognitive and behavioral (higher brain) functions in children ages 4 years and older. By using the SLCB, those interested in assessing LDs (i.e. physicians, psychologists, educators, etc.) can quickly (20-30 minute administration time) recognize and diagnose an LD (Weinberg et al., 1995a; Weinberg et al., 1998).

Although most researchers utilize the term “learning disability” (Beitchman & Young, 1997) the DSM-IV utilizes the term “learning disorder.” The DSM-IV continues to be used by many clinicians in the diagnosis of LDs. The SLCB allows for the diagnosis of the LDs discussed earlier (Appendix A, Table 2). Importantly, these diagnoses can be extrapolated to the broad diagnoses as defined in the DSM-IV (i.e. reading disorder, mathematics disorder, disorder of written expression).

The SLCB as a method for evaluating higher brain functions was first described in 1975 (Weinberg, 1975). In his article, Weinberg described the symbol skills needed for the book-paper-pencil curriculum used in elementary schools and recognized the direct relationship between school achievement and the development of symbol language skills. He listed reading, spelling, arithmetic, printing and writing symbols on paper, and essay writing, symbol and nominal recall, and nonsymbol sequential memory tasks as symbol language skills. He stated that these skills developed on a highly predictable, age-related schedule. The SLCB formed by presenting items representative of the symbol skill and its normal development. In addition, Weinberg recognized the progression of symbol skills from the ability to match, then recognize, and finally recall from memory the printed symbols (Johnson & Myklebust, 1967) and incorporated this principle in the SLCB.

Use of the SLCB. The SLCB requires 20-30 minutes to complete (Weinberg et al, 1995a). Diagnosis of a DSLD is made based upon the specific deficit or deficits in symbol skills and other higher brain functions. For example, if deficits exist in reading (demonstrated by errors of omissions and stoppages), phonemic recall for spelling, and nominal recall (the recall of recently learned names) then a diagnosis of dyslexia is made. Thus, results of the SLCB allow the diagnosis of the specific LD described above (Appendix A, Table 2). These diagnoses can be extrapolated to the broad diagnosis of an LD in reading, writing, math, or written expression as described in the DSM-IV (Appendix A, Table 2). In line with the above example, it is likely that a broad diagnosis

of reading disorder would be given using DSM-IV as well as federal and TEA criteria. Appendix B presents the SLCB items and Appendix C provides the administration and scoring protocol and Appendix D presents the interpretive manual.

The SLCB has the potential for use as a supplemental measure for the identification of LDs. Results of the SLCB may aide clinicians in pinpointing specific information about students' ability to use necessary tools (symbol skills) such as reading, writing, spelling, and arithmetic. For example, results of the SLCB may indicate that a student's previous diagnosis of LD (as diagnosed by the discrepancy method) of math disorder is due to errors in sequencing (as seen in the Developmental Gerstmann Syndrome - see Appendix A, Table 2). Likewise, a child diagnosed with a LD in reading may evidence difficulties in reading comprehension as evidenced by difficulties in spelling words backwards and poor performance on the Gilmore Oral Reading Test-Form C. Writing tasks may demonstrate reversals, indicating good reading prognosis. A child diagnosed with a communication disorder may evidence hyperdysprosody as measured by the SLCB, thus pinpointing the area of communication difficulty. Such information could assist in developing appropriate teaching strategies for students with LDs. In addition, the SLCB can be used in conjunction with intelligence measures currently used by most assessors in most states.

WISC-R and symbol skills Weinberg (1975, 1982) described the WISC-R in relation to interpretation of the symbol skills measured by the SLCB. For example, the

Wechsler Intelligence Scale for Children - Revised (WISC-R) subtests Information and Picture Completion can be used to interpret nominal recall. In addition, Comprehension can be used to interpret oral expression. Also, Arithmetic assists in interpreting arithmetic skills or sequential order while Digit Span relates to sequential order. Picture Arrangement may provide interpretation of sequential memory skills. Vocabulary can be used to interpret inner vocabulary as it relates to storage, retrieval, and simplistic word-to-word relationships (defining words). Similarities can also assist in interpreting inner vocabulary as it requires storage, retrieval, and using words in social context. Block Design and Object Assembly relate more to non-symbol spatial orientation tasks than to printing or writing. Coding and Mazes relate somewhat to handwriting.

The WISC-R was used in the formulation of the above described hypotheses relating subtests of the WISC-R to the interpretation of symbol skills. The WISC-R has since been revised and the Wechsler Intelligence Scale for Children - Third Edition (WISC-III) is currently in use. However, subtests are similar to that of the WISC-R and it is speculated that comparable interpretations could be made. Likewise, research pertaining to the WISC-R should be applicable to the WISC-III.

Statement of problem

The field of learning disabilities has grown significantly over the past thirty years since its debut as a federally handicapping condition. Federal recognition has resulted in increased awareness of LD as well as growth in multi disciplinary research of LDs.

Despite this research, a consensus of how best to define and identify LDs has not been reached. Although often criticized, the federal definition has not changed significantly over the years. Likewise, researchers also note the inadequacies of the present psychological and educational methods of assessing LD (Lyon, 1995).

Classification models have been developed to address criticisms of the federally mandated definition and identification process. One such model is that of Weinberg and colleagues (Weinberg, 1975; Weinberg, 1982; Weinberg & McLean, 1986; Weinberg et al., 1995a; Weinberg et al., 1995b; Weinberg et al., 1998). This model includes principles such as a neurological basis of LD, the age-dependent progression of symbol skills, heterogeneity of LD, and the capacity for other conditions to co-occur with LD. Weinberg and colleagues (Weinberg, 1975; Weinberg, 1982; Weinberg & McLean, 1986; Weinberg et al., 1995a; Weinberg et al., 1995b; Weinberg et al., 1998) deem the evaluation of symbol and verbal communication skills within this framework to be essential to identifying LD. Thus, the Symbol Language and Communication Battery was developed and has been used successfully in a physician's clinic setting for the past 30 years.

Given the significant increase in the identification of LD students in the United States it is essential that measures such as the SLCB be examined to evaluate its role as an adjunct to the assessment of LD. Thus, this study evaluated the effectiveness of using the SLCB in public and private school settings as an appropriate assessment method

because of its well defined theoretical basis, its ability to diagnose specific LD as well as the extrapolation to the DSM-IV diagnoses, and ease of administration.

Hypotheses

Hypotheses of this study were as follows: (1) the SLCB would identify children previously diagnosed by the schools (by current methods) with LDs (2) the SLCB would also identify children regardless of placement (special education classes, regular class with accommodation, private school); (3) Given the confusion over whether or not children with behavior disorders are referred more often than children without, it was hypothesized that if there were children in regular education classes who scored as LD according to the SLCB, they would exhibit fewer behavioral problems than those students identified by the school; (4) It was hypothesized that if there were students in regular education classes who scored in the disordered range on the SLCB, there would be a higher population of girls to boys.

Supplementary hypotheses

Supplementary hypotheses regarding how deficits in certain symbol skills compared to specific WISC-III subtests were as follows: (1) When nominal recall deficits were diagnosed, performance on Picture Completion and Information subtests would be

relatively low; (2) Sequential order deficits would co-occur with relatively lower performance on Arithmetic, Digit Span, and/or Picture Arrangement subtests; (3) Students who evidenced inner vocabulary deficits would have relatively lower performance on the subtests Similarities and Vocabulary and (4) Students who evidenced dysgraphia would have relatively lower performance on the subtests Coding and Mazes.

CHAPTER 2

METHOD

Participants

Participants were students in the fourth and fifth grade (age range 9 years 4 months - 12 years, 5 months) attending school in the Dallas-Fort-Worth metroplex. Two public elementary schools in the Arlington Independent School District participated (A.I.S.D.), West Elementary and Roquemore Elementary, as well as a private school for children with learning disabilities, the Winston School of Dallas. Following consent/assent procedure (described below, see also Appendix E), two groups of students were selected. The only criteria for inclusion were that students speak English as a first language. For this study, students were placed in one of two groups. The first group consisted of students identified by the school as having an LD ($n=26$). Of these, six students were identified by A.I.S.D. while 20 students were identified by the Winston School. The 26 children with school identified LDs were administered intelligence and achievement tests by an appropriate source to determine LD eligibility (either Method 1/ Method 2). The second group consisted of students who have not been identified as having a LD ($n=59$), and who were currently in regular education classes.

Materials

All participants ($n = 85$) were administered the SLCB and the Behavioral Assessment Scale for Children (BASC-SRP-C). Those participants identified as having an LD by the schools were previously administered the WISC-III. However, results of the WISC-III were only available for Winston School students. In addition, teachers completed the Behavioral Assessment Scale for Children - Teachers Report (BASC-TR).

Symbol Language Communication Battery. Research has demonstrated that normally-intelligent children typically develop symbol skills at certain ages. For example, Ireton & Thwing (1972), Frankenburg and Dodds (1969), and Jastak and Jastak (1969) presented mean ages for various symbol language skills. Weinberg, using means provided by such researchers in conjunction with his clinical experience, developed normal age ranges for the development of symbol skills. For example, according to Weinberg and colleagues (Weinberg, 1975; Weinberg, 1982; Weinberg et al., 1995a; Weinberg et al., 1998), the range for the ability to read simple compound polysyllabic words is 8-10 years. Appendix B consists of a summary of the items of the SLCB, including the prospective age ranges of emergence of symbol skills.

The SLCB presents a variety of tasks related to the symbol and verbal communication skills. For the following examples of items, the prospective ages of emergence will be included in parentheses following the description of the item. Items representative of the symbol skill reading include reading high frequency polysyllabic

words (9.5-11 years), and the Gilmore Oral Reading Test-Form C is used to evaluate reading skills. For evaluation of the symbol skill of spelling, words to spell include: purchase, ethics, delicate, and delicious (10-11.5 years). In regards to arithmetic, examples include multiplication such as 4×2 , 6×3 , and 8×9 (9-10.5 years). In order to examine drawing and spatial orientation the child is asked to draw a person (5 + years), and a clock (appropriate size and placement 7-8 years; correct time 7.5-8.5 years). An example of evaluation of writing is the task of writing 3-7 lines "telling what you did last night" (age 7.5 + years). Nominal recall is examined by asking the child to remember a name. For example, a 10-12 year old child is given the name "Mr. Hertzberg," asked to repeat it 5 times so as to not forget it and is later asked to recall the name in order to examine nominal recall ability. Sequencing items include stating the months of the year forward (age 8-9.5 years) and backward (9.5-11 years). Phonemic recall is evaluated by listening to the child speak and spell while noting phonemic omissions. Listening to the child's spontaneous speech with regard to the use of common nouns and action verbs with appropriate prosody (affective and interactive quality of gestures and speech) allows for assessment of phasic verbal expression (Weinberg et al. 1995a; Weinberg et al., 1998). See Appendices B and C for a complete listing of items and appropriate ages of emergence.

The SLCB has been used in a pediatric behavioral neurology clinic setting for over thirty years. Although norming data for the SLCB as a measure has not been

developed as of the present, research regarding the developmental ranges of symbol skills exist (Ireton & Thwing, 1972; Frankenburg & Dodds, 1969; Jastak & Jastak, 1969). The SLCB has been used in studies assessing higher brain functions in children with and without learning disabilities (Weinberg 1982; Weinberg & Rehmet, 1983).

Scoring of the SLCB. Upon review of the items of the SLCB by the investigator, minor changes were made prior to scoring. After consultation with the author (W. A. Weinberg, personal communication, October 24, 1999), it was decided that items 8-11 of the sequencing section were more appropriate in the numeric language section and were moved. These items involved numeric tasks and thus appeared more appropriate in the numeric language section. In addition, following consultation with the author (W. A. Weinberg, personal communication, October 24, 1999), items 15-17 of the numeric language section were omitted due to their perceived difficulty.

For this study, a scoring system for the SLCB was developed. A dichotomous variable for each section of the SLCB was coded in order to delineate an LD. The number of errors in each section was used to determine whether an LD existed. It is important to note that errors on the SLCB are only “errors” when a child is unable to perform an age-appropriate task.

The dichotomous variables for each section were created as follows: An LD, in the respective area was said to exist if (a) one or more error was made in word conduction/formulation; (b) one or more error was made in specific word finding; (c) two

or more errors were made in sequencing; (d) two or more errors were made in true math; (e) three or more errors were made in numeric language; (f) three or more errors in prosody; (g) five or more errors in spelling words A; (h) five or more errors in spelling words B; and (i) five or more errors in writing.

Due to the nature of the SLCB items (see Appendices B-D), dichotomous variables for select sections were created differently. If nominal recall was not intact by recall or multiple choice, an LD in nominal recall was said to exist. Similarly, an LD was noted if (a) reading was one or more grade level below the child's age-appropriate grade level; (b) a child needed two or more multiple choice questions to answer age-appropriate vocabulary questions; or (c) more than two reading comprehension questions were incorrect (meaning the child was unable to answer correctly by recall or multiple choice). While the Goodenough-Harris draw-a-person test provides a standardized scoring system (Harris, 1963), this task of the SLCB was not the focus of the study. Thus, it was decided that such a scoring system would not be used and the section would be excluded for the examination of Hypothesis 1 and 2. In addition, the scoring of the draw-a-clock section is highly subjective, and this section was also excluded. A child was said to have an LD, according to the SLCB, if an LD was noted in one or more of the above described areas.

In order to allow for more information regarding the sensitivity of the SLCB, the specific diagnoses of the children attending the Winston School were obtained (see Appendix A, Table 5). The Winston School Testing Center defines an LD as a learning

disorder or an Attention Deficit Hyperactivity Disorder (ADHD) or a combination of the two. Nine of the children were identified as having a LD in one or more areas including either reading or math. Eleven of the children were diagnosed with a LD in either written expression or a combination of a written expression disorder and a receptive/expressive language disorder, and many of these children had concurrent ADHD diagnoses.

In P. L. 94-142, listening comprehension (receptive language) and oral expression (expressive language) are two of the federally mandated seven skills of LDs. However, the SLCB does not specifically measure these two skills, which in the clinical setting are subjectively determined by the experienced clinician. In addition, in the DSM-IV these two skills are noted as communication disorders rather than LDs. For these reasons, the four Winston School students with only a receptive/expressive were considered as having an “atypical” LD for the purpose of this study.

Seven Winston School students were identified with an LD only in written expression. Six of these students with a writing LD had a concurrent diagnosis of ADHD (see Appendix A, Table 5). Of concern, it is possible that these six (or seven) children may have been placed in the Winston School for their ADHD with the writing LD being a secondary concern. Thus, based on the information obtained from the Winston School files, it was decided that the 9 students with primary LD in reading and math were considered to have “typical” LDs and the 11 students with primary diagnoses of ADHD,

writing LD, or receptive/expressive language disorder were considered to have “non-typical” LDs.

Behavioral Assessment System for Children. The BASC - Self-Report of Personality (BASC-SRP) has two forms: ages 8-11 (SRP-C) and ages 12-18 (SRP-A). It attempts to measure the child’s perceptions and feelings about school, parents, peers, and his or her own behavior problems. Given that participants were in the fourth or fifth grade, the BASC-SRP-C was used. The reading level for the BASC-SRP-C is stated to be 3rd grade for the child version, includes 186 questions, and takes about 30 minutes to complete. Scales include anxiety, attitude to school, attitude to teachers, atypicality, depression, interpersonal relations, locus of control, relations with parents, and self-esteem; whereas composites include school maladjustment, clinical maladjustment, personal adjustment, and emotional symptoms index (Kamphaus & Frick, 1996; Reynolds & Kamphaus, 1992).

Median internal consistency coefficients of the scales are high and generally in the .80s. Test-retest correlations are also high with a median value for the scales of .76 and for the composites of approximately .80. A 7-month stability study resulted in varying results with the Interpersonal Relations scale coefficient .05 and the atypicality scale coefficient .75. In addition, the self-reliance scale has been stated to have a relatively low reliability coefficient (.70). However, overall the reliability of the scales is good, with

most scale coefficients in the .80s. (Reynolds & Kamphaus, 1992; Kamphaus & Frick, 1996).

The BASC-SRP has been correlated with the MMPI, Achenbach Youth Self-Report, Quay Behavior Rating Profile, and Children's Personality Questionnaire (CPQ) to evaluate construct validity. Many scales of the first three instruments correlate highly with the BASC-SRP. The CPQ differs from the others and focuses on normal-range personality and thus has lower correlations with the SRP. Overall, results support construct validity for the BASC-SRP (Reynolds & Kamphaus, 1992).

The BASC-Teacher Rating Scales (BASC-TRS) has three forms: preschool (ages 4-5), child (ages 6-11), and adolescent (ages 12-18). It attempts to measure adaptive and problem behavior in the school setting. Given that participants were in the fourth or fifth grade, the BASC-TRS child form was used. The BASC-TRS assesses composite areas of externalizing problems, internalizing problems, school problems, and adaptive skills. Content scales of adaptive behavior, motor hyperactivity, attentional difficulties, anxiety, depression, and withdrawal are also included (Reynolds & Kamphaus, 1992). The BASC-TRS has 148 questions and takes 10-20 minutes to complete. Norming and standardization was based on scores of 2,401 children and adolescents (Kamphaus & Frick, 1996). This normative sample included a similar proportion of special education students to that of the general population (Kamphaus & Frick, 1996). Evidence for reliability (internal consistency, test-retest, and interrater) and construct validity is

provided in the BASC manual (Reynolds & Kamphaus, 1992). Coefficient alphas for internal consistency across groups averaged .80. Test-retest reliability over 2-8 weeks evidenced a median correlation coefficient of .91 for the elementary school age group ($n=90$). In regards to interrater reliability, correlation coefficients were lower on internalizing ($r=.43$) than externalizing ($r=.65$) behaviors, which is common to teacher rating scales. However, given the many factors that can influence different observers to rate a child's behavior differently, interrater reliability is reasonably high (Reynolds & Kamphaus, 1992).

Factor analysis and correlations between the BASC-TRS and several other teacher rating scales are provided in the manual (Reynolds & Kamphaus, 1992) lending support for construct validity. Many BASC-TRS scales and composites, especially those measuring externalizing and school-problem behaviors, correlate very highly with similar measures. However, the BASC-TRS appears to measure a wider range of adaptive behaviors than the comparative measures (Reynolds & Kamphaus, 1992).

Procedure

Consent for participation by students was obtained from one of their parents or legal guardian. Information about the study was given in writing to the parent or legal guardian and included on the consent form (see Appendix E). Participation in the study was voluntary and participants were able to withdraw at any time during the study.

Two trained undergraduate University of North Texas students administered the SLCB and two trained undergraduates administered the BASC-SRP-C. Undergraduates worked in teams of two when assessing participants. Team I assessed students at West Elementary and the Winston School while Team II assessed students at Roquemore Elementary. One undergraduate (undergrad A) retrieved a participant from his or her classroom and the other (undergrad B) administered the SLCB. Following administration of the SLCB, undergrad A obtained brief information from the participant regarding class placement and background information, and lastly, administered the BASC-SRP-C.

Prior to the administration of any instruments, undergrad B read the child assent letter (see Appendix E) to the child and obtained assent or dissent to participation in the study. All of the students chose to participate. Undergrad B informed participants that they would be taking a test and that some of the tasks would be similar to schoolwork and some would not. They were told to do the best they can but not to worry if they did not get all the answers correct. It was also relayed that the test would only take twenty to thirty minutes and that most of the answers would be given orally. Participants were informed that following the test, undergraduate A would ask a few questions about school (i.e., what they do and do not like about school). Demographic information regarding participants was also obtained by undergrad A. Participants were asked to try not to talk about school classes while taking the test with undergraduate B, but to feel free to talk about school after the test to undergraduate A. This was done to attempt to keep

undergraduate B unaware of class placement of participant. A reward of certificate of participation, pencils, and stickers was given following the test administration and questions regarding background information.

After answering demographic and school-related questions, participants completed the BASC-SRP-C. Participants were asked to answer the questions honestly and to do their best. Undergraduate A administered the BASC-SRP-C and provided assistance with reading the questions, as needed.

Teachers completed the BASC-TRS providing a measure of their students' classroom behavior. Teachers were informed that their participation would assist in the understanding of the behavior of children in different educational placements. Teachers were each given a gift bag containing colored pens, stickers, and rubber stamps prior to completion of the rating scales for their students, as an incentive to participate.

CHAPTER 3

RESULTS

Sample Characteristics

Eighty-five children participated in the study (male, $n = 50$; female, $n = 35$). Sixty-five children attended public schools in the Arlington Independent School District (A.I.S.D.), while twenty children attended the Winston School, a private school for children with learning disabilities, located in Dallas, Texas. The ages of the individuals examined in the study ranged from 9 years, 3 months to 12 years, 5 months (mean age of 10 years, 8 months). The gender, ethnic composition, and age of the participants are presented, by school, in Appendix A, Table 6. No significant differences in gender and age were found between the three schools. However, a significant difference in ethnic composition was noted with Roquemore having greater ethnic diversity than both West and Winston. However, no significant differences in ethnic composition were obtained between Winston and West. Six children from public schools were identified by the school as having a learning disability (see Appendix A, Table 6), while all twenty of the children attending the Winston School were identified with some form of learning disability (see also Appendix A, Table 5).

Prior to data analysis, all variables were examined to determine if excessive intercorrelations were present. Overall, variable correlations were as expected.

Correlations between the teacher and student BASC composite indices were fairly high and correlations between corresponding SLCB sections were relatively high (e.g. numeric language and true math) with relatively low correlations for non-corresponding variables (e.g. reading and prosody). See Appendix A, Tables 7 - 9 for specific correlations. Due to the large number of analyses conducted, using a more conservative alpha level than .05 was considered. However, given the exploratory nature of this study and the small sample size, it was decided that an alpha level of .05 would offer the best initial test of the hypotheses.

For the purposes of clarity in presenting results, the following method of identifying groups was utilized:

- (1) BOTH-LD: both school and SLCB identified as LD
- (2) SLCB-LD: SLCB identified as LD, regardless of school designation
- (3) SLCB-LD-ONLY: only the SLCB identified as LD, school did not
- (4) NO-SLCB-LD: No LD according to the SLCB, regardless of school designation
- (5) SLCB-LD-T: SLCB identified as LD in “typical” areas: reading, numeric language, or writing
- (6) SLCB-LD-ONLY-T: only the SLCB identified as LD in “typical” areas: reading, numeric language, or writing; school did not
- (7) NO-SLCB-LD-T: No SLCB identified LD in “typical” areas: reading, numeric language, or writing

(8) SCHOOL-LD: school identified as LD, regardless of SLCB designation

(9) SCHOOL-LD-ONLY: only school identified as LD, SLCB did not

(10) NO-SCHOOL-LD: no LD according to the school, regardless of school designation

Hypotheses Results

Hypothesis 1. The first hypothesis stated that the SLCB would identify children previously diagnosed by the school with learning disabilities. Chi-square analyses were performed to examine Hypothesis 1. Using this method, the number of SLCB-LD children was 53 and the number of NO-SLCB-LD children was 32. Nineteen of the twenty-six (73%) SCHOOL-LD children were identified as having a LD according to the SLCB; however, this analysis was not significant ($\chi^2=1.835$, $p=.176$). Overall, the number of false positives (i.e. SLCB-LD-ONLY) was high (40%). Positive predictive power was relatively low (.36), while negative predictive power was relatively high (.78). See Appendix A, Table 10 for more information regarding utility estimates.

This hypothesis was also examined with the exclusion of the 11 children from the Winston School with non-typical presentations of LDs. Using this method, the number of SLCB-LD children was 46 and the number of NO-SLCB-LD children was 28 (see Appendix A, Table 10). Twelve of the fifteen (80%) SCHOOL-LD children were identified as having a LD according to the SLCB. This analysis was also not significant ($\chi^2= 2.545$, $p=.111$). The number of false positives continued to be high (46%). Positive

predictive power was low (.26), while negative predictive power was high (.89) (Appendix A, Table 10).

To further examine this hypothesis, the more standard forms of LD, reading, math, and writing, were specifically examined. Children were only considered as having an LD, according to the SLCB, if they had an LD in reading (sections reading or reading comprehension), math (section numeric language), or writing. Using this method, 38 SLCB-LD-T children were identified while 47 NO-SLCB-T children were identified. Seventeen of the 26 (65%) SCHOOL-LD children were identified as SLCB-LD-T. This analysis was significant ($\chi^2= 6.48, p=.011$). The number of false positives decreased as compared to previous analyses (24.7%). Positive predictive power was higher at .45 while negative predictive power was .81 (see Appendix A, Table 10).

For the most conservative test, the children in the SLCB-LD-T group were compared to the SCHOOL-LD group, excluding the Winston school identified non-typical LDs. Using these groups for comparison, the SLCB identified 32 children as SLCB-LD-T and 42 as NO-SLCB-T. Eleven of the fifteen (73%) SCHOOL-LD children were identified as having an LD according to the SLCB. This analysis was significant ($\chi^2=6.940, p=.008$). The number of false positives was low at 28.4%. Positive predictive power was .34 while negative predictive power was .90 (see Appendix A, Table 10).

Hypothesis 2. Hypothesis 2 stated that the SLCB would identify children regardless of placement (special education classes, regular class with accommodation,

private school). In order to examine whether the SLCB's ability to identify children varied between public school and private school, Hypothesis 2 was examined for the public school students. When examining the public school SLCB-LD group, the results were significant ($\chi^2=4.131$, $p=.042$). Forty children were in the public school SLCB-LD group while 25 children were in the public school NO-SLCB-LD group (see Appendix, Table 11). All of the six public SCHOOL-LD children were identified as having a LD according to the SLCB. There were 34 (52.3%) false positives and 25 (38.5%) true negatives. Positive predictive power was low (.15) while negative predictive power was very high (1.00) (see Appendix A, Table 11).

Twenty-seven children were identified as public school SLCB-LD-ONLY-T and 38 were identified as public school NO-SLCB-T. Again, six of the six SCHOOL-LD children were identified as LD by the SLCB. This analysis was also significant ($\chi^2=9.30$, $p=.002$). There were 21 (32.3%) false positives and 38 (58.5%) true negatives. Again, positive predictive power was low (.22) and negative predictive power was very high (1.00) (see Appendix A, Table 11).

Hypothesis 3. The third hypothesis to be tested stated that SLCB-LD-ONLY children will exhibit fewer behavior problems than SCHOOL-LD children. Unfortunately, the examination of this hypothesis was limited by the number of teacher BASC forms completed (60 (71%) completed and 25 (29%) uncompleted).

SCHOOL-LD children (15 of the 26 (57.7%) had completed BASCs) were compared to SLCB-LD-ONLY (22 of the 34 (64.7%) children had completed BASCs). No significant differences between BASC composites or scale scores were obtained, suggesting no differences between SCHOOL-LD and SLCB-LD-ONLY children. However, other groups were compared for mean differences. Specifically, t-tests were performed in order to compare the means of the teacher BASC composite t-scores of the SLCB-LD children (34 of the 53 (64.2 %) children had completed BASCs) in comparison to the NO-SLCB-LD children (25 of 32 (78%) children had completed BASCs). Teachers reported that the SLCB-LD children had significantly more behavioral problems than the NO-SLCB-LD children, although all scores were in the normal range. Specifically, more externalizing problems ($M=54.41$, 46.56 , respectively; $t=3.054$, $p=.004$); more school problems ($M=54.44$, 46.04 ; $t=4.005$, $p=.000$); a higher behavioral symptoms index score ($M=52.06$, $M=45.08$, respectively; $t=3.536$, $p=.001$) and lower adaptive skills ($M=45.21$, $M=54.16$, respectively; $t=3.999$, $p=.000$) were noted in the SLCB-LD group compared to the NO-SLCB-LD group. No other significant group differences were obtained. Furthermore, no significant differences in teacher reported behavior were noted between the BOTH-LD (15 of the 19 (78.9 %) had completed BASCs) children as compared to the SLCB-LD-ONLY (22 of the 34 (64.7%) had completed BASCs) group.

Hypothesis 3 was also examined in regard to children's perceptions of their own behavior. When comparing SCHOOL-LD children ($n=26$) to SLCB-LD-ONLY children

(n=34) on BASC composites, children in the latter group reported greater clinical maladjustment as compared to the children in the SCHOOL-LD group (M=50.41, M=44.65, respectively; $t=2.264$, $p=.027$). In regards to specific scales, SLCB-LD-ONLY children reported lower regard for their teachers (M=51.94, M=46.15, $t=2.453$, $p=.017$), a more external locus of control (M=49.32, M=44.00, $t=2.328$, $p=.023$), and higher levels of anxiety (M=51.53, M=44.92, $t=2.560$, $p=.013$) than the SCHOOL-LD children. Again, differences in behavior were noted, however; all scores were in the normal range.

In contrast to findings from teacher ratings, no significant differences of self-reported behavior (BASC composites and scales) were noted when comparing SLCB-LD children (n=32) and NO-SLCB-LD (n=53) children. In addition, no significant differences in BASC indices of self-reported behavior were noted between the BOTH-LD children (n=19) as compared to SLCB-LD-ONLY children (n=34).

Given that LDs in reading, math, and writing are considered more standard and are more likely to be recognized, it was decided that Hypothesis 3 should be examined in regard to the SLCB-LD-ONLY-T (n=21) in comparison to the SCHOOL-LD children (n=26). A significant difference of self-reported clinical maladjustment was noted between the groups with the SLCB-LD-ONLY-T having more problems than the SCHOOL-LD (M=51.24, M=44.65, respectively) ($t=2.137$, $p=.038$). In regards to teacher reports, no significant differences between these groups were noted.

In order to examine the respective severity of the LDs of the SLCB-LD children, a t-test comparing the mean number of LDs (skill deficits) between the BOTH-LD children ($n=19$) and the SLCB-LD-ONLY group ($n=34$) was performed. More areas of difficulty were noted by the SLCB in the BOTH-LD group ($M=2.89$, $M=1.85$, respectively; $t=2.623$, $p=.011$).

Hypothesis 4. Hypothesis 4 stated that if there were students in regular education classes who score in the disordered range on the SLCB, there will be a higher population of girls to boys. According to chi-square analysis, this hypothesis was not significant. The percentage of girls in the SCHOOL-LD group (34.6%) vs. the SLCB-LD-ONLY group (32.4%) were similar ($\chi^2=.034$, $p=.854$).

Supplementary Analyses

Supplementary analyses were performed to examine the following supplementary hypotheses regarding the comparison of certain symbol skill deficits to specific WISC-III subtests. WISC-III scores were available for the 20 Winston School students but not for the 6 public school LD identified children. The first supplementary hypothesis stated that when nominal recall deficits are diagnosed, performance on Picture Completion and Information subtests will be relatively low. In order to examine this hypothesis correlations as well as ANOVAs were performed. No subtest scores of the WISC-III were correlated with nominal recall. Subtests Picture Completion and Information were not

found to be correlated with any SLCB identified symbol skill deficits. In addition, ANOVA analysis for this hypothesis was not significant.

The second supplementary hypothesis stated that sequential order deficits will co-occur with relatively lower performance on Arithmetic, Digit Span, and/or Picture Arrangement subtests. Negative correlations between WISC-III subtests and SLCB errors would be expected given that a lower subtest score would indicate worse performance, and should be associated with a higher number of errors on a specific section (e.g. sequencing), indicating more difficulty. A significant correlation between the number of sequencing errors and block design scaled score was noted ($r=-.508$, $p=.022$) as well as a significant correlation between the Arithmetic scaled score and math errors ($r=-.451$, $p=.001$). In addition, a significant correlation was found between Picture Arrangement scaled score and drawing a person ($r=-.542$, $p=.014$). However, none of the ANOVA analyses for this supplemental hypothesis were significant.

The third supplementary hypothesis stated that students who evidence inner vocabulary deficits (higher error scores) would have relatively lower performance on the subtests Similarities and Vocabulary. An expected negative correlation between inner vocabulary deficits and Similarities Scaled score ($r=-.525$, $p=.018$) was found. However, inner vocabulary deficits and Comprehension scaled score were unexpectedly positively correlated ($r=.459$, $p=.042$). ANOVA analysis was significant for the Similarities subtest ($F=6.841$, $p=.018$). Specifically, the Similarities subtest scores were significantly higher

for students able to recall vocabulary definitions than for students who required multiple choice vocabulary questions ($M=14.22$, $M=9.5$, respectively).

The fourth supplementary hypothesis stated that students who evidence dysgraphia will have relatively lower performance on the subtests Coding and Mazes. The Coding subtest scaled score was negatively correlated with draw-a-person errors ($r=-.646$, $p=.002$) as would be expected. However, the ANOVA analysis for this supplemental hypothesis was not significant.

CHAPTER 4

DISCUSSION

The purpose of this study was to examine the effectiveness of the SLCB as a tool for the assessment of LD. Results of this study should be interpreted with caution due to the following limitations. First, this study was limited by the low number of public school identified children with learning disabilities. Second, the use of a private school in a different city to obtain a sample of students with identified LDs may have had confounding effects. For example, it should be noted that when the group SCHOOL-LD was compared to NO-SCHOOL-LD, private school versus public school was also largely compared. In addition, private schools are not required to follow Method 1 or Method 2 identification guidelines. Thus, the receipt of services is not determined by the same methods as public schools. Third, differences in ethnic/racial composition may have confounded results between the schools and there may have been differences in SES; however, due to the small sample size, it was decided that it would be unwise to covary out ethnic group/race.

Fourth, this study was also limited in that it was an exploratory study with relatively low numbers of participants. Thus, although this study gives preliminary information, generalizations should be limited. Fifth, a systematic scoring system based upon subjective as well as objective data was developed. A larger-scale study will

eventually help to create norms and a more refined scoring system. Sixth, a further limitation was the fact that the ability of the SLCB to identify students was compared to the standard methods of identifying children. As discussed earlier, the discrepancy method has been highly criticized in itself. Finally, there was a large number of analyses conducted, and therefore some results may be spurious. However, despite these limitations, this study was the first to empirically test the utility of the SLCB.

It was hypothesized that the SLCB would identify children previously diagnosed by the schools as LD, regardless of their school placement [special education (including private school) vs. regular education]. When a deficit in any one area was utilized to indicate a SLCB-LD, this hypothesis was only significant when the sample was restricted to the public schools (n=6 SCHOOL-LD). However, results suggest that the SLCB was effective in differentiating SCHOOL-LD children from NO-SCHOOL-LD children when SLCB diagnosed LDs were restricted to the more typical symbol skill areas of reading, numeric language, and/or writing.

When Winston School's diagnosed non-typical LDs were excluded, the SLCB again only differentiated SCHOOL-LD from NO-SCHOOL-LD children when SLCB diagnosed LDs were restricted to the symbol skills of reading, numeric language, or writing. Specifically, looking at children with typical LDs using standard areas on the SLCB, the SLCB was able to identify most children with an LD (73%) with a relatively low false positive rate (28%). Thus, it appears that the SLCB does a fairly good job of

identifying children when focusing on the more standard LDs in both public and private schools.

Utility estimates of the SLCB suggest a tendency for the SLCB to overidentify children as having an LD. However, it may be that some of the false positives could be attributed to the following factors. Of note, as stated above, public schools are required by state law to utilize Method 1 or Method 2 to identify children. In addition, in order to be identified, educational need (academic failure) must be evident. Thus, it may be that some of the false positives were children with LDs who were unidentified due to lack of school failure. Furthermore, it may be that some children were obviously struggling but would not qualify under Method 1 due to a lack of discrepancy between intelligence and achievement. As most schools utilize Method 1 over Method 2, these children would remain unidentified.

As illustrated by the consistently high negative predictive power values across all analyses, there was a good chance that when the SLCB did not find a deficit, the school also did not identify an LD. In contrast, the likelihood that when the SLCB identified a deficit the school also identified an LD was relatively low, particularly when using the entire SLCB. Despite the above factors, it is unlikely that all of the children identified with SLCB LDs have significant LDs. Thus, results indicate that the SLCB may be best utilized as a screening measure, especially when all areas of the SLCB are used.

Results demonstrated that the SLCB-LD group included most of the SCHOOL-LD group. However, seven of the twenty-six SCHOOL-LD, all Winston School children, were not identified in the SLCB-LD group. Given the potential screening utility of the SLCB, it is important to discuss the seven SCHOOL-LD-ONLY children. Four of the seven children were diagnosed with non-typical LDs (LD in only writing and/or receptive/expressive language disorder). Two of the three children diagnosed by Winston school with typical LDs evidenced moderate difficulty in a number of areas on the SLCB (see Appendix A, Table 12). One child with a Winston school diagnosed typical LD had minimal difficulties on the SLCB. However, it is interesting to note that this child had a concurrent diagnosis of ADHD according to the school, while the other two did not.

In addition, while most of the SCHOOL-LD group was included in the SLCB-LD-T group, some children were NO-SLCB-LD-T. For a total of nine, two students, in addition to the seven described above were not identified. One of these children evidenced an LD in spelling words B, an LD in prosody, and three (when five is the cut-off) writing errors. This child received a non-typical Winston School diagnosis of an LD in writing and ADHD. The other child demonstrated an LD in sequencing and was identified by the Winston School with a typical LD in math as well as a receptive/expressive language disorder. Thus, while not receiving diagnoses in typical areas according to the SLCB, these children experienced difficulty in related areas.

It was further hypothesized that fewer behavioral problems would occur in the SLCB-LD-ONLY group than the SCHOOL-LD group. Such differences were not obtained. However, more problems were noted among SLCB-LD children than NO-SLCB-LD children. Specifically, more behavioral (externalizing problems, school problems, behavioral symptom index, and adaptive skills) problems were noted in teacher reports of the SLCB-LD children when compared to the NO-SLCB-LD children. However, SLCB-LD children did not self-report more behavioral problems than NO-SLCB-LD children. In contrast to the original hypothesis, it appears that an LD, regardless of identification, may lead to more behavioral problems for the teacher in the classroom.

Children in the SLCB-LD-ONLY group held their teachers in lower regard than the SCHOOL-LD group. In addition, SLCB-LD-ONLY children reported more school maladjustment and general distress, a more external locus of control, and higher levels of anxiety than the SCHOOL-LD children. Thus, it appears that the children with unidentified deficits were self-reporting more behavior problems, despite their teachers reporting similar levels of problems.

Of note, the SLCB-LD-ONLY-T group only reported higher general distress when compared to the SCHOOL-LD children. Therefore, the number of behavioral differences decreased when the SLCB-LD-ONLY group was restricted to include only reading, numeric language, and writing deficits. This may indicate that SLCB deficits

other than reading, numeric language, and writing are associated with more behavioral problems.

Overall, the SLCB appears to have better sensitivity than specificity. Thus, it appears to be a potentially useful screening measure for the identification of LD. Furthermore, it performs best when typical LDs (reading, math, writing) are a focus. In addition, more areas of difficulty according to the SLCB were noted in the BOTH-LD children as compared to the SLCB-LD-ONLY group. It may be that evaluating the severity of the LD, according to the SLCB, could lead to higher sensitivity. Also, the study of SLCB tasks other than reading, numeric language, and writing may lead to the identification of children with more behavioral concerns than children with typical LDs.

It was hypothesized that a higher number of girls would be found in the SLCB-LD-ONLY group when compared to the SCHOOL-LD group. However, the ratio of girls to boys in the SCHOOL-LD group and the SLCB-LD-ONLY group were similar. Thus, it appears that unidentified deficits occur at similar rates in boys and girls.

Examination of the supplementary hypothesis regarding the relationship between nominal recall deficits and WISC-III Picture Completion and Information subtests was limited by the scoring of the nominal recall section. The section was scored as either correct by recall, correct by multiple choice, or incorrect. Whether or not the student was able to partially recall the nominal was not obtained. Such information would have been

assistive in determining levels of severity of a nominal recall deficit. Nevertheless, as scored, nominal recall was not associated with any WISC-III subtests.

It was hypothesized that sequential order deficits would co-occur with relatively lower performance on Arithmetic, Digit Span, and/or Picture Arrangement subtests. These results were not obtained. However, fewer sequencing errors were correlated with higher Block Design subtest scores. Thus, it appears that good sequencing skills were associated with good ability to order blocks. While the Arithmetic subtest scaled score was not correlated with the SLCB sequencing section, a correlation was noted with math errors. It appears that good understanding of math concepts was associated with good performance on the Arithmetic subtest. In addition, the Picture Arrangement subtest was not correlated with sequencing but an association with the SLCB section of drawing a person was noted. Thus, it appears that fewer drawing errors was associated with good performance on the Picture Arrangement subtest.

As hypothesized, students with difficulty with inner vocabulary evidenced lower performance on the subtest Similarities. However, the hypothesized association between inner vocabulary deficits and the subtest Vocabulary was not noted. An unexpected positive correlation between inner vocabulary deficits and the subtest Comprehension was noted. These analyses may have been confounded by the fact that most students did not evidence difficulty with the vocabulary section of the SLCB. In contrast to the proposed hypothesis, writing deficits were not correlated with Coding and Mazes

subtests. However, Coding subtest scores were associated with fewer draw-a-person errors.

This exploratory validation study demonstrated that the SLCB can assist schools in identifying children with learning differences and possibly behavior concerns. Results indicate that it should be used primarily as a screening measure and that the sections of reading, numeric language, and writing should be a focus when seeking to identify significant LDs. In addition, it appears that the higher the number of areas of deficits, the higher the likelihood that the student should be identified. However, results also indicated that children who are suffering with non-typical unidentified LDs are likely to be experiencing more behavioral problems. This study illustrates a need to perhaps increase awareness of all students' symbol skills, symbol skill properties, and verbal communication strengths and weaknesses. Future studies could examine whether appropriate accommodation of such deficits lead to less behavioral problems both for the child and teacher.

Further research on the SLCB and other theory-based measures that approach the identification of LDs in alternate ways is sorely needed. Specifically for the SLCB, it would be useful to evaluate its effectiveness in a larger, more appropriately heterogeneous sample. In addition, a study with access to WISC-III and standardized achievement measures for the entire study population could be useful in comparing the SLCB to the standard methods of assessing LD. Furthermore, future studies could

specifically examine false positive children's grades, intelligence and achievement testing. Such examination could determine if a lack of educational need or scores that did not meet the discrepancy criteria contributed to the non-identification by the school. With the growing number of students in the U. S. identified as LD, a need to continue to evaluate alternate methods of conceptualizing, assessing, and identifying students is evident. Results demonstrate the utility of the SLCB as a supplemental/screening measure to the evaluation of LDs. It is likely that further large-scale comprehensive study of the SLCB will lead to a higher understanding of the underlying theory of the measure and serve to increase our understanding of LDs.

APPENDIX A

TABLES

Table 1.

Definitions and Age Ranges of Symbol Skills

Symbol Skill	Definition
Reading	<p>Ability to examine and grasp the meaning of printed symbols (American Heritage Dictionary, 1991); progresses from the naming of letters to the naming (reading) of whole words. Normally begins at 5 - 6 years of age when input reversals disappear. At age 6- to 8-years children should be able to read monosyllabic words; at 8- to 10-years compound words and by 9 1/2- to 11 -years high-frequency followed by mid- and finally low-frequency polysyllabic words. Literacy is the mastery and understanding of high- and mid- frequency polysyllabic words and normally occurs at 9.6 - 11 years of age. Literacy is correlated when a child is able to spell the words “not,” “live,” and “dial” backward as well as label them orally without visual input.</p>
Spelling	<p>Ability to name or write in order the letters constituting a word or part of a word (American Heritage Dictionary, 1991). Spelling requires the ability to recall phonemes and their symbols in correct order. At age 10-11.5 years a child should be able to spell the words “purchase,” “ethics,” “delicious,” and “delicate.” When able, he or she is considered literate for spelling. Transposition errors such as “friend” spelled “freind” and “receive” spelled “receiv” may be due to problems in sequencing.</p>
Arithmetic	<p>Arithmetic is defined as the mathematics of integers under addition, subtraction, multiplication, division, involution, and evolution (American Heritage Dictionary, 1991) It requires the spatial, ability to order and spatially orient numbers in sequence on paper. It is a symbol (numeric) language used for solving mathematic problems. Simple understanding of multiplication, division, and fractions is normally an ability of 7-9 year old children. When a child is able to perform tasks of the SLCB (see appendices A, B) he or she is said to be arithmetic literate.</p>

(table continues)

Table 1

Definitions and Age Ranges of Symbol Skills

<p>Drawing Draw-a- Person</p>	<p>Orientation, recall of facial features, symmetry, and neglect can be evaluated by assessing a child's response to a draw-a-person task. By the age 5-6 years a child should be able to draw a reasonable proportioned person with facial features. Children with left-hemisphere disorders may underdraw the right face or limbs. On the other hand, children with right-hemisphere communication problems may underdraw the left face or limbs. Omissions of facial features may indicate difficulty with recall.</p>
<p>Draw-a- Clock</p>	<p>Used to note sequencing and spatial orientation of symbols on paper, construction of geometric shapes, symmetry (or neglect), and time telling. At the age 7 to 8.5 years, a child should be able to draw a clock using a circle with correctly oriented and spaced numbers and hands representing the time requested. Errors can be due to difficulties with recall or spatial - spatial relations.</p>
<p>Printing, Writing</p>	<p>The ability of the younger child (ages 5 to 7 years) to print from memory the numbers 1 through 10 and lower case letters of the alphabet should be observed. Reversals (strephosymbolia) lead to difficulties with handwriting in future years. However, although prominent strephosymbolia is often associated with delayed reading, there is usually a good reading prognosis. For children ages 7.5 years or older, the task of printing or writing three to seven lines (which tell what he or she did the previous night) permits assessment of essay writing and related symbol skills including word choice, spelling, graphic ability, grammar, and syntax.</p>

Adapted from Weinberg et al. 1995a

Table 2

Summary of specific syndromes and functions

Syndromes (Types)	Functions
Auditory verbal agnosia; Wernicke's aphasia; pseudo-mental retardation; verbal dyslogia	Inner speech
Receptive dysphasia	Reception of spoken words
Phonemic recall dysphasia	Recall of phonemes for letter graphemes
Phonemic recall dyscalculia	Recall of phonemes for numeric graphemes
Broca-type aphasia	Word formulation
Word conductive dysphasia	Word conduction
Nominal recall dysphasia	Nominal recall
Word storage dysphasia	Word storage (inner vocabulary)
Specific word finding dysphasia	Specific word finding
Specific word finding after reading dysphasia; pseudo-reading comprehension dysphasia	Specific word recall after reading
Dyssymbolia for numbers	Storage of number graphemes
Dyssymbolia for letters	Storage of letter graphemes
Dyslexia	Decoding written words
Receptive visual aprosodia; visual dyslogia; pervasive developmental disorder	Understanding visual images
Receptive auditory (verbal) aprosodia	Understanding speech prosody
Conductive gestural dysprosody	Conduction of gestural prosody
Conductive verbal dysprosody	Conduction of verbal prosody

(table continues)

Table 2

Summary of Specific Syndromes and Functions

Asperger's syndrome; expressive dysprosodia	Retrieval of correct prosody: Hyperexpression
Expressive dysprosodia	Retrieval of correct prosody: Hypoexpression
Ross-type expressive dysprosodia	Formulation of verbal prosody
Ross-type expressive gestural dysprosodia	Formulation of gestural prosody
Disorder of global sequencing	Global sequencing
Disorder of event sequencing	Events sequencing
Developmental Gerstmann syndrome	Symbol sequencing and symbol orientation
Orthographic dysgraphia	Orthography (graphical aspects of writing)
Developmental clumsiness/dyspraxias	Motor praxias
Disorder of geometric language	Geometric language

Table 3

Descriptions of specific LDs included in the current paradigm and corresponding DSM-IV diagnoses

Dysgraphia	Spatial orientation of symbols on paper is characterized by reversals and rotations during early elementary school years. Difficulties with penmanship, punctuation, syntax, and grammar are evident. Often see delayed reading but as reversals disappear reading improves.	Disorder of Written Expression
Dyscalculia	May be evidenced by difficulties with the recall of phonemes for number graphemes; difficulties in sequencing symbols in numeric language tasks (transpositions); or a combination of both difficulties.	Mathematics Disorder
Developmental Gerstmann syndrome	Spelling is characterized by transposition errors. Errors in sequencing such as following multiple directions, multi step problems, and changing sets are evident when performing arithmetic. Mathematical concepts are intact but writing numbers on paper is difficult. Dysgraphia is evident. Spatial orientation of symbols on paper is impaired and characterized by reversals and rotations. Sequential ordering is defective and characterized by difficulties with syntax, grammar, and self-organization (i.e. following a set of directions and completing multi step tasks).	Mathematics Disorder Disorder of Written Expression

(table continues)

Table 3

Descriptions of Specific LDs Included in the Current Paradigm and Corresponding DSM-IV Diagnoses

<p>Dyslexia + Developmental Gerstmann syndrome:</p>	<p>Characterized by the combined deficits of dyslexia and the developmental Gerstmann syndrome but reversals are not present (Weinberg & McLean, 1986).</p>	<p>Reading Disorder Disorder of Written Expression Mathematics Disorder</p>
<p>Developmental disorder of global sequencing</p>	<p>Difficulties in the sequencing of symbols, designs, objects, and events (leading to transpositions of symbols in spelling and numeric language tasks) as well as dysgraphia, and poor organization.</p>	<p>_____</p>
<p>Developmental disorder of events sequencing</p>	<p>Difficulty planning and following through with planned activities, becoming readily distracted by environmental events, to which they respond immediately (stimulus dependency). No difficulties with sequencing of letters or numbers in spelling, numeric language tasks, or writing.</p>	<p>_____</p>
<p>Hyperdysprosodia</p>	<p>Characterized by hyperexpressivity or excessive prosody. These children are often socially incompetent and are rejected by others in social situations</p>	<p>Asperger's Disorder</p>
<p>Hypodysprosodia</p>	<p>Characterized by hypoexpressivity and blunted prosody. These children are often socially reclusive and reject others in social situations</p>	<p>Communication Disorder, Not Otherwise Specified</p>

Table 4

Developmental specific learning disabilities

GROUP	SYMBOL SKILLS				SYMBOL SKILL PROPERTIES			VERBAL COMMUNICATION SKILLS					SYMBOLIZATION (PICTURE-TO-PICTURE/WORD REPRESENTATION)	LEARNING DISABILITY
	READING	SPELLING	ARITHMETIC	WRITING	NOMINAL RECALL	SEQUENTIAL ORDERING	REVERSALS	PHONEMIC RECALL	INNER VOCABULARY (WORD STORAGE/RECALL)	HYPERPROSODY	HYPOROSODY	INNER SPEECH (WORD-TO-PICTURE REPRESENTATION)		
L	1													Phonemic Recall Dysphasia
	2													Specific Word Finding and Word Storage Dysphasia
	3													Developmental Pure Dyslexia
	4													Phonemic Recall Dyscalculia

(table continues)

Table 4

Developmental Specific Learning Disabilities

L < R	1																	Dysgraphia
	2																	Developmental Gerstmann Syndrome
	3																	Dyslexia plus Gerstmann Syndrome without reversals
	4																	Dyslexia plus Gerstmann Syndrome with reversals
	5																	Dyscalculia evidenced by phonemic recall and sequencing difficulties
R	1																	Hyperdysprosodia
	2																	Hypodysprosodia
	3																	Dyscalculia evidenced by sequencing difficulties

L = Left Cerebral Hemisphere (Parietal-Temporal Cortex)
 R = Right Cerebral Hemisphere (Parietal-Temporal Cortex)
 Adapted from Weinberg & McLean, 1986

Table 5

Winston School Learning Disability Diagnoses

Diagnosis	Number of Students	Diagnosis of ADHD
LD in reading, math, & writing	3 (15%)	1 (10%)
LD in reading & writing	1 (5%)	1 (10%)
LD in reading and receptive language	1 (5%)	1 (10%)
LD in math & writing	1 (5%)	1 (10%)
LD in reading, math, & writing and Mixed Receptive/Expressive Language Disorder	2 (10%)	0
LD in math and Mixed Receptive/Expressive Language Disorder	1 (5%)	0
LD in writing	7 (35%)	6 (60%)
Expressive Language Disorder	1 (5%)	0
Mixed Receptive/Expressive Language Disorder	2 (10%)	0
Mixed Receptive/Expressive Language Disorder & LD in writing	1 (5%)	0

Table 6

Demographics

	West (n=25)	Roquemore (n=40)	Winston (n=20)
Gender			
Male	15 (60%)	21 (52.5%)	14 (70%)
Female	10 (40%)	19 (47.5%)	6 (30%)
Ethnicity			
Caucasian/Non- Hispanic	18 (72%)	8 (20%)	17 (85%)
African American	3 (12%)	16 (40%)	3 (15%)
Hispanic	1 (4%)	11 (27.5%)	
Asian	2 (8%)	1 (2.5%)	
Other	1 (4%)	4 (10 %)	
Age			
Mean (SD in months)	10.7 (8.1)	10.9 (7.7)	10.9 (7.9)
Range	9.5 - 11.7	9.5 - 12.5	9.4 - 11.8
School-identified learning disability			
Yes	1 (4%)	5 (12.5%)	20 (100%)
No	24 (96%)	35 (87.5%)	0 (0%)

Table 7
Pearson Correlations for SLCB Variables

	Seq	Spelling A	Spelling B	Nominal Recall	Word Formulation	Word Finding	Reading	Reading Comp	Numeric Language	Math	Prosody	Vocab	Writing
Sequencing	----- -												
Spelling A	.242 p=.026	-----											
Spelling B	.310 p=.004	.546 p=.000	-----										
Nominal Recall	.160 p=.143	.250 p=.021	.222 p=.041	-----									
Word Formulation	.206 p=.059	.182 p=.096	.231 p=.033	.087 p=.426	-----								
Word Finding	-.018 p=.872	-.070 p=.526	.095 p=.387	-.100 p=.362	-.037 p=.738	-----							
Reading	.418 p=.000	.444 p=.000	.521 p=.000	.121 p=.268	.412 p=.000	.100 p=.363	-----						
Reading Comprehension	-.057 p=.606	-.057 p=.606	-.054 p=.627	-.105 p=.339	-.003 p=.978	.008 p=.939	-.142 p=.194	-----					
Numeric Language	.437 p=.000	.270 p=.012	.328 p=.002	-.001 p=.992	.407 p=.000	-.024 p=.824	.249 p=.022	.144 p=.188	-----				
Math	-.010 p=.926	-.042 p=.705	.011 p=.924	.067 p=.540	.286 p=.008	.016 p=.882	-.024 p=.825	.053 p=.628	.229 p=.035	-----			
Prosody	-.088 p=.423	.015 p=.890	.131 p=.231	-.091 p=.409	.045 p=.682	-.068 p=.538	-.097 p=.377	.058 p=.596	.016 p=.887	.178 p=.104	-----		

(table continues)

Table 7.

Pearson Correlations for SLCB Variables

	Seq	Spelling A	Spelling B	Nominal Recall	Word Formulation	Word Finding	Reading	Reading Comp	Numeric Language	Math	Prosody	Vocab	Writing
Vocabulary	-.039 p=.723	.274 p=.011	.160 p=.145	.068 p=.537	.082 p=.454	-.097 p=.375	.144 p=.188	.088 p=.423	.109 p=.322	-.008 p=.944	.062 p=.572	----- .	
Writing	.065 p=.555	.521 p=.000	.355 p=.001	.283 p=.009	.212 p=.052	-.038 p=.730	.256 p=.018	.029 p=.794	.189 p=.084	-.072 p=.511	.131 p=.233	.234 p=.031	-----
Drawing (person)	-.006 p=.954	.068 p=.536	.173 p=.113	.021 p=.847	.109 p=.323	.027 p=.806	.024 p=.828	.082 p=.457	.198 p=.069	.072 p=.511	.096 p=.384	.044 p=.690	.366 p=.001

Table 8.

Pearson Correlations Between BASC Composite Variables

	T Externalizing Problems	T Internalizing Problems	T School Problems	T Behavioral Symptoms Index	S School Maladjustment	S Clinical Maladjustment	S Personal Maladjustment
T Externalizing Problems	-----						
T Internalizing Problems	.456 p=.000	-----					
T School Problems	.637 p=.000	.425 p=.001	-----				
T Behavioral Symptoms Index	.909 p=.000	.666 p=.000		-----			
S School Maladjustment	.338 p=.009	.258 p=.051	.220 p=.097	.306 p=.019	-----		
S Clinical Maladjustment	.254 p=.054	.254 p=.054	.103 p=.440	.266 p=.044	.567 p=.000	-----	
S Personal Adjustment	-.209 p=.115	-.449 p=.000	-.252 p=.056	-.295 p=.025	-.518 p=.000	-.587 p=.000	-----
S Emotional Symptoms Index	.214 p=.106	.396 p=.002	.144 p=.281	.300 p=.022	.581 p=.000	.907 p=.000	-.825 p=.000

T = Teacher BASC
S = Student BASC

Table 9

Pearson Correlations Between SLCB Sections and WISC-III Subtests

	Information	Similarities	Arithmetic	Vocabulary	Comprehension	Digit Span	Picture Completion
Sequencing	-.301 (p=.197)	.210 (p=.373)	-.155 (p=.515)	-.078 (p=.743)	-.182 (p=.442)	.082 (p=.740)	-.313 (p=.179)
Spelling A	.085 (p=.722)	-.303 (p=.194)	.030 (p=.901)	.064 (p=.788)	.221 (p=.350)	-.345 (p=.148)	.231 (p=.328)
Spelling B	.099 (p=.678)	-.346 (p=.135)	-.126 (p=.596)	.093 (p=.698)	.109 (p=.646)	-.233 (p=.338)	-.062 (p=.796)
Nominal Recall	.085 (p=.722)	-.143 (p=.549)	-.203 (p=.379)	-.005 (p=.983)	.196 (p=.407)	.257 (p=.288)	.046 (p=.846)
Word Formulation	-.275 (p=.241)	-.278 (p=.236)	-.152 (p=.522)	.086 (p=.719)	-.036 (p=.880)	-.203 (p=.403)	-.308 (p=.187)
Reading	.070 (p=.770)	-.087 (p=.716)	.280 (p=.233)	.328 (p=.158)	.357 (p=.123)	-.186 (p=.445)	.353 (p=.126)
Reading Comprehension	-.221 (p=.348)	-.361 (p=.118)	.257 (p=.273)	-.143 (p=.547)	.473 (p=.035)	.361 (p=.129)	-.188 (p=.427)
Numeric Language	-.240 (p=.307)	-.293 (p=.210)	-.343 (p=.139)	-.096 (p=.686)	-.212 (p=.369)	.083 (p=.736)	-.353 (p=.127)
Math	-.360 (p=.118)	-.416 (p=.068)	-.451 (p=.046)	-.026 (p=.912)	.087 (p=.715)	.077 (p=.756)	-.404 (p=.077)
Prosody	.399 (p=.081)	.031 (p=.897)	-.279 (p=.234)	.147 (p=.536)	-.216 (p=.361)	-.150 (p=.540)	.099 (p=.679)
Vocab	-.016 (p=.948)	-.525 (p=.018)	.101 (p=.670)	.024 (p=.918)	.459 (p=.042)	.377 (p=.112)	.099 (p=.679)
Writing	.232 (p=.324)	-.246 (p=.295)	-.146 (p=.540)	.398 (p=.082)	.188 (p=.428)	-.158 (p=.519)	.220 (p=.352)
Drawing	.040 (p=.868)	-.258 (p=.271)	-.606 (p=.005)	.115 (p=.628)	-.389 (p=.090)	-.146 (p=.550)	-.381 (p=.097)

(table continues)

Table 9

Pearson correlations between SLCB sections and WISC-III subtests

	Coding	Picture Arrangement	Block Design	Object Assembly	Symbol Search	Mazes
Sequencing	-.181 (p=.444)	-.050 (p=.835)	-.508 (p=.022)	-.296 (p=.205)	.012 (p=.964)	-.519 (p=.057)
Spelling A	-.021 (p=.930)	-.063 (p=.792)	.180 (p=.447)	.181 (p=.445)	-.145 (p=.592)	.019 (p=.948)
Spelling B	-.268 (p=.253)	-.138 (p=.561)	.028 (p=.908)	-.023 (p=.924)	-.490 (p=.054)	.098 (p=.738)
Nominal Recall	-.318 (p=.172)	-.136 (p=.567)	-.061 (p=.799)	.201 (p=.397)	-.409 (p=.116)	-.241 (p=.407)
Word Formulation	.012 (p=.960)	-.266 (p=.257)	.193 (p=.415)	.060 (p=.803)	-.181 (p=.502)	-.253 (p=.383)
Reading	.237 (p=.315)	.036 (p=.881)	.421 (p=.065)	.124 (p=.604)	.251 (p=.348)	-.205 (p=.482)
Reading Comprehension	.137 (p=.566)	-.346 (p=.135)	-.033 (p=.890)	-.082 (p=.731)	-.270 (p=.312)	-.045 (p=.878)
Numeric Language	-.122 (p=.639)	-.380 (p=.098)	-.285 (p=.224)	-.182 (p=.444)	-.585 (p=.017)	-.393 (p=.164)
Math	-.185 (p=.461)	-.430 (p=.059)	-.312 (p=.181)	-.032 (p=.893)	-.546 (p=.029)	-.124 (p=.674)
Prosody	-.409 (p=.074)	.108 (p=.651)	.000 (p=1.000)	.000 (p=1.000)	-.342 (p=.195)	.241 (p=.407)
Vocabulary	.192 (p=.417)	.066 (p=.781)	.048 (p=.840)	.060 (p=.803)	-.014 (p=.960)	-----
Writing	-.313 (p=.179)	-.095 (p=.689)	.063 (p=.791)	.115 (p=.629)	-.485 (p=.057)	.030 (p=.920)
Drawing	-.646 (p=.002)	-.542 (p=.014)	-.101 (p=.672)	-.208 (p=.379)	-.756 (p=.001)	.328 (p=.253)

Table 10

Estimates of Diagnostic Validity Based Upon the Use of the SLCB in Public and Private Schools

	False Negatives	True Negatives	True Positives	False Positives	PPP	NPP
Total Group (n=85)	7 (8.2%)	25 (29.4%)	19 (22.4%)	34 (40%)	.36	.78
Total Group Excluding Atypical LDs (n=74)	3 (4.1%)	25 (33.8%)	12 (16.2%)	34 (45.9%)	.26	.89
Standard SLCB LD (n=85)	9 (10.6%)	38 (44.7%)	17 (20.0%)	21 (24.7%)	.45	.81
Standard SLCB LD excluding Atypical LDs (n=74)	4 (5.4%)	38 (51.4%)	11 (14.9%)	21 (28.4%)	.34	.90

PPP: Positive Predictive Power, the likelihood that a child has a school-identified LD when the SLCB indicated that a child has a LD

NPP: Negative Predictive Power, the likelihood that a child does not have a school-identified LD when the SLCB indicated that a child does not have a LD

Table 11

Estimates of Diagnostic Validity Based Upon the Use of the SLCB in Public Schools

	False Negatives	True Negatives	True Positives	False Positives	PPP	NPP
Total Group (n=65)	0 (0%)	25 (38.5%)	6 (9.2%)	34 (52.3%)	.15	1.00
Standard LDs (n=65)	0 (0%)	38 (58.5%)	6 (9.2%)	21 (32.3%)	.22	1.00

PPP: Positive Predictive Power, the likelihood that a child has a school-identified LD when the SLCB indicated that a child has an LD

NPP: Negative Predictive Power, the likelihood that a child does not have a school-identified LD when the SLCB indicated that a child does not have an LD

Table 12

School-LD Children Unidentified by the SLCB

Winston Diagnosis	SLCB Profile
LD in reading, math, and writing	4 spelling words A errors (5 is cut-off); nominal recall by multiple choice; reading spotty grade level; reading comprehension intact by combination of recall and multiple choice; 1 math error; 2 errors in prosody; vocabulary intact by combination of recall and verbal multiple choice; 4 errors in writing (5 is cut-off)
Expressive Language Disorder	4 spelling words A errors (5 is cut-off); 1 spelling words B error; nominal recall by multiple choice; 1 numeric language error
LD in reading and receptive language, ADHD	1 sequencing error; nominal recall by multiple choice; reading comprehension intact by combination of recall and multiple choice; 2 errors in writing
LD in writing, ADHD	1 sequencing error; 2 spelling words A errors; 1 error in writing
LD in writing, ADHD	1 sequencing error; 4 spelling words A errors (5 is cut-off); 2 spelling words B errors; nominal recall by multiple choice; reading comprehension intact by combination of recall and multiple choice; 1 error in math; 1 error in numeric language; 3 errors in writing
LD in writing, ADHD	1 spelling words A error; 2 prosody errors
Mixed Receptive/Expressive Language Disorder & LD in reading, math, & writing	3 spelling words A errors; 1 spelling words B error; nominal recall by multiple choice; reading comprehension intact by combination of recall and multiple choice; 1 math error; 3 writing errors

APPENDIX B
SUMMARY OF THE SLCB ITEMS

**SUMMARY OF THE SYMBOL LANGUAGE AND
COMMUNICATION BATTERY ITEMS**

Higher Brain Functions	Age of Emergence
------------------------	------------------

Sequencing

Counting from 0 - 10	
Forward (0 - 10)	4 - 5 years
Backward (10 - 0)	5 - 6 years

Alphabet	5.5 - 6.5 years
----------	-----------------

Days of the week	
Forward	6 - 7 years
Backward	7 - 8 years

Months of the year	
Forward	8 - 9.5 years
Backward	9.5 - 11 years

Reiteration	
2 + 2 + 1 - 2	6 - 8 years
2 x 3 + 2 - 1	8 - 10 years
4 x 4 + 4 - 3 (or 5 x 5 + 5 - 4)	10 - 11.5 years

Spelling Words A (relating to reading comprehension)

Dog - god	6 - 7 years
Was - saw	7 - 8 years
Tip - pit	7.5 - 8.5 years
Not - ton	9 - 10 years
Live - evil	9.5 - 10.5 years
Dial - laid	9.5 - 11 years

Spelling Words B (relating to phonemic recall and sequencing)

it, cat, look, stop, spot	6 - 7 years
hit, hot, hat, hut	7 - 7.5 years
work, talk, girl, went	7.5 - 8 years
should, could, phone, house	8 - 9.5 years
monkey, elephant, receive, friend	9 - 10.5 years

purchase, ethics, delicate, delicious	10 - 11.5 years
Nominal Recall	
Birth date	
Month and day	5.5 - 7 years
Month, day, and year	8 - 9 years
Name recall	
Monosyllabic (Brill or Dietz)	6 - 8 years
Bisyllabic (Hertzberg or Rutman)	8 - 10 years
Trisyllabic (Ravenstein or Hertzberg)	10 - 12 years
Four syllable name (Schwartzeneimer or Hertenberger)	12 + years
Word Repetition	
Methodist	6 - 8 years
Episcopal	6 - 8 years
Methodist Episcopal	8 + years
Reading readiness	
Naming colors	3 - 4.5 years
Naming shapes	3.5 - 6 years
Naming numbers	5 - 6 years
Naming letters	5 - 6 years
Reading	
Gilmore Oral Reading Test - Form C	
C - 1, C - 2: monosyllabic words	6 - 8 years
C - 3: simple compound polysyllabic words	8 - 10 years
C - 4: high frequency polysyllabic words	9.5 - 11 years
C - 5, C - 12: quantitative efficiency	10 + years
Numeric language (numbers, arithmetic)	
2 + 2, 4 + 5, 9 + 11	6 - 7.5 years
3 - 2, 7 - 4, 13 - 6	6 - 7.5 years
How many pennies in a nickel?	5 - 6 years
How many quarters in two dollars?	7 - 8 years
How many half-dollars in five whole dollars?	8 - 9 years
If you had nine apples and three friends, how many apples could you give each friend?	6.5 - 7.5 years

If you had to walk 100 miles, and you could walk 10 miles an hour, how many hours would it take you to walk the 100 miles?	9 - 10.5 years
4 x 2, 6 x 3, 8 x 9	9 - 10.5 years
18 x 3, 12 x 7, 6 x 8	10 - 11.5 years
A whole pie is divided into four pieces:	
One piece of pie equals what fraction?	10 - 11.5 years
Three pieces equal what fraction of the pie?	10.5 - 12 years
What is one fourth as a percentage?	10.5 - 12 years
What is 25% as a decimal?	11.5 - 12.5 years

Prosody

Involuntary prosody and elemental emotionality	Infancy
Voluntary prosody	
Nonverbal gestural reception	Infancy
Nonverbal gestural conduction	Infancy
Nonverbal gestural expression	Infancy
Voluntary verbal reception	Infancy
Voluntary verbal conduction	Infancy
Voluntary verbal expression	Infancy

Vocabulary (inner vocabulary)

baby, name, green, second	6 - 8 years
visit, spring, money, thought	8 - 10 years
grasp, moist, stride, browse, coward	10 - 12 years
freight, obsolete, drought, absorb, occupation	12- 14 years
fortuitous, vaguely, judicious, vocation, absurd	14 - 16 years
serendipity, foment, impecunious, litigious	16 + years

Spatial orientation and graphic design

Draw-a-person	5 + years
Draw-a-clock	
Appropriate size and placement	7 - 8 years
Correct time	7.5 - 8.5 years
Print numbers	5 - 7 years
Print lower case letters	5 - 7 years
Print or write three to seven lines telling what you did last night	7.5 + years

Taken from Weinberg et al. 1995a & Weinberg et al. 1998

APPENDIX C
SLCB PROTOCOL

**SYMBOL LANGUAGE AND COMMUNICATION BATTERY
PROTOCOL**

1. Student Number _____

2. Date of Birth

_____/_____/_____
Month Day Year

3. Age Tested _____
Months

4. Date Tested

_____/_____/_____
Month Day Year

5. Sex 1. Male 2. Female

SYMBOL LANGUAGE AND COMMUNICATION BATTERY TASKS

GIVE CHILD NOMINAL (SEE MANUAL)

**1. SEQUENCING
(INDICATE NUMBER CORRECT)**

1. Count forward _____ 2. Count backward _____ 3. Alphabet _____

4. Days of the Week 5. Days of the Week 6. Months of the Year
Forward _____ Backward _____ Forward _____

7. Months of the Year
Backward _____

(1=CORRECT, 2=INCORRECT)

8. $2 + 2 + 1 - 2$ _____ () 9. $2 \times 3 + 2 - 1$ _____ () 10. $4 \times 4 + 4 - 3$ _____ ()

11. $5 \times 5 + 5 - 4$ _____ ()

**2. READING COMPREHENSION (SPELLING WORDS A: BACKWARD WORDS SPELLING TEST: RELATES TO READING COMPREHENSION)
(1=CORRECT; 2=INCORRECT)**

1. _____ () Forward 2. _____ () Backward 3. _____ () Labeled
 DOG GOD
4. _____ () Forward 5. _____ () Backward 6. _____ () Labeled
 WAS SAW
7. _____ () Forward 8. _____ () Backward 9. _____ () Labeled
 TIP PIT
10. _____ () Forward 11. _____ () Backward 12. _____ () Labeled
 NOT TON
13. _____ () Forward 14. _____ () Backward 15. _____ () Labeled
 LIVE EVIL
16. _____ () Forward 17. _____ () Backward 18. _____ () Labeled
 DIAL LAID

(1=YES; 2=NO)

19. Enjoy reading () 20. Learn from reading () 21. Reading make sleepy ()

**3. PHONEMIC RECALL AND SEQUENCING OF GRAPHEMES (SPELLING WORDS B)
(1=CORRECT; 2=INCORRECT)**

1. IT _____ () 2. IS _____ () 3. THE _____ ()
4. STOP _____ () 5. SPOT _____ () 6. LOOK _____ ()
7. HIT _____ () 8. HOT _____ () 9. HAT _____ ()
10. HUT _____ ()

11. WORK _____ () 12. TALK _____ () 13. GIRL _____ ()

14. WENT _____ ()

15. SHOULD _____ () 16. COULD _____ () 17. PHONE _____ ()

18. HOUSE _____ ()

19. MONKEY _____ () 20. ELEPHANT _____ () 21. RECEIVE _____ ()

22. FRIEND _____ ()

23. PURCHASE _____ () 24. ETHICS _____ () 25. DELICATE _____ ()

26. DELICIOUS _____ ()

4. NOMINAL RECALL (1=CORRECT; 2=INCORRECT)

Birthday

1a. Day _____ () 1b. Month _____ () 1c. Year _____ ()

2a. Brill (6-8 years) _____ ()

2b. Rutman (8-10 years) _____ ()

2c. Ravenstein (10-12 years) _____ ()

2d. Schwarzenheimer (> 12 years) _____ ()

4A. NOMINAL RECALL MULTIPLE CHOICE (1=CORRECT, 2=INCORRECT)

3a. Brill, Schwartz, Dietz _____

3b. Hertzberg, Rutman, Lineman _____

3c. Handleman, Ravenstein, Hertenberg _____

3d. Hertenberger, Handlemanstein, Schwartzenheimer _____

5. WORD FORMULATION (AND WORD CONDUCTION) (1=CORRECT, 2=INCORRECT)

(Score incorrect if after 3-4 trials response continues to be incorrect)

1. Methodist _____

2. Episcopal _____

3. Methodist Episcopal _____

6. SPECIFIC WORD FINDING (1=INTACT RECALL OF NOUNS/VERBS, 2=PARTIAL RECALL OF NOUNS/VERBS, 3=NIL RECALL OF NOUNS/VERBS, 4=DESCRIBES ROOM USING COLORS ONLY)

1. Describe room _____

2. What did last night _____

3. Free field _____

7. READING READINESS

(1=INTACT NAMING, 2=PARTIAL (≥1 INCORRECT) NAMING, 3=NONE CORRECT)

Skip if ≥ 7 years of age, unless lack of reading readiness is suspected

1. Color naming: red, blue, green, yellow, brown ()

2. Geometric shape naming: square, triangle, diamond, cross, star ()

3. Number discrimination: 1, 3, 6, 7, 9 ()

3a. 5, 1, 4

3b. 3, 2, 8

3c. 5, 3, 6

3d. 7, 2, 4

3e. 7, 9, 2 ()

4. Number naming: 1, 3, 6, 7, 9, 25, 50 ()

5. Letter discrimination: A, B, C, D, E

5a. Q, A, F 5b. G, C, B 5c. U, D, X 5d. E, C, A ()

6. Letter naming: a, b, c, d, h, j, k, m, n, p, u, w, x, y, z ()

8. READING GILMORE ORAL READING TEST - FORM C: ACCURACY

1. Reading level _____

0=nil

1=spotty 1st grade

2=strong 1st grade/nil 2nd grade

3=strong 1st grade/spotty 2nd grade

4=strong 2nd grade/nil 3rd grade

5=strong 2nd grade/spotty 3rd grade

6=strong 3rd grade/nil 4th grade

7=strong 3rd grade/spotty 4th grade

8=spotty 4th grade/occasional p.s. by naming

9=strong 4th grade/spotty 5th grade

10=strong 5th grade but decays with length

11=strong 5th grade/6th grade decays with length

12=strong 6th grade/7th grade decays with length

13=strong 7th grade/8th grade decays with length

14=strong 8th grade/9th grade decays with length

15=strong 9th grade or above

2. Reading errors _____

1=none

2=substitutions

3=omissions

4=blanks

5=mispronunciations

6=skipping around the page

**9. READING GILMORE ORAL READING TEST - FORM C:
COMPREHENSION (1=CORRECT, 2=CORRECT WITH M/C, 3=INCORRECT)**

1. _____
2. _____
3. _____
4. _____
5. _____

10. NUMERIC LANGUAGE (1=CORRECT, 2=INCORRECT)

1. $2 + 2$ _____ () 2. $4 + 5$ _____ () 3. $9 + 11$ _____ ()
4. $3 - 2$ _____ () 5. $7 - 4$ _____ () 6. $13 - 6$ _____ ()
7. Pennies _____ () 8. Quarters _____ () 9. Half-dollars _____ ()
- 9a. Half-dollar 1 with fingers _____ () 9b. Half-dollar 5 with fingers _____ ()
10. 9 apples _____ () 10a. 6 apples _____ () 11. Miles _____ ()
12. 4×2 _____ () 13. 6×3 _____ () 14. 8×9 _____ ()
15. 18×3 _____ () 16. 12×7 _____ () 17. 11×5 _____ ()
18. 1 piece _____ () 19. 3 pieces _____ ()
- 18a. $\frac{1}{6}$, $\frac{1}{4}$, $\frac{3}{5}$ _____ () 19a. $\frac{3}{4}$, $\frac{2}{5}$, $\frac{3}{10}$ _____ ()
20. $\frac{1}{4}$ as % _____ () 21. $\frac{3}{4}$ as % _____ ()
- 20a. 50 %, 90 %, 25 % _____ () 21a. 60 %, 75 %, 40 % _____ ()
22. 25 % as decimal _____ () 23. 75 % as decimal _____ ()
- 22a. .25, 2.5, .14 _____ () 23a. 7.5, .75, .34 _____ ()

11. TRUE MATHEMATICS QUESTIONS (1=CORRECT, 2=INCORRECT)

1. river slopes _____ () 2. farthest _____ () 3. space _____ ()
4. tallest _____ () 5. shortest _____ () 6. weighs most _____ ()
7. weighs least _____ ()

12. INVOLUNTARY PROSODY (Receptive: 1=CORRECT, 2=INCORRECT, Expressive/conductive: 1=NORMAL 2=UNDEREXPRESSIVE, 3=OVEREXPRESSIVE)

Receptive () Expressive/conductive ()

13. VOLUNTARY PROSODY (Receptive: 1=CORRECT, 2=INCORRECT, Expressive/conductive: 1=NORMAL 2=UNDEREXPRESSIVE, 3=OVEREXPRESSIVE)

1. Voluntary nonverbal (gestural) reception
1a. happy () 1b. sad () 1c. mad ()
2. voluntary nonverbal (gestural) conduction:
2a. happy () 2b. sad () 2c. mad ()
3. Voluntary nonverbal (gestural) expression
3a. happy () 3b. sad () 3c. mad ()
4. Voluntary verbal reception
4a. happy () 4b. sad () 4c. mad ()
5. Voluntary verbal conduction
5a. happy () 5b. sad () 5c. mad ()
6. Voluntary verbal expression
6a. happy () 6b. sad () 6c. mad ()

14. WORD STORAGE (INNER VOCABULARY) (1=CORRECT, 2=CORRECT WITH VERBAL M/C, 3=CORRECT WITH VERBAL M/C FOLLOWING PICTORIAL PRESENTATION, 4=INCORRECT)

1. baby () 2. name () 3. green () 4. second ()
 5. visit () 6. spring () 7. money () 8. thought ()
 9. grasp () 10. moist () 11. stride () 12. browse () 13. coward ()
 14. freight () 15. obsolete () 16. drought () 17. absorb () 18. occupation ()
 19. fortuitous () 20. vaguely () 21. judicious () 22. vocation () 23. absurd ()
 24. serendipity () 25. foment () 26. impecunious () 27. litigious ()

15. SPATIAL ORIENTATION AND GRAPHIC DESIGN

1. Draw a person

- | | | | |
|------------------------|--------------|---------------------------|----------------|
| (A) Graphic design | (1) good | (2) fair | (3) poor |
| (B) Placement of parts | (1) good | (2) fair | (3) poor |
| (C) Parts | (1) complete | (2) unimportant omissions | (3) incomplete |
| (D) Symmetry | (1) good | (2) fair | (3) poor |
| (E) Artistic quality | (1) good | (2) fair | (3) poor |
| (F) Shading | (1) yes | (2) no | |

2. Draw a clock

- | | | | |
|-----------------------|-------------|---------------|---------------|
| (A) Size | (1) good | (2) fair | (3) poor |
| (B) Placement | (1) correct | (2) partial | (3) incorrect |
| (C) Sequencing | (1) correct | (2) incorrect | |
| (D) Spatial relations | (1) good | (2) fair | (3) poor |

(E) Neglect	(1) yes: right hemisphere	(2) yes: left hemisphere	(3) no
-------------	------------------------------	-----------------------------	--------

3. Letters

(A) Sequencing	(1) correct	(2) incorrect	
(B) Spatial relations	(1) good	(2) fair	(3) poor
(C) Graphic design	(1) good	(2) fair	(3) poor
(D) Reversals	(1) no	(2) yes	

4. Numbers

(A) Sequencing	(1) correct	(2) incorrect	
(B) Spatial relations	(1) good	(2) fair	(3) poor
(C) Graphic design	(1) good	(2) fair	(3) poor
(D) Reversals	(1) no	(2) yes	

5. Writing

(A) Graphomotor skills	(1) good	(2) fair	(3)poor
(B) Sequencing	(1) good	(2) fair	(3)poor
(C) Word usage	(1) good	(2) fair	(3)poor
(D) Spelling	(1) good	(2) fair	(3)poor
(E) Clarity	(1) good	(2) fair	(3)poor
(F) Punctuation	(1) good	(2) fair	(3)poor
(G) content	(1) good	(2) fair	(3)poor

6. Right/left orientation

(1) correct (2) incorrect

17. WIT (1) good (2) fair (3)poor

18. HUMOR (1) good (2) fair (3)poor

19. LOGIC (1) good (2) fair (3)poor

20. OBSERVATIONS (1=NO; 2=YES)

- 1. Lip reading
- 2. Receptive dysphasia (many "whats")
- 3. Latent responses
- 4. Many "don't knows"
- 5. Passive-aggressive
- 6. Passive-resistant
- 7. Aggressive-resistant
- 8. Frustrated, discouraged, self-deprecating
- 9. Overly concerned, worried, anxious
- 10. Cooperative, compliant
- 11. Attentive
- 12. Pleasant

APPENDIX D
DIRECTIONS FOR ADMINISTRATION AND INTERPRETATION OF THE SLCB

DIRECTIONS FOR ADMINISTRATION AND INTERPRETATION OF THE SYMBOL LANGUAGE AND COMMUNICATION BATTERY (SLCB)

The Symbol Language and Communication Battery (SLCB) is administered individually in an office setting. Twenty to thirty minutes are necessary for its completion.

Get to know the child: who he or she is; what the child likes to do; what the child talks about and thinks about school, home, friends, and activities; the child's general fund of information, memory, and ability to reason and abstract; and how the child feels about himself or herself. Does the child relate warmly and well with appropriate affect and mood? Is the child agitated, sad, anxious, passive-resistant, passive-aggressive, or aggressive-resistant? Is the child cooperative with appropriate desire to please? Does the child demonstrate satisfactory judgement?

Listen to the child speak during random conversation. Is the language (vocabulary, usage, expressive ability, flow, phonation, articulation) age appropriate? Does the child clutter, stutter, or stammer, and does the child have age appropriate verbal expressive ability? Have the child tell a story to a picture stimulus.

Give the child verbal commands, both simple and complex, singular and multiple, and note the responses. Is there echolalia? Does the child understand the spoken word? Have the child repeat simple and "tricky" phrases. Check for object-sound-word naming and discrimination.

Throughout the office visit (waiting room as the "free field"; examining room as semi-structured and structured setting), the clinician should observe the child's ability to maintain alertness and wakefulness (vigilance), work effort and voluntary persistence (diligence), and involuntary persistence (ability to maintain posture and the absence of extraneous movements, hyperkinesia, and other evidence of involuntary impersistence). Note attention toward detail and intention (volition, the will). Estimate adaptive intelligence (the ability to understand the world and become an independent citizen).

When administering items requiring a stimulus-response format, repeat questions as needed. Give the child encouragement through gestures, smile, and looks while saying "that's great", "perfect", "okay", or "that's fine". Encourage the child to answer questions while assisting the child to feel comfortable. Do not say "no", "incorrect," "not right." Do not frown at the child when the child's response is wrong. The examiner's responses should be as honest as possible, offering only positive comments, smiles and frequent warm gestures.

Introducing the SLCB

Say to the child, "What I am going to ask you is somewhat like school work. Some will be real easy. Some will be hard, but don't worry about that. Okay? Is that a deal?"

Then show the child your pen. Using the nominal that is age-appropriate for the child being tested, say, "See this pen? This was given to me by Mr. [(Brill: age 6y-8y5mo.; Rutman (age 8y6mo - 10y5mo); Ravenstein (age 10y6mo - 12y5mo); Schwartzenheimer (age ≥12y6mo)]. Can you say Mr. _____ Let the child say it." In order for you to remember his name, I'd like for you to say _____ five times. Don't forget his name because I am going to ask you what it is later."

In the case that the child's name is similar or the same to the above names alternate names are: Children ages 6 to 8 years 5 months: **Dietz**; Children ages 8 years 6 months to 10 years 5 months: **Hertzberg**; Children ages 10 years 6 months to 12 years 5 months: **Hertzenberg**; Children ≥12 years 6 months: **Hertzenberger**.

1. *Sequencing*

1. Counting from 0 to 10. "Start with zero and count to ten." (Correct: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10) Children ages 4 to 5 years should be able to count forward.

2. "Start at ten and count backward to zero." (Correct: 10, 9, 8, 7, 6, 5, 4, 3, 2, 1, 0) Children ages 5 to 6 years should be able to count backward.

3. Letters of the alphabet. "Tell me the ABCs, all letters of the alphabet." (Correct: A, B, C, D, E, F, G, H, I, J, K, L, M, N, O, P, Q, R, S, T, U, V, W, X, Y, Z) Children ages 5.5 to 6.5 years should be able to say the alphabet.

4. Days of the week. "Tell me the days of the week. Start with Sunday.(Correct: Sunday, Monday, Tuesday, Wednesday, Thursday, Friday, Saturday)"Children ages 6 to 7 years should be able to say the days of the week forward.

5. "Now tell me the days of the week backward. Start with Sunday and go backward." (Correct: Sunday, Saturday, Friday, Thursday, Wednesday, Tuesday, Monday) Children ages 7 to 8 years should be able to say them backward.

6. Months of the year. "Tell me the months of the year. Start with January." (Correct: January, February, March, April, May, June, July, August, September,

October, November, December) Children ages 8 to 9.5 years should be able to say the months of the year forward.

7. **"Now start with December and tell me the months of the year backward."** (Correct: December, November, October, September, August, July, June, May, April, March, February, January) Children ages 9.5 to 11 years should be able to say the months of the year backward.

8. Reiteration. The following reiterative oral number tasks are especially useful as a test of sequencing in children with alphabetic language problems:

"What does 2 plus 2 plus 1 minus 2 equal?" (Correct: 3) Children ages 6 to 8 years should answer correctly.

9. **"What does 2 times 3 plus 2 minus 1 equal?"** (Correct: 7) Children ages 8 to 10 years should answer correctly.

10. **"What does 4 times 4 plus 4 minus 3 equal?"** (Correct: 17) Children ages 10 to 11.5 years should answer correctly.

11. **"What does 5 times 5 plus 5 minus 4 equal?"** (Correct: 26) Children ages 10 to 11.5 years should answer correctly.

2. *Reading comprehension (Spelling words A: backward words spelling test).* This test relates directly to reading comprehension.

1. **"Spell the word *dog*."**

2. **"Spell *dog* backward."** (Correct: god)

3. **"What does that new word spell?"** Children ages 6 to 7 years should correctly spell and label the backward word (*god*) and should understand first-grade reading material.

4. **"Spell the word *was*."**

5. **"Spell *was* backward."** (Correct: saw)

6. **"What does that new word spell?"** Children ages 7 to 8 years should correctly spell and label the backward word (*saw*) and understand second-grade reading material.

7. **"Spell the word *tip*. Like the *tip* of my finger."**

8. **"Spell *tip* backward."** (Correct: pit)

9. **"What does that new word spell?"** Children ages 7.5 to 8.5 years should correctly spell and label the backward word (*pit*) and understand third-grade reading material.

10. **"Spell the word *not*. Like, "I will *not* go."**

11. **"Spell *not* backward."** (Correct: ton)

12. **"What does that new word spell?"** Children ages 9 to 10 years should correctly spell and label the backward word (*ton*) and understand fourth-grade reading material.

13. **"Spell the word *live*."**

14. **"Spell *live* backward."** (Correct: evil)

15. **"What does that new word spell?"** Children ages 9.5 to 10.5 years should correctly spell and label the backward word (*evil*) and understand fifth-grade reading material.

16. **"Spell the word *dial*. Like, "*dial* a telephone number."**

17. **"Spell *dial* backward."** (Correct: laid)

18. **"What does that new word spell?"** Children ages 9.5 to 11 years should correctly spell and label the backward word (*laid*) and understand fifth- to sixth-grade reading material. A child able to do *live/evil* and *dial/laid* is literate.

19. Ask the child, **"Do you enjoy reading?"**

20. **"Can you learn from reading?"**

21. **"Does reading make you sleepy?"**

3. *Spelling words B (relates to phonemic recall and sequencing of graphemes).*

"Now, these are more difficult words. Some may be fifth-grade words, but do the best you can. Spell them as well as you can." Children who are able to spell the fifth-grade words are considered to be literate for spelling.

*Start one grade level below current grade or estimated grade level ability. Find the basal level (4/6 or 3/4 *correct*) and the ceiling level (4/6 or 3/4 *incorrect*)*

First-grade words (ages 6 to 7 years):

1. **it** 2. **is** 3. **cat** 4. **look** 5. **stop** 6. **spot**

Second-grade words (ages 7 to 7.5 years):

7. **hit** 8. **hot** 9. **hat** 10. **hut**

Ages 7.5 to 8 years:

11. work 12. talk 13. girl 14. went

Third-grade words (ages 8 to 9.5 years):

15. should 16. could 17. phone 18. house

Fourth-grade words (ages 9 - 10.5 years):

19. monkey 20. elephant 21. receive 22. friend

Fifth-grade words (ages 10 to 11.5 years):

23. purchase 24. ethics 25. delicate 26. delicious

4. *Nominal recall*

a. Birthday. Ask the child,

1. "When is your birthday? Please tell me the a) day, b) month, and c) year you were born." Children ages 5.5 to 7 years should know the day and month. Children ages 8 to 9 years should know the day, month, and year.

2. Name (nominal recall). Ask the child, "Now do you remember the man's name who gave me this pen?" "What is his name?" Point to the pen that was shown to the child at the beginning of the test. If the child does not "remember", provide a choice of three names. If the child cannot recall the name, but can pick the correct name by multiple choice, the response is scored as a nominal recall problem. For incomplete or partial recall, the response is scored as a phonemic recall problem. If incorrect both by multiple choice and naming, storage (memory) of nominals (names) may be impaired.

5. *Word formulation (and word conduction)*. Ask the child to repeat the word *Methodist*, then *Episcopal*, then *Methodist Episcopal*. Offer three to four trials, noting clarity, phonemic and syllable omissions, and sound substitutions.

1. "I'd like for you to say some words. Please say **Methodist**."

2. "Say **Episcopal**." Children ages 6 to 8 years can repeat the single words (*Methodist* or *Episcopal*)

3. "Say **Methodist Episcopal**." After age 8 years, children can repeat the words together (*Methodist Episcopal*).

* Score incorrect if after three to four trials the child continues to state the words incorrectly*

6. *Specific word finding.* Listen to the child speak both in the free field and in a semi-structured/structured setting.
1. "Now, we're going to do something a little different. First, I'd like for you to describe the room for me, just look around and tell me what you see."
 2. "Now, I'd like for you to tell me what you did last night."
 3. "My next question is, what kinds of things do you like to do?"
7. *Reading readiness.* This section of the test asks the child ages 3 to 6 years to name the classic symbols: colors, shapes, numbers, and letters. A child unable to name the symbols should be presented multiple choice using three choices. If the child is unable to select the proper choice, then assume that the symbol has not been stored.
- *Skip this section if child is ≥ 7 years, unless lack of reading readiness is suspected*
1. Color naming. "**What color is this?**" Show the child red, blue, green, yellow, and brown. Children ages 3 to 4.5 years should be able to name colors.
 2. Geometric shapes. "**What shape is this?**" Show the child a square, triangle, diamond, cross, and star. Children ages 3.5 to 6.0 years should be able to name shapes.
 3. Number discrimination. "**What number is this?**" Show the child a 1, 3, 6, 7, and 9. If the child is unable to name the number, offer three possible responses for the child to choose from. Children ages 4 to 5 years should be able to discriminate numbers.
 4. Number naming. "**What number is this?**" Show the child a 1, 3, 6, 7, 9, 25, 50. Children ages 5.0 - 6.0 years should be able to name numbers.
 5. Letter discrimination. "**What letter is this?**" Show the child upper case A, B, C, D, and E. If the child is unable to name the letter, offer three possible responses for the child to choose from. Children ages 4 to 5 years should be able to discriminate numbers.
 6. Letter naming. "**What letters are these?**" Show the child a lower case a, b, c, d, h, j, k, m, n, p, u, w, x, y, z. Children ages 5.0 to 6.0 years should be able to name letters.

8. *Gilmore Oral Reading Test Form C: Accuracy.* **"I want you to read for me. Some of the words may be difficult. That's okay, just do the best you can. I am going to ask you some questions after you have read the stories."** Start the child reading aloud at a grade level below the child's estimated ability. When possible, find the grade level at which the child makes no errors (base) and at which he or she makes four or fewer errors (ceiling). Stop after the fifth error at a grade level. Record the number of errors made for each tested grade level. Types of errors are substitutions, omissions, blanks, mispronunciations, and skipping around on the page.

9. *Gilmore Oral Reading Test Form C: Comprehension.* If the child's ceiling level is lower than their current age appropriate grade level use the child's ceiling paragraph. If the child's ceiling level is above their age appropriate grade level use the appropriate grade level paragraph. Read the questions to the child. For each question that the child cannot answer, present a multiple choice using three choices with one being correct. (See below)

Gilmore Reading Multiple Choice Questions

<p>C-1</p> <ol style="list-style-type: none"> 1. <u>Mary</u>, Jane, Martha 2. Frisky, <u>Puff</u>, Muffin 3. Black, <u>Gray</u>, Green 4. Brother, Uncle, <u>Father</u> 5. <u>Working</u>, Playing, Singing 	<p>C-2</p> <ol style="list-style-type: none"> 1. Uncle, Father, <u>Brother</u> 2. <u>Yard Work</u>, Play Catch, Ride Bikes 3. Playing Ball, <u>Talking to her cat</u>, Eating Lunch 4. <u>To the Store</u>, Next Door, to Buy Clothes 5. Run, Drive, <u>Walk</u>
<p>C-3</p> <ol style="list-style-type: none"> 1. Mary, <u>Dick</u>, John 2. <u>12</u>, 15, 18 3. 7, <u>9</u>, 12 4. Spelling, Sewing, <u>Cooking</u> 5. <u>Art</u>, Science, Math 	<p>C-4</p> <ol style="list-style-type: none"> 1. <u>Cook</u>, Read, Sew 2. On Saturdays, <u>On Certain Holidays</u>, On Sundays 3. <u>Builds the fire</u>, Buys the food, Sets the table 4. Set the table, Eat the food, <u>Gather wood</u> 5. <u>Tastes better</u>, Looks better, Fun to eat outside
<p>C-5</p> <ol style="list-style-type: none"> 1. 4, <u>2</u>, 6 2. Beside a: <u>sparkling mountain lake</u>, the shimmering blue sea, on top of a mountain 3. Swimming, Sailing, <u>Camping trips</u> 4. May, October, <u>July</u> 5. <u>Attend overnight Scout camp</u>, Attend day scout camp, Go on a sailing trip 	<p>C-6</p> <ol style="list-style-type: none"> 1. <u>A garage</u>, A department store, An office 2. Brakes, transmission, <u>electrical system</u> 3. Friday afternoons, <u>Saturday afternoons</u>, Sunday nights 4. <u>Essential to become an intelligent driver</u>, So can fix car if it breaks down, Because everybody should know about cars 5. Become a race car driver, Go to college, <u>Work on cars</u>

<p>C-7</p> <ol style="list-style-type: none"> 1. <u>Athletics</u>, Play an instrument, Join a drama club 2. Swimming, Basketball, <u>Baseball</u> 3. <u>Catcher for junior high team</u>, 1st baseman for high school team, Outfielder for a major league team 4. Attend all of Dicks games, <u>Attend 1 major league game each summer</u>, Watch baseball on T.V. 5. Kindness, <u>Patience</u>, Strictness 	<p>C-8</p> <ol style="list-style-type: none"> 1. Spelling, <u>Cooking</u>, Science 2. <u>9th</u>, <u>12th</u>, <u>7th</u> 3. <u>12th</u>, <u>10th</u>, <u>8th</u> 4. <u>Kindergarten teacher</u>, Counselor, High School teacher 5. Help her in typing, Help her in stenography, <u>Help plan for her future</u>
<p>C-9</p> <ol style="list-style-type: none"> 1. Keeping it the same, <u>Changing the business world</u>, Making it worse 2. Tools today will: <u>Appear crude</u>, Seem better, Appear the same 3. Shorthand is used: more frequently, the same amount, <u>less frequently</u> 4. Microfilmed records: take up more space, <u>take up less space</u>, look better 5. Machines will: <u>Increase accuracy and speed</u>, Decrease accuracy and speed, Make no difference 	<p>C-10</p> <ol style="list-style-type: none"> 1. <u>Computer</u>, Calculator, Typewriter 2. , Video-phone will take up less space, Video-phone will look nice, <u>Housewife will shop via video-phone</u> 3. <u>Store contents of libraries and make data available to all</u>, Restrict the availability of data, Make libraries smaller 4. Because approximately: <u>1/2</u>, <u>1/5</u>, <u>2/3</u> of world's population speak or understand English 5. Happiness, <u>World peace</u>, Good fortune

10. *Numeric language (numbers)*. Children able to answer correctly items 18-23 are through pre-algebra numeric language.

1. "What does 2 plus 2 equal? (Correct: 4) Children ages 6 to 7.5 years should answer correctly.
2. "4 plus 5 equal?" (Correct: 9) Children ages 6 to 7.5 years should answer correctly.
3. "9 plus 11 equal?" (Correct: 20) Children ages 6 to 7.5 years should answer correctly.
4. "What is 3 minus 2?" (Correct: 1) Children ages 6 to 7.5 years should answer correctly.

5. **"7 minus 4?"** (Correct: 3) Children ages 6 to 7.5 years should answer correctly.
6. **"13 minus 6?"** (Correct: 7) Children ages 6 to 7.5 years should answer correctly.
7. **"How many pennies in a nickel?"**(Correct: 5) Children ages 5 to 6 years should answer correctly.
8. **"How many quarters are there in two dollars?"** (Correct: 8) Children ages 7 to 8 years should answer correctly. If the child gives the answer "four" say, **"No, how many in two dollars?"** and hold up two fingers.
9. **"How many half-dollars are there in five whole dollars?"** (Correct: 10) Children ages 8 to 9 years should answer correctly. If the answer is incorrect, then ask,
 - 9a. **"How many half-dollars in one whole dollar?"** (Correct: 2) Hold up one finger.
 - 9b. **"Now, how many in five whole dollars?"** (Correct: 10) Hold up five fingers.
10. **"If you had nine apples and three friends, how many apples could you give each friend?"** (Correct: 3) Children ages 6.5-7.5 years should answer correctly. If the child cannot answer this question, ask:
 - 10a. **"If you had six apples and two friends, how many apples could you give each friend?"**(Correct: 3)
11. **"If you had to walk 100 miles, and you could walk 10 miles an hour, how many hours would it take you to walk 100 miles?"** (Correct: 10) Children ages 9 to 10.5 years should answer correctly.
12. **"Multiply 4 times 2"** (Correct: 8) Children ages 9 to 10.5 years should answer correctly.
13. **"6 times 3"** (Correct: 18) Children ages 9 to 10.5 years should answer correctly.
14. **"8 times 9"** (Correct: 72) Children ages 9 to 10.5 years should answer correctly.
15. **"Multiply 18 times 3"** (Correct: 54) Children ages 10 to 11.5 years should answer correctly.
16. **"12 times 7"** (Correct: 84) Children ages 10 to 11.5 years should answer correctly.
17. **"6 times 8"** (Correct: 48) Children ages 10 to 11.5 years should answer correctly.
18. **"A whole pie is divided into four pieces. One piece of pie equals what fraction of the pie?"** (Correct: 1/4) Children ages 10 to 11.5 years should answer correctly.

19. **"Three pieces equal what fraction of the pie?"** (Correct: $\frac{3}{4}$) Children ages 10.5 to 12 years should answer correctly. If the answer is incorrect, offer three choices, with one being correct.
20. **"What is one fourth as a percent?"** (Correct: 25%) Children ages 10.5 to 12 years of age should answer correctly. If answer is incorrect, offer three choices, with one being correct.
21. **"What is three fourths as a percent?"** (Correct: 75%) Children ages 10.5 to 12 years of age should answer correctly. If answer is incorrect, offer three choices, with one being correct.
22. **"How do you write 25% as a decimal?"** (Correct: .25) Children ages 11.5 to 12.5 years and older should answer correctly. If the answer is incorrect, offer three choices, with one being correct.
23. **"What is 75% as a decimal? Where do you place the point?"** (Correct: .75) Children ages 11.5 to 12.5 years and older should answer correctly. If the answer is incorrect, offer three choices, with one being correct.

11. *True mathematics questions.*

1. Using each index finger to represent different slopes of rivers flowing down a mountain, ask,
"If you had two rivers, both the same size, which of these two rivers would be flowing the fastest?"
2. **"What is the farthest from here, the moon or the planet Mars?"** (Correct: Mars)
3. **"If you bought a pound of feather pillows and a pound of bricks, which of those two pounds would take up the most space?"** (Correct: feather pillows)
4. **"In this room, who is the tallest?"**
5. **"In this room, who is the shortest?"**
6. **"In this room, who weighs the most?"**
7. **"In this room, who weighs the least?"**

12. *Involuntary prosody and elemental emotionality.* Involuntary prosody is the spontaneous behavior of the child. Observe whether the child has excessive ...

prosody or elemental emotionality (hyperdysprosody) or blunted prosody and elemental emotionality (hypodysprosody). Dysprosody may be either receptive, expressive, or both. Observe the child's ability to respond appropriately to gestures by others and emotional elements of speech. Observe the child's spontaneous gestures and speech tones.

13. *Voluntary prosody*

1. Voluntary nonverbal (gestural) reception. Ask the child to identify the appropriate face card of happy, sad, and mad. **"Please point to the happy face (pause and allow to point), the sad face (pause and allow to point), and the mad face"**

2. Voluntary nonverbal (gestural) conduction. Ask the child to mimic an appropriate face card or examiner's facial expressions of happy, sad, and mad. **"Make a happy face like the one in the picture (pause and look at child's face), a sad face (pause and look at the child's face), and a mad face."**

3. Voluntary nonverbal (gestural) expression. Ask the child to show by facial expressions (express on his or her own face) happy, sad, and mad. **"Now, without looking at the pictures, I'd like for you to make a sad face (pause and look at child's face), a mad face (pause and look at child's face), and a happy face."**

4. Voluntary verbal reception. Ask the child to state (or show) whether the examiner sounds happy, sad, or mad. State **"I'm going to the movies tonight"** Use prosody/emotionality of happy, sad, and mad, making certain the examiner's face is not visible to the child.

5. Voluntary verbal conduction. **"I'd like for you to repeat 'I'm going to the movies tonight' and sound just like I sound."** make certain the examiner's face is not visible to the child. Offer the above statement using prosody/emotionality of happy, sad, and mad. The child then repeats the statement using prosody/emotionality of happy, sad, and mad. Note whether the child is able to verbally express these emotions without looking at the child's face.

6. Voluntary verbal expression. **"Now I'd like for you to turn around so that I can't see your face and say 'I'm going to the movies tonight' happy, sad, and mad and make me guess which one it is."** Listen without looking at the child (child's face not in view). If uncertain, ask the child to repeat the statement.

14. *Word storage (inner vocabulary)* * Start 1 level below child's age group. Find the basal level (3/4 or 3/5 scores of "1" *correct without verbal multiple choice*) and ceiling level (3/4 or 3/5 scores of "3" or "4" - *incorrect with verbal multiple choice*)*

Ask the child to define (state "define ____ or tell me what ____ means") words. If unable to do so, offer three verbal choices (see below). If unable to choose the correct definition, show the pictorial representation of the word. Take away the picture and offer the child three verbal choices again.

Ages 6 years to 8 years 5 months:

1. **baby** 2. **name** 3. **green** 4. **second**

Ages 8 years 6 months to 10 years 5 months

5. **visit** 6. **spring** 7. **money** 8. **thought**

Ages 10 years 6 months to 12 years 5 months:

9. **grasp** 10. **moist** 11. **stride** 12. **browse** 13. **coward**

Ages 12 years 6 months to 14 years 5 months:

14. **freight** 15. **obsolete** 16. **drought** 17. **absorb** 18. **occupation**

Ages 14 to 16 years 5 months:

19. **fortuitous** 20. **vaguely** 21. **judicious** 22. **vocation** 23. **absurd**

Ages 16 years 6 months:

24. **serendipity** 25. **foment** 26. **impecunious** 27. **litigious**

Word Storage (Inner Vocabulary) Multiple Choice

<p>1. Baby: <u>young child</u>, teenager, adult 2. Name: a toy, a dog, <u>state the child's name</u> 3. Green: <u>color of grass</u>, color of a lemon, color of a carrot 4. Second: part of a horse, <u>a part of time</u>, part of a sentence</p>	<p>14. Freight: scary, worn out, <u>cargo</u> 15. Obsolete: <u>outdated</u>, flexible, brand new 16. Drought: wet, long period of rainy weather, <u>long period of dry weather</u>, unpredictable weather 17. Absorb: to join together, <u>to soak up</u>, to separate 18. Occupation: <u>line of work</u>, line of clothing, a type of feeling</p>
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<p>5. Visit: to stay home, <u>to go to see someone</u>, to go to school</p> <p>6. Spring: <u>season of the year</u>, cold time of the year, summer</p> <p>7. Money: something to laugh at, used to play music, <u>used to buy things</u></p> <p>8. Thought: <u>idea</u>, sentence, unfrozen</p>	<p>19. Fortuitous: <u>very lucky</u>, of great strength, very predictable</p> <p>20. Vaguely: certain, transparent, <u>not certain</u></p> <p>21. Judicious: <u>wise</u>, articulate, ignorant</p> <p>22. Vocation: a holiday, <u>a job</u>, a hobby</p> <p>23. Absurd: practical, common, <u>silly</u></p>
<p>9. Grasp: <u>to hold</u>, to let go, to extend</p> <p>10. Moist: dry, itchy, <u>damp</u></p> <p>11. Stride: <u>walk with long steps</u>, jogging slowly, to skip quickly</p> <p>12. Browse: to look at in detail, <u>to skim</u>, to consume rapidly</p> <p>13. Coward: someone who is excited, someone who has bravery, <u>someone who lacks courage</u></p>	<p>24. Serendipity: <u>having great fortune</u>, a snake crawling, calm & peaceful</p> <p>25. Foment: to explain well, <u>to agitate</u>, to use the telephone</p> <p>26. Impecunious: <u>lacking money</u>, mischievous, lacking intelligence</p> <p>27. Litigious: to harm the reputation by slander, the process of forming an opinion, <u>prone to engage in law suits</u></p>

15. *Spatial orientation and graphic design: Pencil and paper tasks.* Give the child three sheets of 8 1/2 x 11 in. white, unlined paper and two sharp no. 2 pencils with erasers. The child is asked to do the following:

1. Draw-a-person. **"I want you to draw a person for me. It can be a man, woman, boy or girl. Draw the best picture of a person that you can. Draw a complete person. Do not draw a stick person."** Children age 5 years and older should be able to do this task. Observe graphic design, placement of parts, omissions of facial features, symmetry, artistic-aesthetic quality, and shading of the body.

2. Draw-a-clock. **"I want you to draw a face of a clock, a simple face of a clock. Put the numbers on it and then put the hands at 10 minutes before 2 o'clock. Do the best you can. If you don't know where to put the numbers or hands, just put them where you think they belong - do the best you can."** Appropriate size and placement of the hands is noted between ages 7 and 8 years, with correct time between ages 7.5 and 8.5 years. The draw-a-clock task is useful in observing sequencing, spatial relations, and in particular, neglect of either right or left cerebral hemisphere.

3 & 4. Printed letters and numbers. For children ages 5 to 7 years, **ask the child to "print the lower-case ("little" or "small") letters of the alphabet."** If the child is unwilling or unable to work spontaneously, have the child print to dictation the numbers 3, 5, 6, 7, and 9 and the lower case letters b, d, p, q, w, z, m, and n. Observe for sequencing, spatial relations, graphic design and reversals. At this age, lower-case letters represent a more mature response than upper-case letters.

5. Write three to seven lines. Children over age 7.5 years should be able to write a story: **"I want you to write for me a little story. Please print or write three to seven lines telling me what you did last night. Do not write more than seven lines, but write at least three lines, and tell me what you did last night" (or this morning, if the child states, "I don't remember.").** Writing requires multiple communication functions of brain. Writing a brief passage allows the clinician to note graphomotor skills, sequencing, word usage, spelling, clarity of thought, and study in further detail syntax and semantics. Children past age 9 years who continue to print rather than cursively write are the dysgraphics with a history of prominent strephosymbolia. Children and young adolescents who write in single-line format rather than offering a paragraph often have significant difficulties with organization. Writing is also used to note spatial relations.

16. *School subjects: Easiest and hardest.* **"Of the following - reading, spelling, arithmetic, writing, art, gym, making a speech or show and tell, social studies, science, geography, language arts, music or band - "** (repeat the choices if necessary):

1. **"Which do you like the best?"**
2. **"Which is the easiest for you?"**
3. **"Which is the most fun?"**
4. **"Which do you find the hardest; most difficult?"**
5. **"The least fun?"**
6. **"The most work?"**

17. *Wit.* The natural ability to perceive or know. (This is a subjective judgement by the clinician.)

18. *Humor.* To perceive, appreciate, and adapt to situations. (This is a subjective judgement by the clinician.)

19. *Logic.* Correct reasoning; the understanding of cause and effect. (This is a subjective judgment by the clinician.)

 20. *Important additional observations*
 1. Did the child watch your face and lips closely (lipreading)?
 2. Do you suspect a receptive dysphasia? Did the child say "what" several times?
 3. Did the child take too long a time before answering (ie, latency-to-response)?
 4. Did the child say "I don't know" or "I can't" rather than offering a response?

 5. Is the child passive-aggressive? Is the child passive-resistant? Is the child aggressive-resistant?
 6. Did the child appear too easily frustrated, discouraged, or self-deprecating?
 7. Did the child appear overly concerned, too worried, or anxious?
 8. Was the child cooperative? compliant?
 9. Was the child appropriately attentive?
 10. Did the child relate in a pleasing, pleasant, sociable, and age-appropriate manner?
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Adapted from: Weinberg & McLean, 1986; Weinberg et al., 1998

APPENDIX E
CONSENT/ASSENT LETTERS

PARENTAL CONSENT LETTER

Dear Parent or Guardian:

We would like to ask your permission for your son or daughter to help us determine the usefulness of a test, the Symbol Language and Communication Battery (SLCB), in diagnosing learning disabilities. This test is designed to see what skills children have in certain grades. We will also be using the Behavior Assessment Scale for Children (BASC) to look at children's thoughts, feelings, and behaviors. This project has been reviewed and approved by the University of North Texas committee for the Protection of Human Subjects (940) 565-3940.

Children will be told to do the best they can but not to worry if they do not get all the answers correct. They will also be told that the testing will take about forty-five minutes and that many of the answers will be given out loud. Following the tests they will be asked a few questions by another examiner (i.e. what their likes and dislikes about school may be and which is their favorite subject).

Potential Benefits and Concerns. We will schedule administration of these tests so that your child will not miss important lessons. However, he or she may have to make up missed work. A certificate for participation, pencils, and stickers will be given after the testing. This project should help researchers further understand learning disabilities. By participating in this research, your child will be contributing to the understanding of learning skills in elementary school children and will receive valuable experience in a one-on-one testing situation. This study should have no risks associated with participation.

Participation is voluntary. Your child's participation in this study is completely voluntary. After hearing about the tests, children will be given the choice to participate or not. They will be told that they can stop being in the project at any time and no one will be upset with them. They will also be told that their decision will not make a difference in their school grades. Your decision whether or not to allow your child to participate, will not affect your child's standing in his or her class/school. This project has been approved by your child's school, as well as the University of North Texas.

Information is confidential. All information will be held confidential. Only the researchers will see the results of testing. Once your child has completed the testing, his or her name will be removed and replaced with a number. At the conclusion of the study, a summary of group results will be made available to all interested parents and teachers.

Questions? If you have any questions, please feel free to call Ms. Caitlin D. Schraufnagel (940-565-2671), Dr. Persephanie Silverthorn (940-565-2655), or the school principal (Ms. Susie Swan, (817-801-3500). Either of us can arrange for you to see the Symbol Language and Communication Battery and the Behavior Assessment Scale for Children in advance if you wish.

Thank you for your consideration.

Sincerely,

Caitlin D. Schraufnagel
Graduate Student
Department of Psychology

Persephanie Silverthorn, Ph.D.
Assistant Professor
Department of Psychology

Please return this form by _____ (10 days)

I do grant permission for my child, _____ to participate in this project.

I do not grant permission for my child, _____ to participate in this project.

Parent/Guardian's signature

CHILD ASSENT LETTER

I understand that I have been asked to be in a project looking at how children do in school subjects like reading and writing and math. I will also be asked about my thoughts and feelings. If I agree to be in this project, I will be interviewed alone and asked questions that are like school work and questions about my thoughts and feelings. This will take about 45 minutes.

I understand that I do not have to answer any questions I do not want to and I can go back to my class early if I want. I can stop being in this project any time that I want and no one will get mad at me. It will not make any difference in my grades if I do not want to be in the project. If I feel bad about any of the questions I answer, I can talk to my teacher, Ms. Schraufnagel, or Dr. Silverthorn about it.

I understand that my name won't be used and the interviewer will not tell anyone what I said because it's private. I will keep my answers private, too.

If I have any questions, I can ask my parents or teacher or have them call Ms. Schraufnagel or Dr. Silverthorn at (940) 565-2671. This project has been approved by the University of North Texas.

I have had a chance to ask questions. I volunteer to be in this project.

Child Signature _____ **Date** _____

Interviewer Signature _____ **Date** _____

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