THE RELIABILITY AND FACTOR STRUCTURE OF THE SALON DIFFERENTIAL A NEUROPSYCHOLOGICAL SCREENING INSTRUMENT

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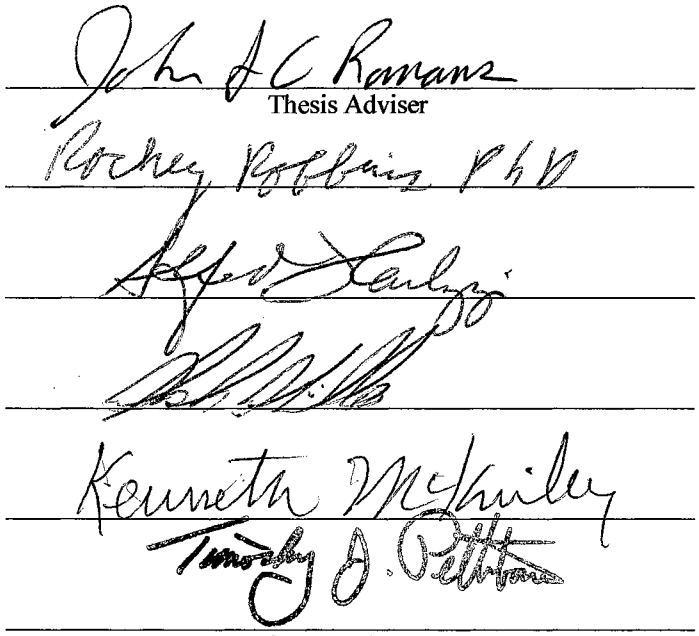

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CHAPTER ONE

STATEMENT OF THE PROBLEM

Children can experience difficulties in school in a variety of different areas and for a variety of different reasons. Academically, a child may be experiencing difficulty with math, spelling, reading, or any other fundamental area. To account for academic difficulties, there have been many attempts historically to classify academic difficulties a child may be experiencing. Aside from difficulties related to trauma, birth defects or severe developmental disorder, Binet, in the late 1880's and early 1900's, categorized children as indolent versus inept. Inept refers to those who have some inherent weaknesses, such as lacking sense, judgment or reason and are generally deemed incompetent. Indolent refers to those individuals who possess considerable cognitive abilities, but are unmotivated or lazy.

Today, classification systems have moved beyond dichotomous categories and are more complex. In the process of differentially diagnosing children experiencing academic difficulties, various factors need to be considered. For the most part, factors contributing to academic difficulties in children who have experienced a trauma, birth defect or severe developmental disorder may be well known. When trauma, birth defects and severe developmental disorders can be ruled out, other factors that may be the source of a child's academic difficulties need to be considered such as possible learning disabilities, environmental stress and the motivational level of the child. Children with

learning disabilities, through no fault of their own, may be inherently less able to succeed at certain academic tasks. When learning disabilities can be ruled out, environmental factors should be considered as a potential source of a child's academic difficulties. Environmental factors that result in stress (i.e. parents divorcing, physical or sexual abuse, neglect, poverty, relocation) can detract from a child's ability to perform adequately in the classroom. When learning disabilities and childhood stress are not issues, a child may be experiencing difficulties in school due to motivational reasons. Lack of motivation often manifests itself in oppositional behavior, underachievement and/or poor work ethic. However, oppositionality, as opposed to underachievement and poor work ethic, is more likely to be the focus of a teacher's attention. Collectively, the process of identifying why a child is having academic difficulties includes ruling out the presence of a learning disorder first, followed by identifying environmental stressors, and ultimately addressing motivational or oppositional behavior as possible sources of academic difficulties. This process of differential diagnosis is outlined on the left side of Table 1.

In the process of differential diagnosis, identifying the source of a child's difficulties is particularly challenging considering many disorders result in different symptom patterns. For example, children who experience anxiety may manifest very different symptoms. Some children may focus their anxiety outward, demonstrating problem behaviors or attention seeking behaviors, while others may direct their anxiety inward and withdraw socially. Such variability in the presentation of a disorder calls for very careful diagnostic practice, which would include valid and comprehensive assessment.

Valid assessment of a child's difficulties can be confounded by symptom overlap, as one symptom may be evident in a variety of different disorders. A child who has difficulty following instructions may have a disorder related to visual or auditory acuity, comprehension difficulties, attention-related disorders, low motivation/oppositional behavior, or stress. Comprehensive assessment is needed to account for the span of possible explanations as to why a child may be experiencing trouble at school.

Valid and reliable classification of a child's difficulties is also needed to ensure that children receive appropriate remedial services. The need for reliable classification directly impacts children, as those who do not meet eligibility criteria are often not considered for further services. For those children who are classified as eligible for services, *how* they are classified is directly related to the intervention they receive. As Tharinger, Laurent and Best (1986) suggest, lack of an adequate nosology hinders intervention.

Classification also affects children indirectly. Invalid nosologies hinder research on disabilities and child psychopathology. As funding is often a concern, systems that classify symptoms with low reliability and validity (i.e. a high false positive rate) will consume excess resources, financial and otherwise. For these reasons and others, reliable and valid classification of a child's difficulties are worthy of our attention.

Historically, various nosologies or classification systems have been used to account for the span of possible explanations as to why a child may be experiencing academic difficulties. Typically, the nosologies and classification systems have varied depending on the setting and the purposes of the classification. In public schools, Public Law 94-142, and more recently the Individual's with Disabilities Education Act, have

proposed guidelines for classifying children as disabled and eligible for special education services. In a separate but somewhat related manner, psychiatric classification systems based on the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV; American Psychiatric Association, 1994), have been used to conceptualize psychiatric conditions that often predispose children to perform poorly in school. With the advent of the DSM-IV diagnostic criteria, there has been a corresponding increase in the use of psychiatric based behavior-rating scales designed to screen for potential psychiatric conditions that account for school difficulties. Finally, in a more recent development, the field of neuropsychology has generated its own nosology for categorizing brain-related impairments that inherently account for school related problems by virtue of specific information processing deficits. For the most part, these classification systems have developed apart from each other and represent divergent theoretical orientations and philosophical models in classifying a range of difficulties. As noted in the right half of Table 1, psychoeducational, psychiatric and neuropsychological classification systems account for academic difficulties related to learning disorders, childhood stress and motivational/oppositional behavior in a very different manner.

Psychoeducational Classification

Psychoeducational assessments are made possible by and regulated by the Individual with Disabilities Education Act (IDEA) of 1997. Previously know as the Education for All Handicapped Children Act or Public Law 94-142, IDEA was developed to provide guidelines for services for children with cognitive and emotional difficulties. One of the goals of P.L. 94-142 and IDEA, was to develop a new diagnostic nosology for public school systems.

IDEA identifies 13 separate categories of disabilities that make special education and related services available to children. These categories include autism, deafness, deaf-blindness, hearing impairment, mental retardation, multiple disability, orthopedic impairment, serious emotional disturbance (SED), specific learning disability, speech or language impairment, traumatic brain injury, visual impairment or other health impairment (IDEA, 1997).

Of particular interest to this paper are the categories of specific learning disability, SED and Other Health Impaired. A large majority of learning disabled children will be diagnosed into one of these three categories. Briefly, specific learning disability includes difficulties in understanding or using written or spoken language that manifests itself in basic academic skills. SED represents nonintellectually based difficulties in learning, relationship difficulties, mood disturbance, or the presence of physical symptoms or fears related to school or personal problems. The category of Other Health Impaired reflects diminished strength, energy or alertness due to longstanding or acute medical problems.

While IDEA has provided some definitional guidelines and assessment practices, it has also served to provide an equal educational opportunity to all. Since the passage of P.L. 94-142 and IDEA, the percentage of students diagnosed as learning disabled has increased about 150% and now includes 5% of all students in school. Although it is unclear, the increase may be partially attributed to a better understanding of learning disabilities, as well as a more inclusive and precise definition of what constitutes a learning disability. Learning disabled students represent half of all students with disabilities (Kavale & Forness, 1997). The enactment and implementation of IDEA was designed to provide a free appropriate public education and improve the educational

results of children with disabilities (IDEA, 1997). Its major emphasis has been on the equal provision of services and appropriate remediation, particularly to strengthen the role of the parents and provide a nonadversarial means for parents and educators to work out their difficulties.

While valued for its provision of services to all, IDEA has been criticized as a classification system. Its definitions of specific learning disability and serious emotional disturbance are vague. As a classification system, it offers few guidelines to carry out assessments and has often resulted in wide discrepancies across states.

Psychiatric Classification

In another arena, psychiatric-based DSM classification schemes and behavior rating scales emerged and flourished, particularly in the diagnosis of Attention Deficit Hyperactivity Disorder (ADHD). Today, the DSM is the most widely used classification system in North America (Merrell, 1999). The DSM is based on a medical model of behavioral and emotional problems and views disturbances in these areas as mental disease. The DSM's multi-axial system was designed to classify a broad range of problems, such that any moderate to severe behavioral or emotional problem can be potentially diagnosed under one of the many categories available (Merrell, 1999). Learning disorders are most often diagnosed under mathematics disorder, reading disorder, disorder of written expression, developmental coordination disorder, expressive language disorder, mixed receptive-expressive disorder, phonological disorder, attention deficit hyperactivity disorder, or Asperger's disorder. Childhood stress is accounted for under the diagnosis of adjustment disorder, and lack of motivation/oppositional behavior seems to fit under the diagnosis of oppositional defiant disorder.

Not only is the DSM-based classification system advantageous in that it allows for the classification of a host of problems, but it is also based on a common system and language familiar to many professionals (Merrell, 1999). The DSM system has been applauded for its use of reliability and validity studies and meta-analyses in the face of revisions of the system (Merrell, 1999). The most recent revision of the DSM included an emphasis on seemingly more objective behavioral criteria. This change prompted an increase in psychiatric based behavior rating scales.

Psychiatric rating scales are valued for their time efficiency (both for the rater and clinician) and cost effectiveness relative to other diagnostic procedures such as observation (Merrell, 1999). Welcomed for their sensitivity, rating scales can provide data on low frequency behavior worthy of documentation, such as aggression, when other methods, such as observation, may not identify these behaviors (Merrell, 1999). For children who are uncooperative or unavailable for assessments, rating scales can be used to evaluate those children who, for whatever reason, cannot provide information about him or herself (Merrell, 1999). When ratings are obtained from those who are regarded as familiar with the child's behavior (i.e. parents and teachers), the judgments and observations of the subject are thought to represent an "expert" opinion. Ratings can also reflect the individual's behavior across a period of time and in their natural environment (Merrell, 1999). In this manner, they can be used in assessments to provide a baseline to measure treatment effectiveness (Brock, 1997; Reynolds, 1999). Data obtained from rating scales has been regarded as "easy" to quantify via the use of factor analysis and multidimensional scaling, ultimately easing the classification process (Kazdin, 1985).

For these reasons, the DSM and behavior rating scales have become popular as a means of accounting for a child's school related difficulties.

Although popular and widely used, the DSM and behavior rating scales appear to be symptom driven and do not take into account syndromes or patterns of deficits that occur together. As a classification system, the DSM tends to account for behavior at the extreme ends of the continuum and does not account for symptoms that are less severe, yet more common. Behavior rating scales also suffer from various forms of rater bias and tend to have high face validity. As an alternative to the psychiatric classification system, neuropsychology approaches academic difficulties from a syndrome and information processing perspective and can more readily account for less severe disabilities.

Neuropsychological Classification

Neuropsychology, often defined as the scientific study of brain-behavior relationships, is yet another evolving field offering a nosology of its own for understanding and explaining why a child may be experiencing problems in school. The neuropsychological paradigm has been welcomed for its theoretical framework and its empirical basis in understanding a child's difficulties (Lezak, 1995), which are typically not evident in other classification systems such as IDEA. Within the neuropsychological classification system, learning disorders may be classified as language learning disorders, nonverbal learning disorders or disorders of attention. Childhood stress and oppositional behavior may also be accounted for during the course of a clinical interview and a child's performance on neuropsychological tests.

D'Amato, Rothlisberg and Leu Work (1999) have identified the neuropsychological paradigm as holding "promise for the understanding of children's learning and the full range of their behavioral repertoire" (p.452). Clark and Hostetter (1995) go further by suggesting that the relevancy of a neuropsychological perspective for educators is obvious. That is, to understand learning and the learner, one only needs to recognize that all behavior is a product of the brain and central nervous system (CNS). As such, assessment can be based on the lawful principles of the CNS (Lewandowski, 1991), as neuropsychological tests have been found to reliably differentiate normal and abnormal CNS functioning (Reitan & Wolfson, 1985). Neuropsychology is one of the first fields to incorporate models of how the brain actually functions into the assessment of a child's difficulties. For example, many neuropsychologists would agree that there are many models of impairment in language, non-language, attention, etc. With each of these models of impairment, there are unique patterns of cognitive strengths and deficits that emerge. With the presumed relationship between brain dysfunction and childhood disorders such as learning disabilities and disorders of attention, clinical neuropsychologists are in an ideal position to assess and provide differential diagnoses and treatment recommendations for children presenting with school difficulties.

Neuropsychology is also welcomed for its use of statistical techniques and actuarial basis to arrive at diagnoses (Lezak, 1995). Utilizing statistical norms and properties such as standardized data-based psychometric scores, neuropsychological tests are more precise and offer greater sensitivity to detect subtle impairments in ability (D'Amato, Rothlisberg & Rhodes, 1997). For example, children who do not learn easily and lag behind their peers may be readily identifiable, however children with subtle

symptoms and difficulties may go unnoticed, thus benefiting most from neuropsychological assessment (Merz, Buller & Launey, 1990). It may be argued that many diagnoses are possibly due in part to the specificity and sensitivity of neuropsychological tests (Lezak, 1995). Specificity and sensitivity refers to the correct classification of individuals as normal or impaired (Spreen & Strauss, 1998). More specifically, sensitivity refers to the true positive rate, or the ability to detect a disorder when it is present. Specificity refers to the true negative rate, or the ability to differentiate among conditions and detect the absence of a disorder.

As neuropsychology tends to be sensitive and specific in detecting syndromes and patterns of deficits and information processing deficits, neuropsychological evaluations can be lengthy and time consuming. Administration of a full neuropsychological battery may also be costly. In response to these concerns, neuropsychological screening instruments may be utilized.

Neuropsychological Screening Instruments

In the face of time constraints and limited resources, there has been a recent trend in neuropsychology to develop neuropsychological screening instruments. As Chouinard and Braun (1993) note, neuropsychological screening serves the purpose of orienting test selection to adopt a more invasive and expansive test battery. Focusing on the diagnostic process using screening instruments is an important early stage of assessment. To adequately focus the diagnostic process, a screening exam needs to be broad reaching (i.e. screen for more than only 1 or 2 disorders; Adams & Heaton, 1990) and based on psychometrically sound principles of reliability, validity and a good normative sample (Chouinard & Braun, 1993).

At the present time there are a variety of neuropsychological screening tests available for various presenting complaints (e.g. Mayo Early Language Screening Test, Children's Neuropsychological Screening Test, Kaufman Short Neuropsychological Assessment Procedure). However, screening instruments currently available tend to be restrictive in that they screen for only one or two conditions or may be as extensive as a full battery, yet only constitute a screening for deficits. Time consuming and expensive, this approach does not allow the clinician to address the full range of possible explanations for a child's difficulties. Many screening instruments also have high face validity, such that raters may easily endorse items that correspond to their preconceived diagnosis.

Purpose of the Study

There is a need for a neuropsychological screening instrument that can discriminate children in a school population and can account for a range of possible explanations as to why a child may be having difficulty in school (i.e. learning disorders, environmental stress and motivational/oppositional concerns). The SALON Differential is a neuropsychological screening instrument which utilizes developmental and behavioral descriptors that identifies five common referral profiles: childhood stress (S), disorders of attention (A), language learning disorder (L), oppositional/motivational behaviors (O) and nonverbal learning disorder(N). (The SALON is titled and represents an acronym of each of the diagnostic categories.) The SALON was developed in response to a need for a neuropsychologically based instrument that looks at a span of possible explanations as to why a child may be having difficulties in school. In this

respect, the items on the SALON reflect neuropsychological constructs, however are presented to the respondent as behavioral and developmental descriptors or items. As such, the SALON is a behavior rating scale completed by the caretaker with the items reflecting neuropsychological principles. As a recently developed instrument, the focus of this study was to address the psychometric properties of the SALON, namely reliability, validity and factor structure.

As will be discussed in further detail later, the SALON was developed by constructing rationally derived and theoretically supported items based on neuropsychological constructs. While the subscales were derived of theoretically based items, the question arises if the items are psychometrically sound. To address the reliability of the SALON, the internal consistency of the subscales were analyzed using coefficient alpha. Concurrent validity of the SALON was established by correlating each of the subscales with standardized neuropsychological measures. Lastly, an exploratory factor analysis was conducted to determine the factor structure of the scale as a measure of validity. While the items on the SALON were theoretically derived to reflect 5 distinct diagnostic categories, a factor analysis was conducted to verify the underlying factor structure.

Hypotheses

1. The items on the SALON subscales are internally consistent and reliable.
2. The SALON will factor analyze into 5 factors representing 5 diagnostic categories: stress, attention disorder, language learning disorder, nonverbal language learning disorder and oppositional behavior.
3. Each of the items on the subscales will load on the respective factors.

4. The SALON subscales will correlate with select neuropsychological tests.

Research Questions

1. Are the theoretically derived items of the SALON internally reliable such that coefficient alpha equals 0.70 or greater?
2. Do the SALON subscales significantly correlate with select neuropsychological measures?
3. Does the SALON yield five factors as it was theoretically derived to measure?

Assumptions

1. Children in the study performed with adequate effort for reliable results.
2. Parents or guardians rated children in an honest and representative manner.
3. Assessments were conducted in an optimal testing environment and standard test protocol was followed.
4. Diagnoses are accurate.
5. Children in the study do not have comorbid diagnoses.

Limitations

1. Diagnoses are made by a member of the Neurocognitive Diagnostic Team under the supervision of a diplomate in the American Board of Professional Neuropsychology. The diagnoses were not corroborated by an independent source.
2. Further research will be needed on the SALON to determine other aspects of reliability and validity.
3. Generalizations of this study should be made cautiously.

CHAPTER TWO

REVIEW OF THE LITERATURE

Of the various classification systems available, IDEA legislation, psychiatric classification and neuropsychological nosologies, each has drawn from its unique theoretical foundation to arrive at its current conceptualization of how a child's inherent cognitive weaknesses in terms of learning disorders, stress and motivational/oppositional behavior affect cognitive skills and/or school performance. Each of these categories will be discussed from a psychoeducational, psychiatric, and neuropsychological perspective as well as a brief overview of the current state of assessment practices in each area. Lastly, the limitations of each of these classification systems will be discussed.

Psychoeducational Classification of Learning Disorders

In accordance with federal guidelines, the Individuals with Disabilities Education Act of 1997 accounts for learning disabilities under the federal category of specific learning disability. According to federal legislation, a specific learning disability is "a disorder in one or more of the basic psychological processes involved in understanding or using language, spoken or written, which may manifest itself in an imperfect ability to listen, think, speak, read, write, spell, or do mathematical calculations" (IDEA, 1997). IDEA legislation treats learning disabilities as a homogenous group and does not recognize the heterogeneous nature of learning disabilities in its current definition.

For those learning disabilities marked by impairments in attention, the US Department of Education (1991) issued a memorandum clarifying its policy regarding the eligibility of services for children with attention disorders (Lerner, 1997). This marked a significant step in the recognition of attention disorders (e.g. Attention Deficit Hyperactivity Disorder) as eligible for special education services within the public school system. According to this memorandum, children with attention disorder may qualify for special education and related services under the specific learning disability, serious emotional disturbance (SED) or Other Health Impaired category of IDEA. SED refers to

> A condition exhibiting one or more of the following characteristics over a long period of time or to a marked degree which adversely affects school performance:
> (a) an inability to learn which cannot be explained by intellectual, sensory or health factors;
> (b) an inability to build or maintain satisfactory relationships with peers and teachers;
> (c) inappropriate types of behavior or feelings under normal circumstances;
> (d) a general pervasive mood of unhappiness or depression; or
> (e) a tendency to develop physical symptoms or fears associated with personal or school problem.
> The term includes children who are schizophrenic. The term does not include children who are socially maladjusted, unless it is determined that they have a serious emotional disturbance (IDEA, 1997).

In order to qualify under the Other Health Impaired category, the disorder of attention should reflect a "chronic or acute health problem that results in limited awareness" (IDEA, 1997), ultimately affecting a child's ability to perform in school.

Although IDEA establishes criteria, it offers few guidelines regarding how psychoeducational assessments are to be conducted and which assessments are to be used in gauging whether a child has a learning disability or disorder of attention. Generally approaches to assessment vary from school system to school system. The guidelines set forth by IDEA to guide the evaluation process are as follows (National Information

Center For Children And Youth With Disabilities, 1994). First, the evaluations must be conducted by a multidisciplinary team, which may include a speech and language pathologist, school psychologist, occupational or physical therapist, medical specialist, or others. In addition, the team must include one teacher or specialist familiar with the child's disability. Second, the evaluation must thoroughly assess every area relevant to the child's alleged disability. Third, multiple valid measures and observational data should be used, as no one procedure or criterion can be used to determine eligibility. The tests or other measures utilized must be validated for the specific purpose for which they are used during the assessment and be administered by trained personnel. Lastly, the child's disability can not interfere with his or her ability to take the test.

Limitations of Psychoeducational Classification

The lack of specificity in IDEA legislation has prompted several criticisms. For a field officially recognized nearly 30 years ago, there remains an inability to answer the seemingly plain-spoken question "What is a learning disability?" (Kavale & Forness, 1997). IDEA is plagued by vague subjectivity, resulting in a lack of consensus as to what constitutes a learning disability (Reynolds, 1985). Without consensus, the daily implementation of P.L. 94-142 varied in educational systems from state to state, and even more so in clinics and private practices (Reynolds, 1990). Assessment practices continue to vary under IDEA legislation.

Chalfant (1984) reviewed various state education agency policies regarding their definition of specific learning disability and found five components that appear to be shared consistently across states. The first component is failure to achieve, or inadequate levels of academic achievement in one of the primary components of education. Low

levels of achievement can be compared to grade placement or to intellectual potential. A second component is psychological process disorders in which a deficit is noted in a student's basic psychological processes that contribute to his or her learning. While "psychological processes" has not been entirely defined, it may include processes of attention and concentration, comprehension and utilization of written and spoken language, conceptualization, and other areas of information processing. It remains ill-defined (Reynolds, 1990) and the relationship between psychological processes and academics is unclear (Kavale & Forness, 1997). Thirdly, exclusionary criteria state that symptoms can not be due to sensory deficiencies, mental retardation, emotional disturbances or disadvantages related to education, economics or other areas. Such "rigid use of exclusionary criteria prohibit a finding of 'multiply handicapped'" (Reynolds, 1990, p. 573). Even more obvious, distinguishing what LD is *not* through the use of exclusionary criteria is not the same as saying what it *is* (Kavale & Forness, 1997). Fourth, etiology was cited as a factor and refers to the need for a clinician to examine a student's medical and developmental history to identify factors linked to LD. This is difficult when, as Reynolds (1990) notes, there is typically a lack of etiological factors. Lastly, the fifth factor is the identification of a severe discrepancy such that a child's failure to achieve corresponds with age *and* ability. That is, a severe discrepancy is noted between achievement and intellectual ability and a student's level of achievement is compared to same aged peers.

While Reynolds (1985) and Chalfant (1984) agree that all components are important, each is troubled by lack of operational and technical clarity. The severe discrepancy criterion is the most often utilized across the United States (Reynolds, 1990),

although not without limitations. The popular acceptance of this aptitude-achievement criteria as a marker for LD is evident when considering that, in spite of the lack of consensus for a definition of learning disability, it is a common thread throughout much of the literature (Berninger & Abbott, 1994). In an attempt to provide some guidance as to what constitutes a severe discrepancy, various formulas have been derived and ultimately rejected due to mathematical inadequacy (Reynolds, 1990). The discrepancy criteria has also been criticized on a conceptual level. Brown and Bryant, in their editorial comments regarding Reynolds' (1985) article, point out that even if a discrepancy is determined to exist, the clinician still is not certain the child has a learning disability, rather it only indicates that the student is an underachiever. Such diagnostic weight is put on this criteria that those who don't meet the criteria for the discrepancy may be excluded from further analysis. This is particularly disturbing when considering that language learning disabled students may do poorly on both language-loaded intelligence tests and language-loaded achievement tests, thus no discrepancy exists.

As states are allowed to determine their own operational criteria, various models exist for determining a "severe" discrepancy. Reynolds' (1990b) review of the literature found various models: constant grade-equivalent discrepancies, standard score difference methods, requirements of an achievement deficit and processing strength, various regression models of discrepancies between aptitude and achievement. However, each of these models have been criticized (Reynolds, 1985).

While fraught with difficulties in the assessment of learning disabilities, the IDEA diagnostic system is more often criticized for its conceptualization of severe emotional disturbance (Forness & Knitzer, 1992; Forness & Kavale, 1997). To be eligible for

services, a student must have a problem in one of five areas and meet the criteria of chronicity "over a long period of time," severity "to a marked extent," and difficulty in school "adversely affects educational performance" (Kavale & Forness, 1998). Yet, what if a student only meets the "inability to learn" criterion? Even the chronicity and severity criterion have not been operationalized. Both the term and the definition have resulted in under identification. As "seriously" is included as part of the term, many children are not even considered for services, as the term has been reserved by some for the most impaired. Because a team is needed to identify a child as SED and thus declare a need for services, there has been a tendency also to identify only the most overt and extreme cases (Forness & Kavale, 1997).

Closer analysis of each of the five criteria listed under seriously emotionally disturbed also reveal difficulties. In the first criteria, "inability to learn" is often confused with the learning disability definition (Forness & Kavale, 1997). The second criteria "inability to build satisfactory relationships with teachers and peers" sounds very much like social adjustment problems (Forness & Kavale, 1997). Yet, children are to be excluded from the SED category if their problems are considered social maladjustment. Recognizing the difficulty in distinguishing "social" from "emotional" maladjustment, many states have elected to not exclude children with "social maladjustment" as the definition requires (Forness & Kavale, 1997). However, many states still do.

The five SED criteria have been criticized by Kavale and Forness (1998) for their lack of utility. In many cases, systems other than the school may be conducting the evaluation and arriving at treatment interventions. However, the SED criteria do not coincide with the types of disorders identified in the diagnostic nomenclature of other

mental health professionals. Students deemed eligible for services in the schools may be denied services within the mental health system, or vice versa.

Psychiatric Classification of Learning Disorders

The DSM-IV (American Psychiatric Association, 1994) identifies three specific learning disorder diagnoses which focus on academic skills of reading, spelling and math to account for a child's difficulties. The specific learning disorders identified include reading disorder, mathematics disorder, and disorder of written expression. Additional relevant disorders include developmental coordination disorder, expressive disorder, mixed expressive-receptive disorder, attention deficit hyperactivity disorder, and Asperger's disorder.

Diagnostic criteria for reading disorder, mathematics disorder and disorder of written expression are available in Tables 2, 3 and 4, respectively. For each of the specific learning disorder diagnoses, the individual's level of achievement on an individually administered standardized test of reading, mathematics or written expression is below that expected considering the child's age, education and level of intelligence. In addition, before each of these diagnoses can be made, the individual's learning problems must significantly interfere with his or her ability to achieve academically or carry out daily activities that utilize reading, mathematics or writing skills. However, should a sensory deficit be present, the learning problems evident in the respective diagnoses must be in excess of those typically associated with the deficit.

The DSM-IV also offers diagnoses that account for difficulties in other core areas. Disorders related to motor skills (i.e. developmental coordination disorder; see Table 5) may be evident in a child's ability to assemble puzzles, build models, engage in physical

education or recess activities and printing or drawing. These deficits are greater than expected given a child's age and intellectual level and interfere with academic achievement and daily living.

Disorders of communication (e.g. expressive language disorder, mixed receptive-expressive language disorder and phonological disorder) evidence themselves in a variety of symptom patterns. Expressive language disorder (see Table 6) is characterized by limited quantity of speech, limited range of vocabulary, word finding errors, difficulty learning new words and use of simplified grammatical structure such as short sentences. Expressive language skills are substantially below nonverbal intellectual capacity and receptive language development and interfere with academic or occupational achievement or social communication. Mixed receptive-expressive language disorder (see Table 7) is characterized by the deficits related to expressive disorder as well as those related to receptive language development, including difficulty understanding words and sentences. Standardized scores on both receptive and expressive language tests are below nonverbal intellectual development and interfere with school, work or social communication. Phonological disorder (see Table 8) is characterized by deficits in speech production, use, representation or organization.

Assessment of learning disorders from a psychiatric classification system often includes the use of a standardized achievement test and intelligence test. Popular achievement tests include the Wechsler Individual Achievement Test-Revised and the Wide Range Achievement Test-3. Depending on the child's age, the Wechsler Intelligence Scale for Children-III and the Wechsler Adult Intelligence Scale-III are commonly used tests of intelligence. Writing, reading and spelling samples are useful in

the diagnosis of communication disorders. Instruments such as the Peabody Picture Vocabulary Test and the Grey Oral Reading Test may be useful to obtain such samples.

Disturbance of attention also impact a child's ability to learn in the classroom. Research in the latter 1980's and early 1990's has prompted the current understanding of attention deficit hyperactivity disorder (ADHD) as published in the DSM-IV (American Psychiatric Association, 1994). From this perspective, there are three types of disorders of attention subsumed under the term ADHD (see Table 9). The first is predominantly inattentive type in which criteria for inattention have been met, however criteria for hyperactivity have not been met. Second, is the predominantly hyperactive-impulsive type in which criteria for hyperactivity and impulsivity have been met; however criteria for inattention have not been met. While these criteria assist in determining the subtype, additional criteria also have to be met. As noted in Exhibit 1, the hyperactive-impulsive or the inattentive subtypes must have resulted in some impairment prior to age seven. The impairment caused by the symptoms needs to be present in two or more settings, such as school, home, daycare, etc. Evidence must also suggest clinically significant impairment in at least one domain of functioning (i.e. work, school, or social domains). Exclusionary criteria are also applied as the symptoms cannot be accounted for by another mental disorder and the symptoms cannot occur exclusively during the course of or be accounted for by another disorder.

In accordance with DSM-IV's conceptualizations of attention into disorders of attention, impulsivity, and hyperactivity and the situational variability of ADHD, multiple methods of assessment are needed (Shelton & Barkley, 1994). Assessments must also be based on normative data, as diagnostic criteria stipulate that the severity of

symptoms need to be developmentally inappropriate for the child's age. For these reasons, behavior-rating scales have become popular in assessing for ADHD. Some of the more popular rating scales include the Child Behavior CheckList-Revised, Devereux Scales of Mental Disorders and the Conner's Rating Scales for parents and teachers.

Children with more pervasive developmental disorders such as Asperger's disorder (see Table 10) also likely have difficulty in school. Children with Asperger's disorder tend to have social interactions marked by qualitative impairment. Their behavior, interests and activities are restricted to repetitive and stereotyped behavior. These impairments strain their ability to function socially, occupationally, academically or otherwise. These occur despite no significant delays in language, cognitive development, age appropriate self-help skills, adaptive behavior, or exploratory behavior.

Limitations of Psychiatric Classification

Psychiatric classification of childhood disorders is criticized for its subjectiveness and corresponding reliance on behavior rating scales. One potential problem of DSM-based classification systems is related to its comprehensiveness. Many professionals using this system will end up making classification decisions that may be outside of their area of expertise (Merrell, 1999). For example, many individuals who have little or no experience in speech or language disorders could end up giving this diagnosis. This is particularly disturbing in light of the fact that, while initially appearing objective, DSM classifications are often criticized for their subjectivity and may result in low interrater reliability, as many problems can be diagnosed under one or more categories (Merrell, 1999). As DuPaul and Stoner (1994) suggest, the psychiatric classification system elicits a search for pathology and under certain conditions can result in the over identification of

disorders. Gresham and Gansle (1992) suggest that without reliable diagnoses, diagnostic validity and classification validity (the extent to which distinct diagnoses are meaningful) are compromised.

Despite research supporting their effectiveness (Barkley, 1990), rating scales are not recommended as the sole means of assessment. When rating scales are considered a "test" for attention disorders (among others), they lead to many false positives (Morriss, 1992). Such measurement errors are unsettling. Likewise, clinicians who do not carefully research the rating scales they are using may be surprised to find that some scales offer normative samples that are unrepresentative (Hindshaw, 1994). When normative comparisons are used, Barkley (1990) proposed setting the criteria for the clinical significance at greater than the 97th percentile (or 2 standard deviations above or below the mean at the 3rd percentile) when comparing a child's behavior to their peers using behavior rating scales.

Merrell (1999) discusses two classes of measurement problems: bias of response and error variance. Response bias refers to the approach that informants take when completing rating scales. Three types of response bias include halo effects (attributing positive and negative characteristics on the basis of other positive or negative characteristics and not related to the item), leniency or severity (rating in an overly generous or critical manner), and central tendency effects (the tendency to rate in the mid-range, avoiding the extremes).

Related to response bias is the concept of error variance (Merrell, 1999). Three types of error variance affect rating scale assessment. Source variance refers to the

subjective way in which raters complete the rating scale. Reynolds (1999) concurs that ratings often reflect the rater's standard for behavior (Reynolds, 1999), with different raters assessing individuals based on different standards (e.g. acceptability of a given behavior). When multiple persons may be asked to rate a child's behavior, raters may only concur to a moderate degree (Reynolds, 1999). Setting variance refers to the situational specificity of behaviors, with different environments eliciting and reinforcing different behaviors. Temporal variance reflects the tendency for ratings to lack consistency over time, either due to changes in behavior or the rater's approach. Similarly, the nature of many rating scales is that behavior is assessed retrospectively and comparisons of recollections of behavior occurrence with actual occurrence of behavior reveal a less than perfect relationship (Reynolds, 1999). This is particularly disturbing in light of the fact that many scales are constructed to detect negative behavior rather than positive behavior and may predispose the rater to a negative frame of reference. The variability inherent in rating scales is so commonplace that various statistical indices are often utilized to measure the extent of various types of error variance. Three such indices used to quantify variance include interrater reliability, test-retest reliability and alternate-form reliability (Anastasi & Urbina, 1997).

Neuropsychological Classification of Learning Disorders

Aside from the psychoeducational and psychiatric classification of a child's inherent weaknesses, neuropsychology offers its own conceptualizations of why a child may be experiencing difficulties in school. One of the largest referral populations to child neuropsychology clinics is children with learning disabilities (Culbertson & Edmonds, 1996). Taylor (1988) concurs unequivocally, neuropsychological tests provide useful

information that cannot be gleaned from alternative sources. Perhaps because neuropsychology's theoretical and empirical foundation is best suited to account for the presumed neurologic basis of LD. In addition, Culbertson and Edmonds (1996) value the neuropsychological approach for its integration of neurologic, cognitive, academic and social-emotional components in understanding learning disabilities.

Historically, much of the early work in understanding academic difficulties has focused on phonological processing deficits and as Fletcher, Shaywitz and Shaywitz (1994) suggest, children with phonological processing deficits typically have problems that extend beyond a reading or language disorder. Dating back to the 1920's, Gerstmann defined Gerstmann syndrome as consisting of difficulty recognizing or differentiating fingers of either hand (finger agnosia), inability to write (agraphia), right-left confusion and an inability to do simple arithmetic problems (acalculia; Arbuse, 1947). Gerstmann related each of these difficulties to a focal lesion in the angular gyrus between the occipital and parietal cortex. Today, there is some debate as to whether the Gerstmann syndrome exists (Reynolds, 2000; Walsh & Darby, 1999). Some offer alternative explanations (Benton, 1977; 1992) and others offer support for the syndrome (Mazzoni, Pardossi, Cantini, Giorgetti & Arena, 1990; Saxe & Shaheen, 1981).

In the early 1970's, Elaine Boder also focused on phonological processing skills and identified three atypical reading and language patterns with other distinctive neuropsychological features (Telzrow, Century, Redmond, Whitaker & Zimmerman, 1983). She classified children as dysphonetic, dyseidetic or mixed dysphonetic-dyseidetic. Dysphonetic dyslexia is typified by reading that is heavily dependent on sight vocabulary, as phonetic skills are not developed. As such, readers often respond by

looking at words as individual configurations, often relying on the shape of the word (e.g. "hat" and "hot" may be confused due to their similar visual shapes). As may be expected, phonetic coding and encoding skills are weak, thus spelling errors tend to be nonphonetic in nature. Semantic substitutions are also common (e.g. "funny" for "laugh"). Dyseidetic dyslexia represents an inability to read words as a whole or gestalt and reflects a visual-perceptual difficulty. Words tend to be broken down into phonetic components and are sounded out, even if they are familiar words. Spelling errors also reflect phonetic equivalents (e.g. "laf" for "laugh"). Mixed dysphonetic-dyseidetic dyslexia is characterized by the deficits associated with each subtype. Collectively, it reflects an impaired ability to develop phonetic word synthesis and an inability to perceive letters and words as visual gestalts.

Today, much of our current conceptualization of learning disabilities has been furthered by the extensive work of Byron Rourke and colleagues. Rourke utilizes a developmental neuropsychological approach to studying learning disabilities by identifying developmental change in behavior through a brain-behavior perspective (Rourke & Fuerst, 1996). Rourke conceptualizes learning disorders into two distinct types: Group R-S, referred to here as language learning disorders and Group A, referred to here and in his own research as nonverbal learning disorder.

Language Learning Disorders (LLD) are characterized by linguistic and verbal difficulties related to a phonological processing deficit, particularly in the left hemisphere of the cortex. Rourke and colleagues have developed a cause and effect model of understanding LLD that addresses both assets and deficits (Rourke & Del Dotto, 1994). Rourke's model (see Table 11) includes primary neuropsychological assets which cause

secondary neuropsychological assets, which in turn cause tertiary neuropsychological assets; primary, secondary and tertiary neuropsychological assets effect verbal neuropsychological assets which is ultimately evidenced in academic and socioemotional assets. The same model is utilized for deficits.

According to Rourke's LLD model, primary neuropsychological assets include tactile and visual perception, motor and psychomotor skills, and competence in dealing with novel material. Secondary neuropsychological assets include tactile and visual attention. Tertiary neuropsychological assets include tactile memory, visual memory, ability to form concepts and problem solving skills. These primary, secondary and tertiary assets evidence themselves in various neuropsychological assets related to verbal ability. Specifically, LLD children have well-developed use of pitch, rhythm, loudness and tempo (prosody). They demonstrate better understanding of word meanings than understanding for the phonetic equivalent of words. Content of speech is also well developed in terms of appropriate use of language within a context (pragmatics), ability to associate verbal material and appropriate use of language in a social context.

Collectively these assets are represented in relative academic strengths including reading comprehension (which develops late), mathematics and science. These relative strengths tend to reflect strong verbal ability, comfort in novel situations and concept formation and problem solving skills. Socioemotional/ adaptive assets include the ability to adapt to novelty, competently engage in social situations, demonstrate emotional stability and engage in an appropriate activity level.

LLD children also have a pattern of deficits. These include primary neuropsychological deficits of auditory perception and secondary deficits in auditory and

verbal attention. Tertiary neuropsychological deficits include auditory and verbal memory. Verbal neuropsychological deficits include knowledge and use of speech sounds (phonology), ability to receive, repeat, store and associate verbal material and low amounts of verbal output.

Academically, deficits are evident in writing or drawing due to poor graphomotor skills; impaired single word reading, or word decoding skills; early difficulties with reading comprehension; spelling deficits; impaired verbatim memory; and mechanical arithmetic deficits. Socioemotional/adaptive deficits of LLD children are unclear at this time.

Rourke and colleagues have also developed a similar cause and effect model for understanding NLD that addresses both assets and deficits. As in the LLD model, the NLD model includes primary, secondary and tertiary neuropsychological assets and deficits that culminate into a pattern of relative strengths and weaknesses (see Table 12).

Children with NLD have primary neuropsychological assets in the areas of auditory perception, simple motor skills, and rote (repetitive/overlearned) material. Secondary neuropsychological assets include attention for auditory and verbal stimuli or material. Tertiary neuropsychological assets include auditory and verbal memory, particularly for overlearned verbal material. Verbal neuropsychological assets include knowledge of and good use of speech sounds (phonology), reception and repetition of verbal material, ability to store expansive amounts of verbal material, verbal associations and a large amount of speech output. Collectively, these verbal neuropsychological assets are reflected in relative academic strengths in writing and drawing related to graphomotor skills (however, these develop late due to initial visual motor impairments),

single word reading skills (word decoding), spelling and verbatim memory for oral and written verbal material. It is unclear as of yet, how these assets evidence themselves in socioemotional/adaptive abilities.

Primary neuropsychological deficits of NLD children include bilateral inability to recognize objects by touch on either side of the body, but more so on the left side (tactile perception); inability to discriminate and recognize visual detail and visual relationships (visual perception); poor complex psychomotor skills in the form of bilateral coordination deficiencies, but more so on the left; and difficulty adjusting to novel material or situations. Secondary neuropsychological deficits include deficiencies in tactile and visual attention, as well as limited exploratory behavior. Tertiary neuropsychological deficits include memory for tactile and visual stimuli. This includes memory impairments for nonverbal material if it is presented in an auditory, visual, or tactile modality and not coded in a verbal manner. Tertiary deficits also include poor concept formation and problem solving skills, particularly for novel material or tasks. Verbal neuropsychological deficits include various speech and language difficulties such as difficulty moving and forming muscles of the mouth (oral-motor praxis), little or no use of pitch, loudness, tempo or rhythm in speech (prosody), and knowledge of speech sounds greater than word meanings (phonology developed more than semantics). Content disorders of language include poor pragmatics (for example, "cocktail party speech") and functional difficulties such as relying on language as a means of social relating and anxiety relief.

Collectively, these deficits are evident academically in graphomotor deficits, reading comprehension, mechanical arithmetic, mathematics and science deficits.

Graphomotor deficits are evidenced in the early school years with trouble with drawing, printing and cursive script – however, with practice, improvement is seen. Reading comprehension tends to be poor, despite a strength in single-word reading or decoding skills. These deficits tend to get worse with age and are particularly poor for novel material. Mechanical arithmetic remains a relative deficiency (as compared to word recognition reading and spelling). The mechanical difficulties are attributed to visual-spatial difficulties in the form of carry over mistakes for example. The discrepancy between math and reading/spelling increases with age. Mathematical reasoning also remains poorly developed. Science difficulties are evident due to their reliance on novel problem solving and concept formation skills.

Socioemotional/adaptive deficits are also evidenced in children with NLD, including deficits in the ability to adapt to novelty, social competence, emotional stability, and activity level. In novel social situations, these children may have difficulty organizing, analyzing and synthesizing new and complex situations. Social competence is compromised due to significant impairments in social perception, social judgment and interactional skills. Emotionally, NLD children tend to evidence some acting-out behaviors in early childhood, however these children begin to internalize social difficulties in the form of anxiety, depression and social withdrawal. Likewise, children with NLD are often hyperactive in childhood, and eventually evidence normal levels of activity, which typically turn into hypoactive levels of activity.

Learning disabilities may also be related to disorders of attention. Review of the literature on attention confirms that many models of attention exist. However, many are based on cognitive psychology research and have not been developed with the use of

tools available to clinicians (Mapou, 1999). That is, there was an apparent lack of theory with corresponding assessment. As an alternative, those models of attention based on strong empirical evidence and clinical utility are often used to guide current conceptualizations of attention as well as assessment of it in a neuropsychological domain. Mapou (1999) suggested difficulties with attention need to be looked at from a neuropsychologically based model of attention rather than from a psychiatric vantage that includes behaviors and psychiatric criteria. In neuropsychological models of attention, arousal is continually assessed, typically via observation. For assessment purposes, if arousal is a problem (i.e. the individual cannot remain awake), the neuropsychological evaluation is not continued. Because arousal is a minimum requirement and assumed across models of attention, it will not be discussed as a factor in each of the models.

Using neuropsychological criteria, Mirsky and colleagues, in a series of experiments using factor analysis, arrived at a four factor model of attention (Mirsky, 1987; Mirsky et al, 1991; Mirsky et al, 1995). Mirsky's quest for a clinical neuropsychological model of attention resulted in the development of the Laboratory of Psychology and Psychopathology – National Institute of Mental Health (LPP-NIMH) Attention Battery. In Mirsky's series of experiments, the factors yielded were quite similar and included four components of attention: focus-execute, shift, sustain, and encode (Mirsky et al, 1995). Focus executive includes the ability to quickly scan for, identify, and respond to a target stimuli. The sustain component reflects vigilance, or the ability to sustain attention without error or tiring. Shift refers to the ability to flexibly alternate attention between stimuli. Encode "requires serial incorporation, retention, cognitive manipulation and recall of numeric information" (Mirsky et al, 1995; p. 22).

Misky and colleagues also cite considerable literature suggesting that each of these functions are supported by different regions of the brain.

Shum, McFarland and Bain in their 1990 study conducted a principal component analysis with a large battery of clinical neuropsychological tests thought to measure attention. They employed an approach similar to Mirsky's earlier work, however used slightly different tests. Shum and colleagues analysis revealed three components of attention. The visuo-motor component requires visuo-motor tracking of particular stimulus features. Sustained selective processing requires the selection and manipulation of specific stimuli while ignoring others. Visual auditory span requires attention and reproduction in a particular order of stimulus features that have occurred within a particular time frame. Using these three components of attention (visual-motor scanning, sustained selective processing, and visual auditory span), the authors were able to distinguish control subjects from closed head injury patients.

Drawing heavily on the work of Mirsky and colleagues, as well as from his own clinical experience, Mapou (1999) developed a hierarchical framework for assessing attention. Mapou conceptualized attention as having three components: deployment (or vigilance), encoding (or capacity), and mental manipulation/divided attention (or executive attention). Deployment refers to the ability to "direct attentional resources to stimuli or the task at hand" (Mapou, 1999, p. 7). Deployment includes three components: arousal, focused attention, and sustained attention. Focused attention refers to "the ability to focus attention on specific stimuli or tasks and respond accordingly" (Mapou, 1999, p. 7). Lastly, sustained attention reflects "the ability to maintain the focus of attention for an extended period, without a performance decrement" (Mapou, 1999, p. 7).

Mapou describes encoding as the first processing step needed to learn and subsequently remember information. Encoding involves two components: attention span and resistance to interference. Attention span refers to "the amount of information that can be held consciously in mind at any one moment" (Mapou, 1999, p. 7). Resistance to interference refers to the ability to reassess information after performing a brief distracting task. Lastly, mental manipulation/divided attention is the "ability to hold information in mind, manipulate it and produce a result" (Mapou, 1999, p. 7).

Collapsing across the work of Mirsky, Shum and Mapou and their respective colleagues, three components of attention appear to be common: capacity, vigilance and executive attention. Capacity represents how much information can be maintained in an attentional span and dates back to the 7+/-2 literature. Vigilance refers to the ability to maintain attention to a task without fatigue or diminished performance. Executive attention refers to the ability to conduct mental manipulations of material and appropriate attentional resources in a flexible fashion. Collectively, these models support the multidimensional nature of attention. Likewise, neuropsychological assessment of attention should include each of the components: Capacity, vigilance and executive attention. Each of these components should be assessed across visual, auditory and tactile modalities, if relevant. Perhaps most importantly, these studies suggest that attention is not equivalent to the behaviorally based psychiatric criteria utilized in the DSM-IV. Perhaps the psychiatric system's account of attentional difficulties is inadequate for understanding the true nature of attention.

Neuropsychological assessment of learning disabilities is multifaceted. Consistent with Rourke's conceptualization of learning disability subtypes, Rourke and

Del Dotto (1994) emphasize the importance of a comprehensive assessment that measures the principle skills/abilities of the brain. A broad sampling of tasks would include an assessment of the following areas: sensation, perception, motor/psychomotor, attention, memory, language, concept formation and problem solving. Tactile, visual and auditory modalities of each, when relevant, should be addressed.

Limitations of Neuropsychological Classification

Perhaps one of the greatest limitations related to the neuropsychological paradigm and assessment is its relative youth. Despite its considerable growth over the past 20 years (Groth-Marnat, 2000), much research is still needed to better understand the nature of neuropsychological syndromes and disorders. As a relative neophyte to classification, limited theoretical foundations have impacted assessment and drawn criticism.

Many neuropsychological tests are criticized for their lack of consensus among clinicians as to the nature of the processes measured by each test (Shum et al, 1990). Many tests are not considered "pure" measures per se. That is, some tests reflect complex abilities and require a combination of several skills to complete the task. For example, the Trail Making Test, Part A is considered a measure of visual perception. However, it also requires vigilance, sequencing skills, psychomotor skills, and good speed of processing due to its timed component. Clinicians not familiar with neuropsychological assessment may not be able to partial out these other factors. Work is also needed by neuropsychologists to determine the nature of processes measured by tests. As a relatively young field with various competing models and definitions, various tests have been designed to measure similar constructs. Many of the tests of attention,

utilized, for example, were not developed out of a model or theory of attention and have lacked validated in the literature (Shum et al, 1990).

Neuropsychological tests have been criticized for their ecological validity, or the applicability of neuropsychological test results to the patient's level of functioning in various contexts such as occupational, educational, interpersonal and community (Groth-Marnat, 2000). The ecological validity of neuropsychological tests is compromised by two factors in particular: 1) assessment sessions can be artificial and 2) specific tests are given in a relatively structured, minimally distracting environment (Groth-Marnat, 2000). In contrast to the assessment environment, life situations often place multiple demands on individuals which they must initiate, organize and impose their own structure on behavior. In this respect, the testing environment is seen as artificial. Also related to the ecological validity of test results, Groth-Marnat (2000) adds that some symptoms occur intermittently and may not be observed in the course of testing. For those individuals with limited insight into their deficits, he or she may not be aware of or able to articulate their difficulties to the clinician.

The psychometric properties of neuropsychological tests have also been criticized and reflect the relative youth of the field. Many of the limitations related to neuropsychological testing are related to the lack of adequate reliability data (Taylor, 1988). Neuropsychological batteries are also criticized for their poorly developed normative samples (Taylor, 1988). Their usefulness in explaining independent sources of variance related to academic abilities was also cited as a limitation (Taylor, 1988). Each of these criticisms limits the interpretability and inferences drawn from these tests (Felton & Brown, 1991).

It is worth noting, that many of these criticisms typically do not reflect the present state of neuropsychological assessment, as many of the criticisms have been responded to through the development of better normative samples (e.g. Heaton norms, MOANS norms). Also, there has been more recent literature speaking to the validity of neuropsychological tests and the constructs they measure.

Childhood Stress

Some children experience difficulties at school that can not be accounted for by inherent weaknesses such as learning disabilities. Alternative explanations may include an evaluation of contributing environmental factors in a child's life, such as stress. Stress has often been defined as the physiological and emotional reaction to a psychological event (Rubenzer, 1988). However, as Romer (1993) contends, there is little agreement on a definition of stress in children. As part of the definition, some authors have resorted to identifying the sources of stress in children (Romer, 1993). These include, but are not limited to parental separation/divorce, loss of a loved one, moving, substance abuse, family financial or legal difficulty, physical, sexual or emotional abuse or neglect, marriage of a parent and health problems.

Stress undoubtedly impacts children. A link has been found between the significant life events that children endure and their educational outcomes (Taylor & Hege, 1996). Physical symptoms of stress including clammy-sweaty hands, upset stomach, fidgeting and squirming and other arousal symptoms can distract from cognitive tasks and the learning process (Rubenzer, 1988). This may result in carelessness, rushed errors and diminished performance. In Taylor and Hege's (1996) review of the literature, a significant relationship was found between a child's achievement test scores and school

attendance and the number of significant life events that a family experiences. Sameroff, Seifer, Baldwin and Baldwin (1993) used a "risk index" measure of stress and found that the amount of risk present in a child's life impacted his or her intellectual development. Likewise, Taylor and Hege's (1996) research suggests that children who experience more life events achieve less in school.

While the research does suggest a relationship between academic achievement and stress, the research is not clear on the interaction between stress and cognitive ability or inate intelligence. Early theories proposed by Wechsler, and later Horn and Cattell, conceptualized cognitive abilities as "hold" or "crystalized" and "no hold" or "fluid" abilities (Matarazzo, 1977; Nelsen & McKenna, 1975; Kaufman, 1990). Hold or crystalized abilities represent those abilities resilient to trauma or impairment, generally representing overlearned information (D'Amato et al, 1997). No hold abilities generally represent novel problem solving and typically are most susceptible to impairment from trauma (D'Amato et al, 1997). Consistent with Wechsler's early theory of hold and no hold abilities, the Stress subscale was hypothesized to have no significant relationship with "hold" abilities, as measured by the WISC-III Information and WISC-III Vocabulary subtests. That is, general intelligence is thought to be resilient to the impact of environmental stressors.

Psychoeducational Classification of Childhood Stress

While research appears to support the relationship between stress and educational performance, it is not identified as a disability category available for supportive services. For this reason, it is often not addressed or taken into account. Discussing special education legislation, Phillips (1993) contends "it is increasingly clear that there are a

large number of children and adolescents, including those experiencing debilitating stress, not covered by the mandate of the law for whom 'education as usual' does not work" (p. 18). He goes on to suggest that modifications are needed in the education curriculum as well as increased support services, including mental health services.

At present, childhood stress is only considered a disability if it meets SED category criteria or Other Health Impaired criteria, secondary to physical manifestations of stress. Even then, only those children who experience significant debilitating stress will ever be identified for special services. As a result, many children responding to stress may not only perform poor in the classroom, they may not even be identified as in need of services.

Psychiatric Classification of Childhood Stress

Childhood stress may be accounted for by the DSM classification system under the diagnosis of adjustment disorder (American Psychiatric Association, 1994). Adjustment disorder most accurately mirrors and accounts for the intensity of stress children commonly experience.

As identified in Table 13, the hallmark of adjustment disorder is emotional or behavioral symptoms in response to an identifiable stressor. The symptoms must occur within three months of the onset of the stressor and not last for more than six months at the termination of the stressor. The symptoms must cause distress in excess of what would be expected from exposure to the stressor or cause impairment socially, occupationally, or academically. Exclusionary criteria are also presented.

While adjustment disorder presents as a viable option to account for childhood stress responses, it does not identify a specific stressor and may represent a more severe

and prolonged reaction to common childhood stress. The DSM-IV suggests that even adjustment disorder, the least severe of the stress related diagnoses "should be distinguished from other nonpathological reactions to stress" (American Psychiatric Association, 1994; p. 626). However, *how* this is to be done is not clear.

Neuropsychological Classification of Childhood Stress

Much of the current literature on stress and neuropsychological functioning has focused on PTSD in adult populations (Tramontana & Hooper, 1997). These authors note findings of hippocampal damage and memory deficits related to extreme stress. However, as of yet, this research has not been extended to children and no discernable pattern of deficits has been identified. Some researchers have focused on anxiety, as a manifestation of stress and its relationship to neuropsychological factors. Acknowledging that the relationship is complex, Tramontana and Hooper (1997) suggest that much of the discussions of anxiety and neuropsychological functioning speak to its interference in making inferences about test data. Other researchers have implicated specific regions of the brain involved in anxiety responses (Tramontana & Hooper, 1997), however its impact on neuropsychological testing is not clear.

As mentioned earlier, many of the hypotheses about children and stress are based on adult populations (Romer, 1993). Much of the current literature focuses on social adjustment and coping rather than stress per se. There is a lack of psychometrically sound instruments to assess stress in children. Several instruments purported to measure stress in children include the Schedule of Recent Experience, Children's Version of the Family Environment Scale, Stress Response Scale and the Personal Problems Checklist for Adolescents.

Limitations of Classification of Childhood Stress

One of the current limitations regarding the assessment of stress is related to its definition, which reflects a lack of consensus in the field. The definitions available in the literature on stress are written from an adult's perspective and interpretation. It is not surprising then that many of the current measures of stress are suited for adults, as the adult perception of stress has controlled its investigation and assessment (Romer, 1993). In this regard, no psychometrically sound instruments are available. Thus despite the fact that stress in childhood can be demonstrated to have a deleterious effect on academic performance, it appears to be a condition that is not readily identified nor adequately measured in children who may be having difficulty in school.

Motivational/Oppositional Behaviors

When inherent weaknesses in the form of learning disabilities and environmental chaos resulting in stress can be ruled out as the source of a child's difficulties in school, questions of motivation arise. Lack of motivation on the child's part may result in underachievement, poor work ethic and/or oppositional behaviors. While each of these scenarios results in poor academic performance, the occurrence of underachievement and poor work ethic are more easily overlooked in the classroom than are more outwardly oppositional behaviors. As such, oppositional behavior problems represent a significant referral population for assessment.

Psychoeducational Classification of Motivational/Oppositional Behaviors

Under IDEA, children who demonstrate oppositional behavior may be eligible for special education services under the SED disability category, provided he or she does not

meet the exclusionary criteria for social maladjustment. If a child is deemed socially maladjusted and not emotionally disturbed, he or she is not eligible for services. However, no where within IDEA is social maladjustment defined (IDEA, 1997; Skiba & Grizzle, 1991). Without operational definitions, the states are left to operationalize and assess for SED.

Psychiatric Classification of Motivational/Oppositional Behaviors

The DSM-IV identifies oppositional defiant disorder (see Table 14) to account for oppositional behaviors in children, albeit a more extreme case than more traditional lack of motivation or oppositional tendencies. Oppositional defiant disorder is characterized by a pattern of defiant, negative and hostile behavior which occur more frequently than age- and developmentally-matched peers and lasts at least six months. Significant academic, social and/or occupational impairment is noted.

Neuropsychological Classification of Motivational/Oppositional Behaviors

Across settings, lack of motivation may manifest itself in oppositional behavior. When motivational concerns are minimized during a neuropsychological evaluation, accurate results can be obtained. Under the conditions of adequate effort, a clear profile of scores tend to emerge. Information processing skills and general cognitive abilities across domains of functioning are generally intact. However, levels of achievement are significantly below that expected given the child's intellectual functioning.

Assessment of Motivational/Oppositional Behaviors

Various commercially available indices can assist in the diagnosis of oppositional behavior in children. These include the Child Behavior CheckList, Devereux Behavior

Rating Scale-School Form (designed to detect severe emotional disturbances based on the federal criteria outlined in IDEA) and the Conner's Rating Scales.

Purpose of the Study

Three of the most widely used classification systems have been explored for their conceptualization and assessment of inherent learning disorders (LLD, NLD and disorders of attention), childhood stress and lack of motivation/oppositional behavior. While federal legislation in the form of IDEA has been useful in creating services for children with disabilities, its limited and vague conceptualization of learning disabilities and severe emotional disturbance diminish its value as a classification system. Similarly, the psychiatric based classification systems reliance on subjective DSM-IV criteria which tend to characterize and account for disorders on the extreme end of the continuum and its affinity for behavior rating scales lacking in psychometric properties speak to its limitations. While the neuropsychological paradigm has been criticized, relative to others it offers the most comprehensive understanding and assessment of cognitive impairments. In light of neuropsychology's lengthy and time consuming assessments, the field has responded by developing neuropsychological screening instruments designed to shorten the time required for neuropsychological assessment.

Many of the current neuropsychological instruments utilized to screen for impairments were developed to screen for a specific cognitive function (i.e. memory, attention, language). Additionally, many of the instruments currently used to screen for impairments were not developed specifically as screening instruments, rather a select subset of the instrument's subtests are generally administered as a means of screening. Neuropsychological tests commonly used as a screening instrument are presented.

The Wide Range Achievement of Memory and Learning (WRAML; Adams & Sheslow, 1990) assesses a child's ability to learn and memorize visual and verbal information. Four of the nine subtests (i.e. Picture Memory, Design Memory, Verbal Learning, & Story Memory) are combined to obtain a Memory Screening Index Score. However, the obtained screening index includes both visual and verbal material and may pose a difficulty for children with language processing or visual perceptual difficulties.

Visuospatial and constructional abilities may be assessed via the Developmental Test of Visual-Motor Integration (Berry, 1997). The test consists of having a child copy geometric designs of increasing difficulty. The test may be used as a screening instrument by utilizing the short form consisting of the first 15 designs; however, due to a ceiling effect, the short-form is only applicable for children aged two to eight.

Language abilities may be screened in a brief period of time through the use of the Controlled Oral Word Association test (COWA; Benton, deS. Hamsher & Sivan, 1983), a test of generative verbal fluency. As a timed task, the child is presented with a letter of the alphabet and asked to give as many words that begin with a specified letter as quickly as possible during a one minute period. Although the test was not specifically designed to be used as a screening instrument, its generally brief administration time allow for its use as a screening instrument. While the test may be sensitive to impairment, the test lacks specificity for the origin of the difficulties (i.e. left temporal lobe vs. frontal lobe difficulties). Additionally, the test only assesses one component of language and fails to assess other aspects (i.e. comprehension, repetition, spontaneous speech, prosody, etc.)

Various tests of attention are available, however none provide a brief screening index. Of the tests available to assess attention difficulties, many measure a specific type of attention (i.e. capacity, flexibility, vigilance). None of the measures of attention available assess each of the components of attention within one instrument.

Across each of the domains of cognitive abilities, few instruments have been developed to screen for neuropsychological disorders. The instruments and indices that have been developed as screening devices often are abbreviated versions of a larger scale. The current screening instruments available typically screen for impairment in one cognitive domain. These too are limited by their myopic scope. There appears to be a need for a neuropsychological screening instrument that can assess for various reasons as to why a child may be having problems in school. The SALON Differential is one such instrument designed to address this need.

CHAPTER THREE

METHOD

Participants

The study was conducted using archival data gathered from 1995 to 2000. Participants in the study included a normative group (n = 131) and a clinical group (n = 235) for a total sample of N = 366. The 235 children in the clinical group were referred to the Child Health and Guidance Division of the Oklahoma State Department of Health for evaluation related to academic difficulties. The 131 children in the normative group composed the normative sample of the SALON. Briefly, this included an equally representative sample of boys and girls 5 to 18 years of age who were not experiencing academic difficulties. Additional screening prerequisites were also established and are discussed in more detail in the section "Development of the Normative Sample". Some analyses included the clinical group, normative group, or both. Each of the children referred for assessment underwent a comprehensive neuropsychological assessment by a member of the Neurocognitive Diagnostic Team (NCD), under the direct supervision of a board-certified neuropsychologist. Table 16 summarizes the number of children in each of the diagnostic groups. The parent or guardian of the referred minor child completed the SALON.

Measures

Children were rendered a diagnosis on the results of a comprehensive neuropsychological evaluation dictate by the referral question. In this respect, not every child was administered the same test. The summary sheet utilized to record the results of the assessment is available in Appendix B. In general, the battery of tests assessed various domains of functioning, including attention, sensation, perception, motor, perceptual motor, memory, learning, language, executive function, abstraction, and global intelligence. A list of testing instruments that were used to assess each of these domains is available in Appendix C. While children were being evaluated, the parent/guardian completed the SALON. As the SALON is a new instrument, it will be described in detail here.

Development of the SALON

The SALON was developed in a collaborative effort by a team of psychologists and neuropsychologists, specifically Terry Shaw, Karen Cornell and Norris Sonntag, employed in the Child Health and Guidance Division of the Oklahoma State Department of Health. Responsible for the day to day delivery of services, these clinicians evaluate children referred to the agency for various reasons, including academic difficulties. Among those children referred for academic difficulties, each child would undergo a comprehensive neurocognitive assessment. As demand exceeded resources, many children were placed on a waiting list. In an effort to minimize the wait time and to prioritize the order of evaluations, commercially available screening instruments were used. However, these were often myopic in their scope and incited the need for a

neuropsychologically based instrument that would screen for a broader range of possible explanations for academic difficulties.

In developing a broader screening device, the team of clinicians drew from their own clinical practice and neuropsychological assessment experience and arrived at five relatively common etiologies often associated with academic difficulties in school-aged children. Of the five etiologies identified, three seemed to be neurologically based (i.e. Language Learning Disability, Nonverbal Learning Disability, and primary disorders of attention). One was typically viewed as behavioral in origin (i.e. oppositional) and one was seemingly related to environmental factors (i.e. stress). Each of these etiologies, excluding stress, also appears to have a distinct pattern of neuropsychological abilities identifiable on objective testing.

Language learning disabilities, for example, include an underlying phonological processing impairment that affects listening, naming of objects and body parts, reading, fluency and spelling skills among others, even though visual processing and eye hand assembly skills are intact. This is in contrast to Rourke and Del Dotto's (1994) Nonverbal learning disability (NLD), where poor math skills, problems with concentration, tactual functioning deficits, poor eye-hand assembly and poor socialization are evident in the presence of intact phonological skills.

Aside from verbal and nonverbal learning disorders, neuropsychological impairments in primary attention processing skills may also contribute to poor school performance. Typically, deficits are noted in one or more domains of attention (i.e. capacity, vigilance, or executive attention), resulting in an inconsistent pattern of performance. This is consistent with Luria's (1973) earlier conceptualizations of

attention such that disturbances in any of the domains of attention can interfere with any and all cognitive functions, academics included. Neuropsychologically based disorders of attention (A) should not be confused with the more behaviorally based psychiatric diagnosis of ADHD (Mapou, 1999).

While language learning disabilities, nonverbal learning disabilities, and disorders of attention seem to account for the majority of neurologically based academic difficulties referred for assessment, non-neurologic reasons are also commonly encountered to account for why a child is doing poorly in school. This mirrors Binet's original goal of separating out the indolent versus the inept. Today, the most common behavioral disturbance associated with academic difficulties appears to be oppositionality by the child. For this reason, a subscale assessing oppositionality as a source of academic difficulties was included in the SALON. When conducting assessments on children with oppositional behavior, if power struggles and issues of control are minimized, reliable and valid test results can be obtained. Typically, the results represent a pattern of normal neuropsychological abilities across domains emerges with the exception of poor scores on achievement tests.

Finally, stress and chaos in the lives of young children frequently lead to anxiety, depression and poor school adjustment. While stress and chaos may be less frequently encountered than other behavioral or organic causes, environmental and emotional factors have been documented as impacting a child's ability to learn and achieve.

With five common etiologies of academic difficulties identified, the next step was to develop items for each subscale. A rationally derived set of descriptive questions or items thought to be sensitive to and unique to the developmental history and cognitive

presentation of each etiology were developed. This approach to scale development was modeled after Nelson, Satz & D'Elia (1994). However, to reduce face validity of items and avoid response biases, items describing classroom behavior were generally avoided. Collectively, 70 items were generated for inclusion in the SALON.

The Stress (S) subscale was developed from an item pool considered theoretically sensitive to the possible effects of stress and chaos in a child's life. These included items regarding parental conflicts, moving, personal loss, and others. The final item count on the S subscale includes 13 non-redundant descriptors.

The Attention (A) subscale was similarly derived on an intuitive basis. A pool of behavioral symptoms consistent with neuropsychologically based estimates of impaired attention (i.e. inconsistent performance, inability to sustain attention to tasks, frequent shifting of activities) were generated. Of the original item pool, 13 items were included under the A subscale. However, four items (two from the Oppositional subscale and two from the Nonverbal Learning Disorder subscale) were also added into the A subscale total, as these items were also thought to be sensitive to disorders of attention. This gave rise to a total of 17 items for the scale.

The Language Learning Disorder (L) subscale was developed from a review of the literature on phonological processing deficits. Various descriptors reflective of deficits in phonological processing were generated (i.e. misunderstands conversations, early speech/language services, math generally better than reading and spelling). Those items thought to be more representative of cognitive and developmental symptoms of LLD were included for a total of 13 items.

The Oppositional (O) subscale was developed following a review of the parent/guardian complaint list on children referred to the child guidance center for the treatment of school refusal, difficulty with authority and compliance problems. Sample items include refusal to do homework, defiance of authority and avoidance of chores and demands. Of the original item pool, 14 items were retained and comprise the O subscale.

Lastly, the Nonverbal Learning Disorder (N) subscale reflects the extensive work of Byron Rourke and colleagues. The items were based on the developmental signs and symptoms often associated with this disorder. The original item pool was pared down to 17 unique descriptors, including those sensitive to lack of coordination, spatial disorientation, tactual defensiveness and poor math skills.

Collectively, the SALON includes 70 items or descriptors on which the child is rated. Each item is rated on a scale from 1 to 3 based on the frequency with which the symptoms or behavior is presented or noticed. A value of 1 indicates "almost never/no/does not apply". A value of 2 is indicative of "sometimes/occasionally". A value of 3 means the behavior or symptom occurs "often/frequently/yes". With each item rated on a scale of 1 to 3 and assuming all questions are answered, the Stress and Language Learning Disorder scales each have a range of 13 to 39. The Attention and Nonverbal Learning Disorder scales can range in scores from 17 to 51. The Oppositional scale has a range of 14 to 42.

Development of the Normative Sample

In order to develop baseline ratings for each item of the SALON, families with children who were academically on track and ranged in age from 5 to 18 were recruited and included in the study as part of the normative sample. For each family recruited, a

parent/guardian was interviewed by NCD Staff and completed the SALON based on his or her perceptions of their child. To establish the normalcy of this population, screening prerequisites were developed. The ratings of the child were excluded from the normative sample if the child had a history of any of the following: 1) developmental delays; 2) major medical or neurologic or central nervous system disturbance; 3) recent social or emotional crises or losses; 4) history of having been labeled or tested for LD or reading problems by the school or having to repeat a grade; 5) grossly delayed or impaired social development; 6) subnormal intellect as judged by their parent/guardian.

In an effort to evaluate whether or not the age of the child might influence the endorsement rate of any particular item or set of items, representative samples were collected on three different age groups. The youngest group was made up of children age 5 years, 0 months to 8 years, 11 months. The second group ranged in age from 9 years, 0 months to 12 years, 11 months. The third and oldest group of children in the normative sample ranged in age from 13 years, 0 months to 18 years, 11 months of age. In addition to age, gender might also confound the ratings. As a result, a concerted effort was made to collect a representative sample of males and females in each age group.

In all, the final group of individuals used to comprise the normative sample consisted of 132 children distributed by age and gender according to Table 15. Means and standard deviations for each subscale of the SALON are also presented in Table 15. Analyses of variance designed to detect age or gender effects were conducted. As the data suggest, no significant age or gender effects were found on any of the SALON subscales nor were there any significant interactions. This suggests that the manner in

which parents rated their children on each of the SALON items was independent of age or gender.

Initial Implementation Phase

After establishing baseline ratings of putative normal children, the NCD staff of the Child Health and Guidance Division of the Oklahoma State Department of Health began to require completion of the SALON for each child evaluated in the clinic for academic related complaints and problems. Independent of their SALON ratings, children were administered a comprehensive neurocognitive assessment using the instruments listed in Appendix C. This is a standardized assessment developed by Dr. Terry Shaw, who is a Diplomate with the American Board of Professional Neuropsychology. The standardized assessment is designed to sample a wide range of neuropsychological skills and abilities. Furthermore, the scope of the assessment allows for the diagnosis of most major learning problems.

Since 1995, SALON data have now been gathered on the five basic clinical groups: 1) children under stress; 2) children with neuropsychological disorders of attention; 3) children with documented language learning disabilities; 4) children considered oppositional; and 5) children with documented nonverbal learning disabilities. Each of these children were thoroughly screened, evaluated and diagnosed according to standardization criteria. Yet to date, there has been no clinical validation of the "rationally derived" scales and test items.

Procedure

Prior to completing the 70 item SALON as described above, the parent(s)/guardian(s) and child participated in a clinical interview and medical record

review. All participants were interviewed and assessed by a member of the Neurocognitive Diagnostic Team. Assessments were completed based on the standard protocol for each of the individual measures. The Neurocognitive Diagnostic Team was responsible for test selection, administration, scoring and interpretation, under the supervision of a Board Certified Neuropsychologist. Testing generally took place over a seven hour period with a one hour break for lunch. The participants were allowed to take breaks at any point during the assessment and breaks were given when fatigue was apparent. Data from the individual's history, medical records, demographics and assessment results were recorded on a neuropsychological evaluation face sheet constructed and used by the Neurocognitive Diagnostic Team (see Appendix B).

Following the interview and neuropsychological assessment, participants were rendered a diagnosis. Each of the 235 participants were diagnosed based on cardinal criteria representative of each diagnosis derived from the literature (see Appendix D, E, F and G). Of the total number of children referred to the agency, only those children with diagnoses of LLD, NLD, disorders of attention, motivational/oppositional behavior, or childhood stress were retained for this study. In particular, only those children who represent "classic" or clear cases of each of the diagnoses were included in the study.

Design/Analysis

To establish the psychometric properties of The SALON Differential, analyses were conducted to address the scale's internal reliability, concurrent validity and factor structure. Based on the derived factor structure, an item analysis was to be conducted to identify those items contributing to the reliability of each of the factors. As will be

discussed later, the obtained factor structure of the SALON did not support further item analysis, and therefore the item analysis was not conducted.

Internal Reliability

The internal reliability of each of the SALON subscales was analyzed using coefficient alpha (Cronbach, 1951). Coefficient alpha was utilized to determine the level of interitem consistency within each of the subscales.

Concurrent Validity

To determine the concurrent validity of each of the SALON subscales, each subscale was correlated with the results of select neuropsychological tests from the assessment battery administered to the child. Neuropsychological tests were selected based on theoretical considerations regarding how a child's performance on neuropsychological tests would relate to ratings on the SALON subscales. The following neuropsychological tests and indices were included: Attention Concentration Index (ACI), Attention Capacity, Attention Vigilance, Attention Filtering, Knox Cube Test, Wechsler Intelligence Scale for Children - III (WISC-III) Digit Span Subtest, Trail Making Test Part B, Multilingual Aphasia Exam (MAE) Token Subtests 3 through 5, Finger Localization, Motor-free Visual Perception Test, Right-Left Discrimination, Beery Visual Motor Integration (VMI), WISC-III Block Design Subtest, WISC-III Vocabulary Subtest, WISC-III Information Subtest, WISC-III Verbal Intelligence Quotient (VIQ), WISC-III Performance Intelligence Quotient (PIQ), and WISC-III Full Scale Intelligence Quotient (FSIQ). A brief description of each of the tests and indices is available in Appendix H.

As outlined in Table 17, apriori hypotheses regarding the nature of the correlations between the SALON subscales and select neuropsychological tests were generated. The nature of the hypotheses and the tests selected were generated by this author and Terry Shaw, Ph.D. The Stress subscale was hypothesized to have no significant relationship with "hold" or "crystallized" abilities, as measured by the WISC-III Information and WISC-III Vocabulary subtests. That is, general intelligence is thought to be resilient to the impact of environmental stressors.

The Attention subscale was hypothesized to correlate negatively with various measures of attention, such that as behavioral symptoms of attention difficulties increase, performance on attention tests was expected to decrease. Specifically, the SALON was expected to negatively correlate with the WISC-III Digit Span subtest, as a measure of auditory attention span (Wechsler, 1991), and the Knox Cube Test, as a measure of visual attention span (Stone & Wright, 1990). Additionally, based on Mirsky and colleague's model of attention, an Attention Concentration Index (ACI) was derived (see Appendix I). The ACI was theoretically derived to reflect a composite score of Mirsky's three-part model of attention, including vigilance, capacity and flexibility. ACI Vigilance refers to the ability to sustain focus to a task without a decrement in performance. ACI Capacity represents the maximum amount of information that an individual can hold. ACI Flexibility refers to the ability to shift mental resources as needed. The composite ACI and each of the three components were hypothesized to have a negative correlation with the Attention subscale. A positive correlation was expected between the Trail Making Test Part B (Reitan & Wolfson, 1985) time to completion and the Attention subscale,

with children experiencing attention difficulties taking longer to visually scan and sequence alternating numbers and letters.

The Language Learning Disorder subscale was hypothesized to negatively correlate with Token Test Subtests 3 through 5 (Benton, Sivan, deS Hamsher, Varney & Spreen, 1994), as measures of language comprehension and ability to follow multi-step commands. A negative correlation was also predicted between ratings on the Language Learning Disorder subscale and Right/Left Discrimination (Benton, 1959), with children rated higher on the Language Learning Disorder subscale expected to evidence right-left confusion. Similarly, the Language Learning Disorder subscale was expected to positively correlate with the number of Finger Localization (Benton et al, 1994) errors obtained.

No correlation was expected between the Oppositional behavior subscale and either Performance Intelligence Quotient (PIQ; Wechsler, 1991) or Verbal Intelligence Quotient (VIQ; Wechsler, 1991) since academic achievement may be low while cognitive ability may be high.

Lastly, the Nonverbal Learning Disorder subscale was hypothesized to negatively correlate with the Motor-free Visual Perception Test (MVPT; Colarusso & Hammill, 1996), a measure of visual perceptual ability. A negative correlation was also expected between the Nonverbal Learning Disorder subscale and visuo-constructional ability as measured by both the Beery Visual Motor Integration Test (VMI; Berry, 1989) and WISC-III Block Design subtest (Wechsler, 1991).

Various recording discrepancies across examiners were evident within the archival data set. For example, test results were recorded as Z scores, T scores, scaled

scores, percentiles, index scores or more generally as "within normal limits" or "ok". The neuropsychological test results were not recorded using a common metric. Only test results with the metric identified were included in the data set for analysis. Because of data recording discrepancies, correlations were based on a limited data set.

Exploratory Factor Analysis

An exploratory factor analysis was conducted on the SALON. A principal axis factor analysis with an oblique rotation allowing the factors to correlate was used. An oblique rotation was performed using Oblimin and Kaiser normalization to analyze the data since the underlying dimensions of the SALON are thought to be related theoretically, and because four of the items are shared on two subscales. Post hoc inspection of the factor correlation matrix confirms the factors were correlated; see Table 18. To increase the sample size, the normative sample (n = 131) and the clinical sample (n = 235) were combined to increase the total sample size to N = 366. This satisfies Steven's (1996) guideline indicating five subjects per variable are needed to obtain reliable factors.

To determine the factorability of the correlation matrix, the Kaiser-Meyer-Olkin measure of sampling adequacy was used. According to Hutcheson and Sofroniou (1999), a value of 0.60 or greater established the criteria to continue with the factor analysis. Additionally, Bartlett's test of sphericity was analyzed, with a significant result indicating the appropriateness of factor analysis as a data reduction technique.

Item Analysis

The internal consistency of the SALON was going to be analyzed through the use of the item analysis. Each of the items were going to be correlated with the derived factor score for each factor (i.e. item 1 was to be correlated with factors 1 through 5). In this manner, each of the items were to be analyzed for its "fit" with each of the factors. While the items for each scale were rationally derived, this would allow items to be considered for use on other scales. In the event that an item correlated highly with more than one factor, it would be retained on each of the factors. Analysis of the correlation of each item with each factor was to be conducted on a relativistic basis by comparison to other correlations: 1) how the specific item correlated with each of the five factors, and 2) how all the items correlated with a specific factor. This process would be continued for each item, until a set of internally consistent items was retained. Note no specific cut off was identified as it was to be determined based on the nature of the correlations.

CHAPTER FOUR

RESULTS

Descriptive Statistics

Table 19 summarizes the mean and standard deviation for each of the items on the SALON. Each of the items did have variance, indicating variability in responses on the items. The mean and standard deviation of each of the subscales for the clinical sample are presented in Table 20. Additionally, the mean and standard deviation of each of the subscales for each of the diagnostic categories are summarized in Table 20.

Internal Reliability

The internal reliability of each of the subscales of the SALON is presented in Table 21. Cronbach's coefficient alpha for the subscales ranged from 0.51 to 0.90. For a test to be considered reliable, Aron and Aron (1994) suggest a reliability coefficient of 0.70 or greater. As shown, the Stress subscale with 13 items had a coefficient alpha of 0.69. With 17 items, the Attention subscale had the highest coefficient alpha at 0.90. The 13-item Language Learning Disorder subscale had the lowest internal reliability at 0.51. The 14-item Oppositional subscale had a coefficient alpha of 0.87. Lastly, the Nonverbal Learning Disorder subscale with 17 items had a reliability coefficient of 0.77.

Concurrent Validity

To establish the concurrent validity of the SALON subscales, each of the five subscales of the SALON were correlated with select tests from the results of the child's comprehensive neuropsychological assessment battery. A correlation matrix of the results are available in Table 22, with a summary of the obtained correlations for the hypothesized relationship between the SALON subscales and select neuropsychological tests available in Table XX. Since the data in the archival data set was not recorded using a common metric, some correlations are based on a limited data set. The sample sizes for each of the correlations ranged from 30 to 366 and are presented in Table 23.

As summarized in Table 17, only 4 of the 19 hypothesized relationships between the SALON subscales and the neuropsychological tests were supported. In general, the neuropsychological tests do not offer convergent validity for the SALON subscales. The ability or construct measured in the respective neuropsychological tests are not correlated and do not share variance with the construct measured in each of the respective SALON subscales.

Contrary to apriori hypotheses, the Stress subscale was significantly negatively correlated with both the Vocabulary and the Information subtests of the WISC-III, suggesting that as stress in the environment increases, vocabulary and general fund of information scores decrease. As predicted, the Attention subscale was negatively correlated with performance on the Knox Cube Test. This relationship suggests that as behavioral indicators of attention difficulties increase, objective measures of visual attention span decreased. The Attention subscale was not found to negatively correlate with the remaining measures of attention as hypothesized. The Language Learning

Disorder subscale was not found to significantly correlate with any of the neuropsychological measures traditionally related to language learning disorders as hypothesized. The Oppositional subscale was not significantly correlated with either VIQ or PIQ as hypothesized. Contrary to the hypothesized direction, the Nonverbal Learning Disorder subscale was not significantly negatively correlated with the Block Design subtest or the Motor-free Visual Perceptual Test, however a significant negative correlation was found between visual motor integration ability and the Nonverbal Learning Disorder subscale.

Exploratory Factor Analysis

Principal axis factor analysis was used to identify the underlying factor structure of the SALON. To determine if the item correlations within the correlation matrix were appropriate for further factor analysis, the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy was used, along with Bartlett's test of sphericity. Briefly, the KMO was 0.89, indicating the correlations among variables were small and therefore the data could be reduced via factor analysis. Bartlett's test of sphericity was significant and therefore factor analysis was appropriate.

The factor structure of the SALON was analyzed and an apriori criterion of extracting five factors was utilized, consistent with the five theoretically derived subscales of the SALON. The results of the factor analysis did not support a five-factor solution and are presented in Table 24. The five-factor model accounted for only 30% of the total variance. The first and largest factor accounted for 20.1% of the total variance, with the residual 9.9% of the variance divided among the remaining four factors. This is significantly below the generally accepted level of factor solutions accounting for 70% of

the total variance (Stevens, 1996). While there are differing opinions regarding the interpretation of a possible factor solution, Hair, Anderson and Tatham's (1987) guideline was followed, suggesting those factors accounting for 5% of the variance or less are not interpretable. As such, the remaining four factors were not considered significant.

As presented in Table 25, analysis of the structure matrix factor loadings of the one significant factor revealed 20 items with factor loadings of 0.40 or above, indicating the item shares at least 16% of it's variance with the factor. Twelve of the 20 items are from the Attention subscale and as a group had relatively higher factor loadings than the remaining 8 items. Of the remaining 8 items, 6 items are from the Oppositional subscale and 2 of the items are from the Nonverbal Learning Disorder subscale. Content analysis of the remaining 8 items seem to suggest behaviors which may have an attention-seeking component (i.e. "Deliberately breaks things," "Purposely breaks rules," "Kicks, hits, pinches, bites others"). Collectively, with the 12 items from the Attention subscale and the 8 items representing possible attention-seeking behavior, the results suggest the most salient construct identified within the factor is that of attention. Therefore, the one salient factor was subjectively labeled an Attention factor.

Often when conducting factor analyses, determining which factor solution to retain is based on Kaiser's criterion of eigenvalues greater than 1.0 and a visual analysis of Cattell's scree plot. The factor solution was not evaluated based on the Kaiser criterion of eigenvalues greater than 1.0, as this criterion tends to overestimate the number of factors with large sample sizes and low communalities such as the data used in this analysis (Stevens, 1996). Additionally, Hair et al (1987) indicate that it is not uncommon

for the eigenvalue criteria to result in the extraction of too many factors when more than 50 variables are involved. The 70 items of the SALON would far surpass this criteria. As Cattell's scree plot provides a visual plot of eigenvalues, it was not used as an indicator of possible factor solutions. Since the conventional practice of Kaiser's criterion and Cattell's scree plot do not apply to this study, the factor solution was evaluated based on the amount of variance accounted for by each factor, item loadings for each factor and theoretical considerations. As such, the results do not support a 5-factor model as hypothesized. Since the factor solution did not support a 5-factor solution, further item analysis was not conducted.

CHAPTER FIVE

DISCUSSION

The focus of this research was to analyze the psychometric properties of The SALON Differential, specifically addressing the scale's internal reliability, concurrent validity and the underlying factor structure. Four of the five subscales had good internal consistency. Each of the SALON subscales was hypothesized to significantly correlate with select neuropsychological test results from the assessment battery administered to the child. Few of the hypothesized relationships provided concurrent validity for the SALON subscales. Additionally, it was hypothesized that the underlying factor structure of the SALON would mirror the 5 theoretically derived subscales. Analyses did not support a five-factor model as hypothesized; the results and implications are discussed.

Internal Reliability

Three of the 5 subscales of the SALON (Attention, Oppositional & Nonverbal Learning Disorder) had good internal reliability, with coefficient alpha greater than 0.70. Marginal reliability was found for the Stress subscale, while the Language Learning Disorder subscale had poor internal consistency. Generally, the results suggest the items composing each of the subscales are homogenous, with marginal to good interitem consistency. Possible explanations for the poor reliability of the Language Learning Disorder subscale are offered.

In the theoretical development of the Language Learning Disorder subscale, four items were added regarding social skills and peer interactions. Although not specifically supported in the research literature, it was theorized that individuals with language learning disabilities may excel at and prefer social interactions as opposed to more language oriented activities such as school. While the research has found that children with Nonverbal Learning Disorder tend to have more difficulty with, and thus avoid social interactions, it was thought that children with Language Learning Disorder may seek out peer relations. Inspection of the items from the internal consistency analysis did not support the theory. Rather, the analysis suggested that deleting 3 of the 4 items reflecting a preference for social interactions would result in an increase in the overall reliability coefficient for the Language Learning Disorder subscale.

Additionally, the lack of internal consistency within the Language Learning Disorder subscale may be reflective of the Language Learning Disorder syndrome. That is, the complexity of the Language Learning Disorder syndrome includes impairments in language reception and expression, academic achievement, right-left body confusion, a history of chronic ear infections and anxiety related to school. As a syndrome, the symptoms reflect an impairment across multiple domains (i.e. achievement, language, emotional/social functioning, physical health). The items on the SALON were derived to reflect the variability in symptoms, and therefore may be unreasonable to expect a high level of interitem consistency. As may be the case with the Language Learning Disorder subscale, Anastasi and Urbina (1988) suggest that the more heterogeneous the behavior domain sampled, the lower the interitem consistency. One potential solution to improve the interitem consistency of the Language Learning Disorder subscale is to

compartmentalize similar items into supplementary scales. For example, one supplementary scale may cluster those items representing language difficulties, while another may cluster those items representing body confusion, and so forth.

Concurrent Validity

The neuropsychological test data did not contribute to the concurrent validity of the SALON subscales. Few of the hypothesized correlations among the neuropsychological tests and the SALON subscales were supported. In analyzing the relationship between the subscales and the neuropsychological tests, a general pattern seems to emerge. While the results of the SALON subscales in general did not correlate with the predicted neuropsychological measures, many of the selected neuropsychological tests generally were significantly correlated among themselves. This pattern was observed for the Attention, Language Learning Disorder, and Nonverbal Learning Disorder subscales.

The Attention subscale did not significantly correlate with 6 of the 7 standardized measures of attention as predicted. Interestingly, the Attention subscale did not significantly correlate with the WISC-III Digit Span scores, a generally well established measure of auditory attention span. Also of interesting note is that as behavioral indicators of attention difficulties increased on the Attention subscale, a decrease was evident in the time to complete Part B of the Trail Making Test, a timed task requiring visual scanning, sequencing and mental flexibility. None of the relationships were supported between the Attention subscale and the various Attention Concentration Indices. As expected, the neuropsychological measures of attention were generally

correlated among themselves. For example, the Attention Concentration Index was correlated with the neuropsychologically based measures of auditory and visual attention span. Collectively, these results appear to suggest the Attention subscale and the neuropsychological measures of attention are not assessing a similar construct, despite the fact that both are labeled as a measure of attention.

Similar results were found for the Language Learning Disorder subscale, as none of the hypothesized correlations were supported. A trend toward significance was noted with each of the Token subtests, as measures of language comprehension and the ability to follow compound, increasingly complex commands. The trend toward significance may be explained in that 6 of the 13 items were related to language abilities. Similarly, none of the items on the Language Learning Disorder subscale specifically addressed body orientation and right-left confusion (i.e. only 2 items addressed athleticism and activity level). Although right-left discrimination difficulties and finger localization errors are characteristic of Language Learning Disorder, no items on the SALON were specific to these symptoms, thus making the presence of a correlation less likely. Nevertheless, many of the neuropsychological tests were correlated among themselves. For example, right-left discrimination errors significantly correlated with each of the Token Subtests 3 through 5 and finger naming localization errors.

The Nonverbal Learning Disorder subscale was significantly correlated with the Visual Motor Integration test. Content analysis of the Nonverbal Learning Disorder subscale suggests that 5 of the 17 items reflect a visual-motor component, contributing to a significant correlation. Additionally, the NLD subscale includes 5 items related to social interactions with the remaining items reflecting a variety of symptoms (i.e.

auditory processing, anxiety, attention). Although the remaining items may be loosely related to visual perception, visuoconstruction and novel problem solving, lack of specific items may have contributed to the lack of relationship between the subscale and the WISC-III Block Design test and Motor-free Visual Perceptual Test. Despite the lack of correlation with the Nonverbal Learning Disorder subscale, the three neuropsychological measures were correlated among themselves.

Items comprising the Stress subscale generally reflect stressful incidents within the child's environment. Because children experience the effects of stress in diverse ways with multiple influencing factors, children experiencing stress do not typically generate a specific neuropsychological pattern of results. In this research, it was hypothesized that innate cognitive abilities may be resilient in the face of environmental stressors and thus, no relationship would be found between the WISC-III Vocabulary and Information subtests and the Stress subscale. Contrary to the hypothesized relationship, a small, yet significant, correlation was found between "hold" measures and an individual's level of stress. The significant correlation may be an artifact of the large sample size and not practically significant. Kaplan and Saccuzzo (1989) suggest that validity coefficients of 0.30 or less are low. Similarly, the Oppositional subscale was also hypothesized to have no correlation with hold measures VIQ and PIQ. As hypothesized, no significant correlations were found.

Three possible explanations may account for the absence of a relationship between the SALON subscales and neuropsychological measures. While neuropsychological tests in general tend to be specific in focus so as to measure a specific domain or ability (i.e. visual perceptual skills versus visual motor skills versus visual

perceptual motor skills), the SALON subscales are generally broad, reflecting a clinical syndrome impacting various domains and abilities. Because the subscales reflect a broad syndrome, they are not likely to correlate with one test assessing a very specific ability.

Additionally, the discrepancy in results appears to suggest a distinction between behavioral indicators of neuropsychological phenomena and more objective neuropsychological tests. Objective neuropsychological measures appear to be distinct in their specificity and conceptualization from more subjective behavior rating scales. The specificity of a measure directly impacts the inferences that can be made regarding the results. To illustrate, the items comprising the Attention subscale generally reflect behavioral measures of attention and are distinct from the more objective measures of attention difficulties as measured by neuropsychological tests. The lack of correlation between the Attention subscale and the Digit Span test may be reflective of this. As discussed previously, behavior rating scales and behavioral indicators of attention difficulties are distinctly different from neuropsychologically based measures of attention. How disorders of attention are conceptualized and classified has direct implications for how they are assessed.

The specificity of neuropsychological tests in general can lead to clearer inferences about where difficulties arise. Behaviorally oriented measures generally don't offer specificity in differentiating the origin of behavior. The presence of behavior suggestive of attention difficulties may in fact be accounted for by a host of explanations, again, many of which reflect how different taxonomies conceptualize behavior and syndromes. For example, numerous factors can lead to attention difficulties. Typically, the inattention is endorsed on an attention disorder scale and often the child is labeled

with Attention Deficit Disorder. However, the elevated scale suggesting inattention may not be an organic disorder of attention, but rather related to a host of variables, including environmental factors.

In this research, behavioral indicators were not equivalent to objective neuropsychological tests, despite the behaviors being reflective of neuropsychological phenomena or syndromes. In fact, the behaviorally based SALON subscales share little variance with the neuropsychological measures, suggesting the behavior ratings and the neuropsychological measures are assessing different constructs.

The discrepancy in the SALON and the neuropsychological measures may represent the difference between subjective and objective data. As a behavior rating scale, the ratings on the SALON are subjective and inherently include measurement problems such as response biases and error variance. One type of response bias includes the halo effect, or attributing positive or negative characteristics based on another unrelated positive or negative characteristic. For example, when rating items on the SALON, an individual may endorse that a child is athletic based on the rater's knowledge that the child enjoys peer interactions. A second type of response bias includes a range restriction in which some raters may respond with no variability in their responses. That is, the caretaker completing the SALON may respond indiscriminately with a tendency to endorse items in an overly generous or overly critical manner, or alternatively respond to all items in the neutral range. Each of these types of response biases raises questions about the validity of the informant's ratings.

The subjectivity of the raters completing the SALON also impacts the information obtained. This source of error variance refers to any of the idiosyncratic ways an

individual responds to the items (Merrill, 1999). Ratings may be impacted by multiple factors, including but not limited to how the rater interprets the items, the rater's mood, whether the rater is invested in answering the items, secondary gains, the extent to which the rater is familiar with the behavior being rated, and/or differing thresholds for what is considered a high frequency of a behavior. This type of error variance also qualifies the validity of the rater's responses. With all of the possible types of response biases and sources of error variance, objective measurement appears preferable for diagnostic purposes.

Exploratory Factor Analysis

Principal axis factor analysis did not support a five-factor model of the SALON. Although an oblique rotation was performed to allow the factors to correlate, a one-factor solution was extracted, accounting for only 20.1% of the total variance. Opposing theories are presented to explain the results.

One possible explanation for the SALON reducing to one factor is that the instrument as a whole is too heterogeneous. That is, while all of the children referred to the clinic were experiencing academic difficulties, the source of the difficulties varies, ranging from environmental, behavioral or neurological reasons. Despite the heterogeneous nature of the subscales, the sample used may be too homogeneous. All of the children in the clinical sample were referred because they were experiencing academic difficulties. The behavioral manifestation of the academic difficulties may be very similar, and in this case it was seen as attention difficulties. It may be unsurprising that the one factor identified appears to correspond to an attention factor. In more recent years, there has been an increasing focus on disorders of attention, such as Attention

Deficit Hyperactivity Disorder. With increased public awareness and information campaigns, individuals are becoming more adept at identifying specific symptoms of attention difficulties, and thus may be better prepared or primed to respond to behavior rating scales. As such, alternative explanations (i.e. factors) may have been washed out.

Similarly, although the items were theoretically derived to reflect a specific diagnostic classification, many of the items may theoretically reflect more than one disorder. For example, item 2 "Misunderstands or forgets conversations" was theoretically derived to represent the Language Learning Disorder subscale, however the item may also reflect a disorder of attention, making it theoretically applicable to the Attention subscale as well. Many such items on the SALON are similarly theoretically applicable to more than one subscale and disorder. Future versions of the scale may be best served by allowing the items to load on more than one scale, or alternatively, remove the item.

Additionally, various aspects of the SALON's development may have contributed to the identification of one factor. Test development theories generally suggest the use of a response scale allowing a subject to respond with an adequate range of frequency to allow for greater variability among the item responses. Barkley (1990) notes that a sufficient range allows for a greater discrimination of frequency and/or severity needed to differentiate normal and clinical groups. The SALON's scale ranged from one to three and may have limited the variability of the responses across diagnostic groups. As such, limited variability for a specific item may directly impact the items and the subscales ability to distinguish high scorers from low scorers. Such range restriction may have resulted in one homogenous factor.

In conducting the factor analysis, both the clinical group and the normative group were combined to increase the sample size. However, it does raise the issue as to whether the groups can be combined based on their different experiences. That is, does the experience of raising a more active child or a child with learning difficulties result in substantially different ratings (as opposed to raising a "normal" child) to the extent that the ratings of the normative and clinical groups are not equally valid. A focus of future research would be to explore the factor structure of the SALON based on a "normal" population in comparison to a "clinical" population.

Clinical Implications

As different taxonomies and nosologies conceptualize and classify disorders differently, each lends itself to preferred modes of assessment. Globally speaking, the psychiatrically based DSM-IV system tends to utilize behavior rating scales while the field of neuropsychology tends to utilize objective, standardized measures. Within the field of neuropsychology, assessments tend to be time consuming and expensive. The focus of this research was to address the psychometric properties of a behaviorally oriented screening instrument designed to screen for possible explanations as to why a child has difficulties in school. One possible implication of this research includes the role of behaviorally oriented screeners in neuropsychological assessment. The results of this research suggest that behaviorally oriented screening instruments are not equivalent to more objective measures of neuropsychological phenomena. It raises the issue of whether such behaviorally oriented screening instruments such as parent and teacher rating forms can detect neuropsychological or organic deficits such as a disorder of attention. It also raises the question of whether there is a concordance between behavior

disorders and cognitive disorders. Many psychiatrically and psychoeducationally based disorders utilize behavior rating scales to diagnose both cognitive and behavior disorders. The current findings broach the question as to whether it is legitimate to utilize behavior rating scales to diagnose cognitive disorders. The results of this study may imply that behaviorally oriented screening instruments are best utilized within a psychiatric classification system such as the DSM-IV. That is, while behavior rating scales often employ a checklist format of whether a behavior is present or not, a similar criteria is utilized within the DSM-IV system.

In addition to representing the difference between subjective and objective data, the SALON was completed by parents while the neuropsychological data was obtained from the child. In this respect, the data used in the analyses are generated from and reflect different sources of information. Obtaining ratings based on the parent's perspective may be valuable to the clinician, offering a different type of information than that obtained in objective testing. However, as different sources of data, comparisons of the data may be limited. In fact, in this study, the different sources of information may account for the lack of correlation between the neuropsychological test data and the behavior ratings on the SALON.

The results also have implications for clinical practice, particularly in regard to the attributes individuals use to explain behavior. That is, the inferences that can be made regarding the results of a test are related to the specificity of the test. As was found in this research, behavioral indicators of attention do not necessarily correlate with objective measures of attention (i.e. auditory attention span). Identifying and documenting that a child engages in behavior commonly interpreted as an attention disorder does not by

default implicate the child has difficulties with attention. Likewise, behavior suggestive of an attention disorder may be accounted for by a host of explanations, one of which may suggest a reaction to a stressful environment (i.e. Adjustment Disorder). The origin of the inattentive behavior has a direct implication for diagnosis and treatment.

Future Research

Further research is needed on the SALON. Various modifications to the scales design may serve to increase its psychometric properties. While 4 of the subscales had good to borderline internal reliability at 0.69 or above, for diagnostic purposes, internal reliability of 0.90 or greater is convention (Anastasi & Urbina, 1997). Higher internal consistency would serve to reduce error variance and the Type I & II error rate. As discussed previously, one possible way is to increase the rating scale for each item. The SALON limited 3-point scale is a significant limitation in the scales design and significantly limits the variance within the ratings. Rather than providing a limited response range from one to three, a 7-point Likert scale may increase the variability among high and low scorers. With an increased response range, the factor structure of the SALON may be markedly different and would warrant another factor analysis.

Content analysis of the items on the SALON suggests that many of the items may be theoretically applicable to more than one subscale. Yet, in its current state, only four of the items of the SALON are represented on more than one scale. In an effort to "clean up" the scale's items, a discriminate function analysis would be beneficial. A discriminate function analysis would identify which items could best discriminate participants into two or more diagnostic groups (Silva & Stam, 1995). More specifically,

the 70 items on the SALON would be analyzed for each item's ability to separate individuals into one of the five diagnostic groups.

Likewise, content analysis of the SALON's items reveal that some of the items on the SALON may be vague and ambiguous to the caretaker completing the SALON. For example, item 62 "Unable to 'carry a tune'" will likely have different meanings for individuals completing the SALON. Additionally, many of the items on the SALON are worded with emotionally charged words typically suggesting a negative connotation. For example, "indifferent," "avoids," "inconsistent," "manipulates" and "disruptive." The wording of the items may have contributed to a response bias by the raters, particularly a tendency to not endorse the items.

Although the SALON in its current state does not offer sound psychometric properties, future research and development of the subscales may make the SALON a pioneering neuropsychologically based instrument designed to screen for a variety of reasons why children have difficulties in school.

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Table 1

Differential Diagnosis of a Child's Academic Difficulties and Relevant Diagnoses of the Psychoeducational, Psychiatric and Neuropsychological Classification Systems

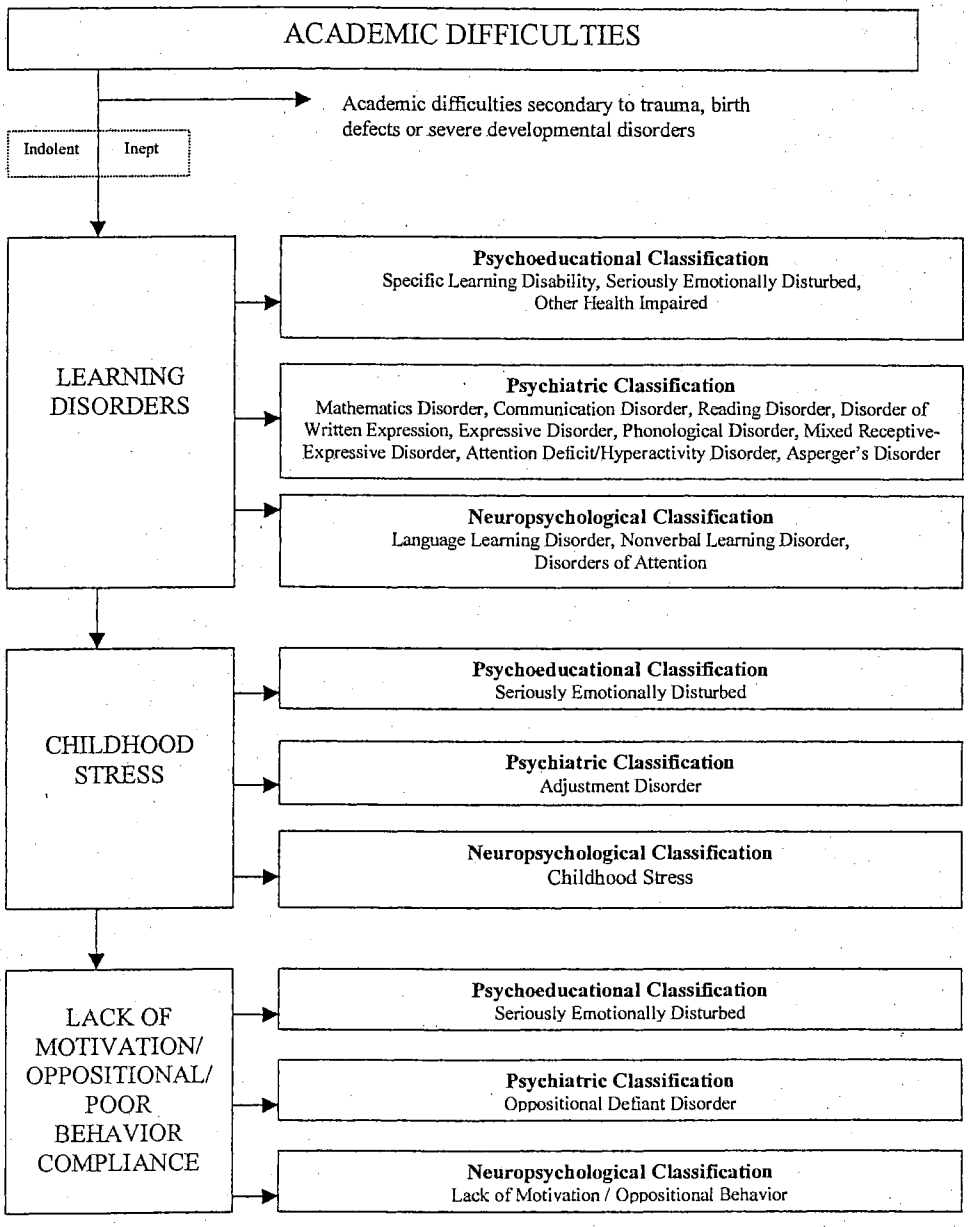


Table 2

Diagnostic and Statistical Manual of Mental Disorders-IV Diagnostic Criteria for Reading Disorder

Reading Disorder

A. Reading achievement, as measured by individually administered standardized test of reading accuracy or comprehension, is substantially below that expected given the persons chronological age, measured intelligence, and age-appropriate education.

B. The disturbance in Criterion A significantly interferes with academic achievement or activities of daily living that require reading skills.

C. If sensory deficit is present, the reading difficulties are in excess of those usually associated with it.

Coding note: If a general medical (e.g., neurological) condition or sensory deficit is present, code the condition on Axis III.

Table 3

Diagnostic and Statistical Manual of Mental Disorders-IV Diagnostic Criteria for Mathematics Disorder

Mathematics Disorder

A. Mathematical ability, as measured by individually administered standardized test, is substantially below that expected given the persons chronological age, measured intelligence, and age-appropriate education.

B. The disturbance in Criterion A significantly interferes with academic achievement or activities of daily living that require mathematical ability.

C. If a sensory deficit is present, the difficulties in mathematical ability are in excess of those usually associated with it.

Coding note: If a general medical (e.g., neurological) condition or sensory deficit is present, code the condition on Axis III.

Table 4

Diagnostic and Statistical Manual of Mental Disorders-IV Diagnostic Criteria for Disorder of Written Expression

Disorder of Written Expression

A. Writing skills, as measured by individually administered standardized tests (or functional assessments of writing skills), are substantially below those expected given the person's chronological age, measured intelligence, and age-appropriate education.

B. The disturbance in Criterion A significantly interferes with academic achievement or activities of daily living that require the composition of written texts (e.g., writing grammatically correct sentences and organized paragraphs).

C. If a sensory deficit is present, the difficulties in writing skills are in excess of those usually associated with it.

Coding note: If a general medical (e.g., neurological) condition or sensory deficit is present, code the condition on Axis III.

Table 5

Diagnostic and Statistical Manual of Mental Disorders-IV Diagnostic Criteria for Developmental Coordination Disorder

Developmental Coordination Disorder

A. Performance in daily activities that require motor coordination is substantially below that expected given the persons chronological age and measured intelligence. This may be manifested by marked delays in achieving motor milestones (e.g., walking, crawling, sitting), dropping things, "clumsiness", poor performance in sports, or poor hand writing.

B. The disturbance in Criterion A significantly interferes with academic achievement or activities of daily living.

C. The disturbance is not due to a general medical condition (e.g., cerebral palsy, hemiplegia, or muscular dystrophy) and does not meet criteria for a Pervasive Developmental Disorder.

D. If Mental Retardation is present, the motor difficulties are in excess of those usually associated with it.

Coding note: If general medical (e.g., neurological) condition or sensory deficit is present, code the condition on Axis III.

Table 6

Diagnostic and Statistical Manual of Mental Disorders-IV Diagnostic Criteria for Expressive Language Disorder

Expressive Language Disorder

A. The scores obtained from standardized individually administered measures of expressive language development are substantially below those obtained from standardized measures of both nonverbal intellectual capacity and receptive language development. The disturbance may be manifest clinically by symptoms that include having a markedly limited vocabulary, making errors in tense, or having difficulty recalling wards or producing sentences with developmentally appropriate length or complexity.

B. The difficulties with expressive language interfere with academic or occupational achievement or with social communication.

C. Criteria are not met for Mixed Receptive-Expressive Language Disorder or a Pervasive Developmental Disorder.

D. If Mental Retardation, a speech-motor or sensory deficit, or environmental deprivation is present, the language difficulties are in excess of those usually associated with these problems.

Coding note: If a speech-motor or sensory deficit or a neurological condition is present, code the condition on Axis III.

Table 7

Diagnostic and Statistical Manual of Mental Disorders-IV Diagnostic Criteria for Mixed Receptive-Expressive Language Disorder

Mixed Receptive-Expressive Language Disorder

A. The scores obtained from a battery of standardized individually administered measures of both receptive and expressive language development are substantially below those obtained from standardized measures of nonverbal intellectual capacity. Symptoms include those for Expressive Language Disorder as well as difficulty understanding words, sentences, or specific types of words, such as spatial terms.

B. The difficulties with receptive and expressive language significantly interfere with academic or occupational achievement or with social communication.

C. Criteria are not met for a Pervasive Developmental Disorder.

D. If Mental Retardation, a speech-motor or sensory deficit, or environmental deprivation is present, the language difficulties are in excess of those usually associated with these problems.

Coding note: If a speech-motor or sensory deficit or a neurological condition is present, code the condition on Axis III.

Table 8

Diagnostic and Statistical Manual of Mental Disorders-IV Diagnostic Criteria for Phonological Disorder

Phonological Disorder

A. Failure to use developmentally expected speech sounds that are appropriate for age and dialect (e.g., errors in sound production, use, representation, or organization such as, but not limited to, substitutions of one sound for another (use of/t/for target/k/sound) or omissions of sounds such as final consonants).

B. The difficulties in speech sound production interfere with academic or occupational achievement or with social communication.

C. If Mental Retardation, a speech-motor or sensory deficit, or environmental deprivation is present, the language difficulties are in excess of those usually associated with these problems.

Coding note: If a speech-motor or sensory deficit or a neurological condition is present, code the condition on Axis III.

Table 9

Diagnostic and Statistical Manual of Mental Disorders-IV Diagnostic Criteria for Attention-Deficit Hyperactivity Disorder

Attention-Deficit Hyperactivity Disorder

A. Either (1) or (2):
   (1) Six (or more) of the following symptoms of inattention have persisted for at least 6 months to a degree that is maladaptive and inconsistent with developmental level:
   Inattention
   (a) often fails to give close attention to details or makes careless mistakes in schoolwork, work or other activities
   (b) often has difficulty sustaining attention in tasks of play activities
   (c) often does not seem to listen when spoken to directly
   (d) often does not follow through on instructions
   (e) often has difficulty organizing tasks and activities
   (f) often avoids, dislikes, or is reluctant to engage in tasks that require sustained mental effort (such as schoolwork or homework)
   (g) often loses things necessary for tasks or activities (e.g., toys, school assignments, pencils, books, or tools)
   (h) is often easily distracted by extraneous stimuli
   (i) is often forgetful in daily activities

   (2) six (or more) of the following symptoms of hyperactivity-impulsivity have persisted for at least 6 months to a degree that is maladaptive and inconsistent with developmental level:
   Hyperactivity
   (a) often fidgets with hands or feet or squirms in seat
   (b) often leaves seat in classroom or in other situations in which remaining seated is expected
   (c) often runs about or climbs excessively in situations in which it is inappropriate (in adolescents or adults, may be limited to subjective feelings of restlessness)
   (d) often has difficulty playing or engaging in leisure activities quietly
   (e) is often "on the go" or often acts as if "driven by a motor"
   (f) often talks excessively

   Impulsivity
   (g) often blurts out answers before questions have been completed
   (h) often has difficulty awaiting turn
   (i) often interrupts or interrupts or intrudes on others (e.g., butts into conversations or games)

Table 9 (Continued)

Diagnostic and Statistical Manual of Mental Disorders-IV Diagnostic Criteria for Attention-Deficit Hyperactivity Disorder

B. Some hyperactive-impulsive or inattentive symptoms that caused impairment were present before age 7 years.

C. Some impairment from the symptoms is present in two or more settings (e.g., at school [or work] and at home).

D. There must be clear evidence of clinically significant impairment in social, academic, or occupational functioning.

The symptoms do not occur exclusively during the course of a Pervasive Developmental Disorder, Schizophrenia, or other Psychotic Disorder and are not better accounted for by another mental disorder (e.g., Mood Disorder, Anxiety Disorder, Dissociative Disorder, or a Personality Disorder).

Table 10

Diagnostic and Statistical Manual of Mental Disorders-IV Diagnostic Criteria for Asperger's Disorder

Asperger's Disorder

A. Qualitative impairment in social interaction, as manifested by at least two of the following:
(1) marked impairment in the use of multiple nonverbal behaviors such as eye-to-eye gaze, facial expression, body postures, and gestures to regulate social interaction
(2) failure to develop peer relationships appropriate to developmental level
(3) a lock of spontaneous seeking to share enjoyment, interests, or achievements with other people (e.g., by a lock of showing, bringing, or pointing out objects of interest to other people)
(4) lock of social or emotional reciprocity

B. Restricted repetitive and stereotyped patterns of behavior, interests, and activities, as manifested by at least one of the following:
(1) encompassing preoccupation with one or more stereotyped and restricted patterns of interest that is abnormal either in intensity or focus
(2) apparently inflexible adherence to specific, nonfunctional routines or rituals
(3) stereotyped and repetitive motor mannerisms(e.g., hand or finger flapping or twisting, or complex whole-body movements)
(4) persistent preoccupation with parts of objects

C. The disturbance causes clinically significant impairment in social, occupational, or other important areas of functioning.

D. There is significant general delay in language (e.g., single wards used by age 2 years, communicative no clinically phrases used by age 3 years).

A. There is no clinically significant delay in cognitive development or in the development of age-appropriate self-help skills, adaptive behavior (other then in social interaction), and curiosity about the environment in childhood.

B. Criteria are not met for another specific Pervasive Developmental Disorder of Schizophrenia.

Table 11

Summary of Primary, Secondary and Tertiary Neuropsychological Assets and Deficits in Language Learning Disorder

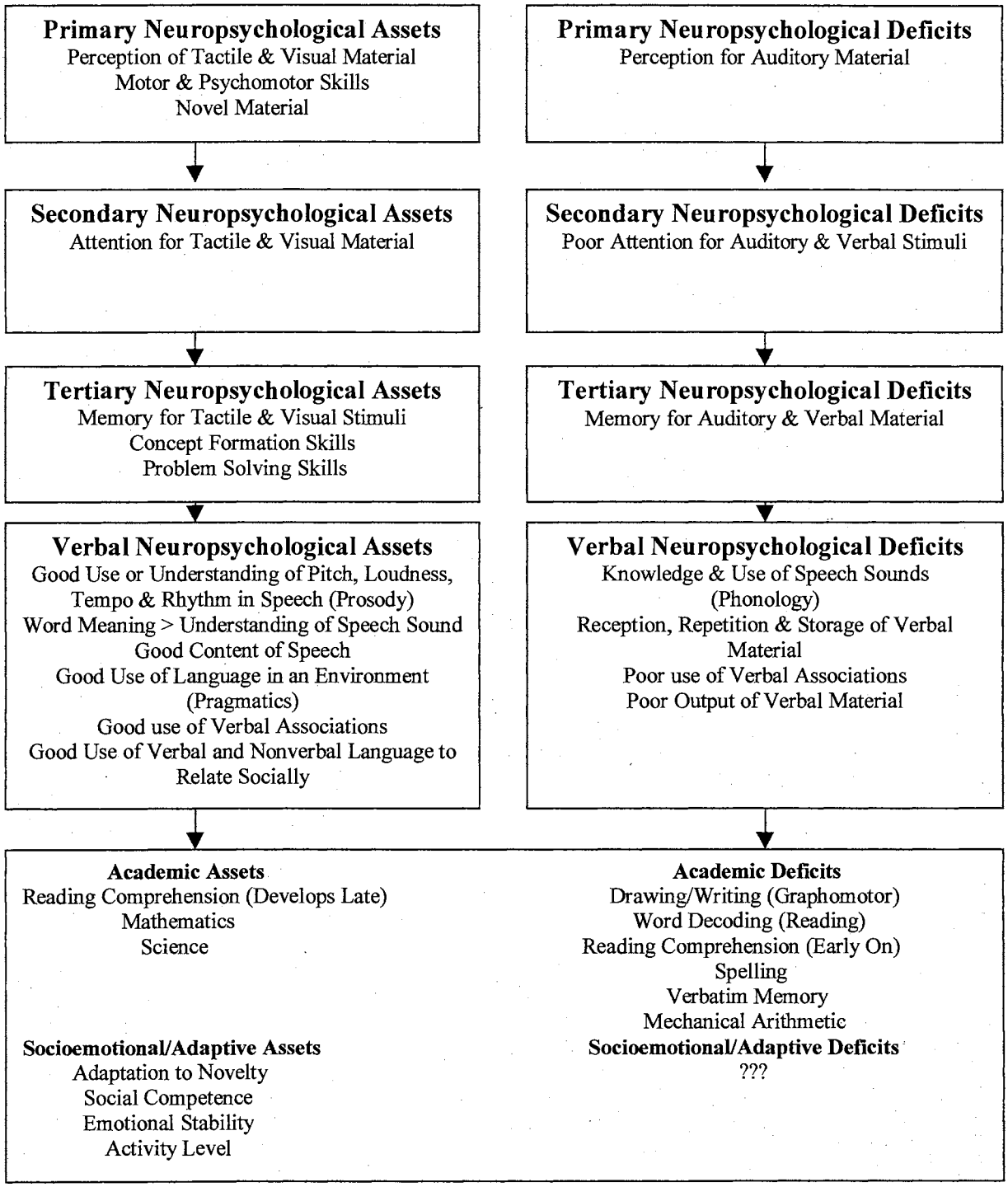


Table 12

Summary of Primary, Secondary and Tertiary Neuropsychological Assets and Deficits in Non Verbal Learning Disability

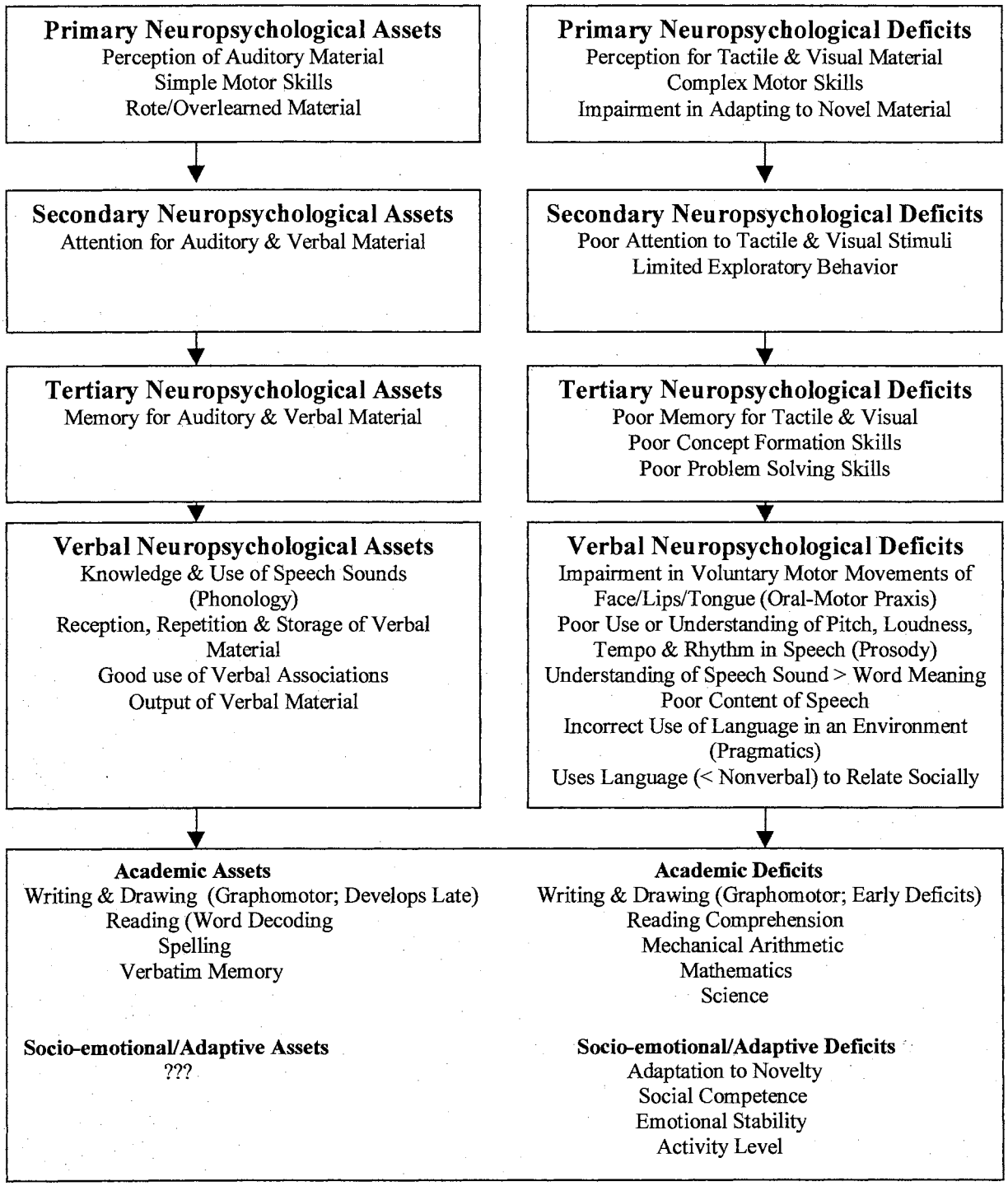


Table 13

Diagnostic and Statistical Manual of Mental Disorders-IV Diagnostic Criteria for Adjustment Disorder

Adjustment Disorder

A. The development of emotional or behavioral symptoms in response to an identifiable stressor(s) occurring within 3 months of the onset of the stressor(s).

B. These symptoms or behaviors are clinically significant as evidenced by either of the following:
   (1) marked distress that is in excess of what would be expected from exposure to the stressor
   (2) significant impairment in social or occupational (academic) functioning

C. The stress-related disturbance does not meet the criteria for another specific Axis I disorder and is not merely an exacerbation of a preexisting Axis I or Axis II disorder.

D. The symptoms do not represent Bereavement.

E. Once the stressor (or its consequence) has terminated, the symptoms do not persist for more than an additional 6 months.

Table 14

Diagnostic and Statistical Manual of Mental Disorders-IV Diagnostic Criteria for Oppositional Defiant Disorder

Oppositional Defiant Disorder

C. A pattern of negativistic, hostile, and defiant behavior lasting at least 6 months, during which four (or more) of the following are present:
   (1) often loses temper
   (2) often argues with adults
   (3) often actively defies or refuse to comply with adults' requests or rules
   (4) often deliberately annoys people
   (5) often blames others for his or her mistakes or misbehavior
   (6) is often touchy or easily annoyed by others
   (7) is often angry and resentful
   (8) is often spiteful or vindictive

D. The disturbance in behavior causes clinically significant impairment in social, academic, or occupational functioning.

E. The behaviors do not occur exclusively during the course of a Psychotic or Mood Disorder.

F. Criteria are not met for Conduct Disorder, and, if the individual is age 18 years or older, criteria are not met for Antisocial Personality Disorder.

Table 15

Means and Standard Deviations of the Normative Sample for Each SALON Subscale by Age and Gender

Mean Standard Deviation		S	A	L	O	N
4 years, 0 months to 8 years, 11 months	Male n = 19	16.6 3.6	25.1 7.3	18.5 2.8	17.8 2.8	23.0 4.7
	Female n = 26	18.3 1.7	25.8 5.2	22.3 3.6	19.8 4.3	23.7 3.7
9 years, 0 months to 12 years, 11 months	Male n = 22	15.6 2.4	23.7 6.0	22.6 3.7	17.9 3.0	25.2 4.9
	Female n = 24	16.6 2.3	24.4 3.5	21.2 2.4	18.5 2.6	23.4 3.0
13 years, 0 months to 18 years	Male n = 19	15.5 2.1	22.9 3.1	21.3 3.9	18.8 3.4	22.7 4.0
	Female n = 22	14.9 1.5	23.7 4.8	22.0 2.6	20.5 4.0	23.0 4.5

Table 16

Total and Group Sample Size of Each of the Clinical Groups Based on Neuropsychological Diagnosis

Childhood Stress	n = 24
Disorders of Attention	n = 17
Language Learning Disability	n = 80
Motivational/Oppositional Behavior	n = 87
Nonverbal Learning Disability	n = 27
	Total N = 235

Table 17

Predicted and Obtained Correlations Between SALON Subscales and Select Neuropsychological Measures.

SALON Subscale	Neuropsychological Test	Predicted Correlation	Obtained Correlation
Stress	WISC-III Information	No Correlation	-.15*
	WISC-III Vocabulary	No Correlation	-.17*
Attention Disorder	WISC-III Digit Span	Negative	-.01
	Knox Cube Test	Negative	-.18*
	Attention Concentration Index (ACI)	Negative	.06
	ACI Vigilance	Negative	.03
	ACI Capacity	Negative	-.11
	ACI Filtering	Negative	.10
	Trail Making Test Part B Time	Positive	-.15*
Language Learning Disorder	Token Subtest 3	Negative	-.21
	Token Subtest 4	Negative	-.17
	Token Subtest 5	Negative	-.18
	Right-Left Discrimination	Negative	.04
	Finger Localization Errors	Positive	.02
Oppositional Behavior	WISC-III Verbal IQ	No Correlation	-.05
	WISC-III Performance IQ	No Correlation	-.07
Nonverbal Learning Disorder	Motor-free Visual Perceptual Test	Negative	-.02
	Visual Motor Integration	Negative	-.23**
	WISC-III Block Design	Negative	-.06

Note.
*$p < .05$
** $p < .01$

Table 18

Factor Correlation Matrix of the Five Factors Extracted from the SALON

Factor	1	2	3	4	5
1	1.00				
2	.15	1.00			
3	.26	.26	1.00		
4	-.41	-.35	-.31	1.00	
5	-.13	-.13	-.08	.11	1.00

Table 19

Mean and Standard Deviation of the SALON Items

		M	SD
1.	Is clumsy or uncoordinated.	1.57	.67
2.	Misunderstands or forgets conversations.	1.90	.77
3.	Child has witnessed parents arguing or fighting.	1.81	.67
4.	Manipulates, cons, loving when (s)he wants something.	1.97	.77
5.	Inconsistent performance in school (good and bad grades).	2.04	.87
6.	Avoids chores.	2.30	.71
7.	Does better in outside-of-school activities.	2.01	.77
8.	Close family members have recently left the household (i.e. divorce, separation, death, work, college).	1.54	.85
9.	Shows indifference to the feelings of others.	1.61	.69
10.	Is disruptive in almost all situations.	1.71	.78
11.	Shy and quiet during younger years.	1.66	.79
12.	Recent additions to the family (i.e. new sibling, stepparent, foster child).	1.46	.81
13.	Dislikes participating in athletic activities.	1.45	.70
14.	Tolerates frustration poorly.	2.30	.76
15.	Child has changed schools.	1.59	.84
16.	Worries about schoolwork.	1.66	.74
17.	Gets lost or turned around easily.	1.35	.61
18.	Deliberately breaks things.	1.43	.69
19.	Gets along well with friends his age.	2.44	.68
20.	Child is picked-on at school.	1.64	.74
21.	Overly excitable.	1.89	.80
22.	Lack of guilt or remorse for misbehavior.	1.68	.79
23.	Serious illness or injury recently happened to other close family member.	1.28	.66
24.	Resisted cuddling as an infant.	1.19	.53
25.	Blames others.	2.14	.73
26.	Has recently had serious injury or illness.	1.10	.40
27.	Worries a lot about minor things.	1.75	.77
28.	Is athletic.	2.27	.73
29.	Purposely breaks rules.	1.71	.70
30.	Due to unforeseen circumstances, child has had to change daily routine (i.e. bedtime, activities).	1.34	.65
31.	Schoolwork makes him/her nervous.	1.78	.82
32.	Has been warned by the authorities.	1.16	.50

Table 19 (Continued)

Mean and Standard Deviation of the SALON Items

33.	Difficulty calming down after changing activities.	1.74	.81
34.	Reading and spelling easier than math.	1.66	.84
35.	Has recently joined or dropped-out-of youth programs.	1.19	.54
36.	Would rather do things than talk about them.	2.11	.79
37.	Reduced need for sleep.	1.35	.64
38.	Dislikes change in routine.	1.72	.78
39.	Kicks, hits, pinches, bites others.	1.49	.69
40.	Is accident prone.	1.48	.70
41.	Recently effected by financial difficulties of family.	1.31	.63
42.	Loses track of time, dawdles.	2.15	.82
43.	Impulsive (i.e. can't wait turn, blurts out, grabs).	2.07	.84
44.	Misplaces things.	2.13	.76
45.	Fidgety, restless, difficulty sitting still.	2.07	.86
46.	Generally lower grades on penmanship.	1.99	.88
47.	History of frequent ear infections.	1.71	.88
48.	History of being messy and disorganized.	2.19	.82
49.	Sent to principal's office for discipline problems.	1.60	.78
50.	Parent has recently changed jobs.	1.47	.81
51.	Shifts from one activity to another.	2.00	.80
52.	Overly dependent, prefers adults to peers.	1.61	.77
53.	Talks a lot, often interrupts, asks many questions.	2.25	.82
54.	Conflicts primarily with adults and not peers.	1.66	.74
55.	Child has witnessed fights between parents and in-laws.	1.34	.65
56.	Lack of sleep-overs with peers.	1.68	.84
57.	Never met a stranger, overly friendly.	1.85	.83
58.	Was seen by a speech therapist when young.	1.45	.81
59.	Would rather play alone or with younger children.	1.52	.75
60.	Refuses to do homework.	1.80	.83
61.	Leaves things unfinished.	2.22	.77
62.	Unable to "carry a tune."	1.39	.66
63.	Overactive since birth.	1.71	.85
64.	Early speech was difficult to understand.	1.46	.76
65.	Family or child has moved or changed households.	1.61	.86
66.	Complications during birth or pregnancy.	1.45	.80
67.	Math easier than reading and spelling.	1.90	.91
68.	Activity level is slowing with age.	1.49	.75
69.	Poor grades in reading, spelling & math (especially after grade 3).	1.82	.90
70.	Other family members have had trouble learning to read.	1.49	.81

Table 20

Mean and Standard Deviation of the SALON Subscales by Diagnostic Category and Clinical Sample

	Subscale									
	S		A		L		O		N	
Diagnostic Category	M[a]	SD	M[b]	SD	M[c]	SD	M[d]	SD	M[e]	SD
Stress (n = 24)	22.79	3.26	37.38	7.39	24.83	2.79	28.75	5.14	32.79	5.44
Attention Disorder (n = 17)	20.00	4.20	41.18	4.20	24.18	3.73	31.12	3.41	31.12	4.37
Language Learning Disorder (n = 80)	19.61	4.33	35.21	6.60	26.81	3.61	26.74	4.92	29.55	4.53
Oppositional Behavior (n = 87)	19.57	4.31	36.08	6.76	24.16	3.30	28.25	5.60	30.78	5.06
Nonverbal Learning Disorder (n = 27)	19.59	4.68	36.37	6.60	23.93	2.95	26.96	6.07	33.59	5.41
Clinical Sample (n = 235)	19.95	4.33	36.32	6.72	25.11	3.56	27.85	5.35	30.91	5.06

Note. [a] range 13 – 39; [b] range 17 – 51; [c] range 13 – 39; [d] range 14 – 42; [e] range 17 – 51

Table 21

Internal Consistency of the SALON Subscales

SALON Subscale	Number of Items in Subscale	Coefficient Alpha
Stress	13	.685
Attention Disorder	17	.904
Language Learning Disorder	13	.505
Oppositional Behavior	14	.875
Nonverbal Learning Disorder	17	.768

Table 22

Intercorrelations Among SALON Subscales and Select Neuropsychological Instruments

	Variable	1	2	3	4	5	6	7	8	9
1	Stress Subscale	--								
2	Attention Disorder Subscale	.44**	--							
3	Language Learning Disorder Subscale	.25**	.41**	--						
4	Oppositional Behavior Subscale	.45**	.81**	.36**	--					
5	Nonverbal Learning Disorder Subscale	.42**	.72**	.39**	.65**	--				
6	Attention Concentration Index	.04	.06	-.02	.02	-.13	--			
7	Attention Capacity	.03	-.11	.18*	-.09	-.06	.74**	--		
8	Attention Vigilance	-.03	.03	.13	-.04	-.02	.62**	.27**	--	
9	Attention Filtering	.07	.10	-.19	.07	-.04	.60**	.17	.16	--

Note.
*p < .05
** p < .01

Table 22 (Continued)

Intercorrelations Among SALON Subscales and Select Neuropsychological Instruments

	Variable	1	2	3	4	5	6	7	8	9
10	Knox Cube Age Equivalent	.07	-.18*	.06	.06	.10	.24*	.67**	.25*	-.15
11	Digit Span	-.08	-.01	-.19**	-.04	.04	.39**	.51**	.03	.06
12	Trails B Time	-.15*	.06	.12	-.06	-.10	-.27	-.14	-.02	-.52**
13	Token Subtest 3	-.14	-.04	-.21	-.00	.01	.04	.06	.26	-.23
14	Token Subtest 4	-.06	-.04	-.17	-.05	-.02	.27	.44**	.21	-.01
15	Token Subtest 5	-.13	-.08	-.18	-.04	.04	.20	.28*	.00	.00
16	Finger Naming Errors	-.02	.17*	.02	.06	.01	.16	-.11	-.10	.22
17	Motor-free Visual Perception	-.08	.03	-.14	.06	-.02	.33**	.33**	.20	.01

Note.
*p < .05
** p < .01

Table 22 (Continued)

Intercorrelations Among SALON Subscales and Select Neuropsychological Instruments

	Variable	1	2	3	4	5	6	7	8	9
18	Right Left Discrimination	-.15	-.24**	.04	-.06	.01	-.01	.33**	.11	-.20
19	Visual Motor Integration	-.01	-.30**	-.08	.18**	-.23**	.20*	.12	.11	.12
20	Block Design	-.01	-.14*	-.09	.09	-.06	.08	.02	.13	-.01
21	Vocabulary	-.17*	.08	-.15*	-.03	.07	.22*	.27**	.09	.11
22	Information	-.15*	.02	-.18**	-.06	.02	.12	.28**	.10	.11
23	Verbal IQ	-.18**	.05	-.19**	-.07	.01	.32**	.40**	.13	.14
24	Performance IQ	-.11	-.07	-.00	-.05	-.13	.40**	.25**	.27**	.16
25	Full Scale IQ	-.17**	.01	-.12	-.06	-.05	.42**	.39**	.23*	.18

Note.
*p < .05
** p < .01

Table 22 (Continued)

Intercorrelations Among SALON Subscales and Select Neuropsychological Instruments

	Variable	10	11	12	13	14	15	16	17
10	Knox Cube Age Equivalent	--							
11	Digit Span	.09	--						
12	Trails B Time	-.37**	-.09	--					
13	Token Subtest 3	.14	.21	-.09	--				
14	Token Subtest 4	.30**	.32**	-.30	.48**	--			
15	Token Subtest 5	.11	.39**	-.13	.43**	.53**	--		
16	Finger Naming Errors	-.36**	-.08	.03	.05	-.19	.03	--	
17	Motor-free Visual Perception	.30**	.34**	-.11	.23*	.30**	.13	.05	--

Note.
*p < .05
** p < .01

Table 22 (Continued)

Intercorrelations Among SALON Subscales and Select Neuropsychological Instruments

	Variable	10	11	12	13	14	15	16	17
18	Right Left Discrimination	.42**	.27**	-.21*	.27*	.27**	.23*	-.25**	.15
19	Visual Motor Integration	.17*	.15*	-.07	.06	.07	-.04	-.13	.26**
20	Block Design	.10	.23**	.04	.05	.15	.07	-.10	.48**
21	Vocabulary	-.04	.36**	.08	.09	.30**	.29**	-.05	.38**
22	Information	.20*	.33**	-.12	.21	.35**	.29**	-.11	.32**
23	Verbal IQ	.05	.55**	-.01	.25*	.43**	.39**	-.10	.39**
24	Performance IQ	.13	.29**	-.10	.12	.19*	.10	-.04	.53**
25	Full Scale IQ	.11	.50**	-.06	.22*	.35**	.29**	-.09	.55**

Note.
*$p < .05$
** $p < .01$

Table 22 (Continued)

Intercorrelations Among SALON Subscales and Select Neuropsychological Instruments

	Variable	18	19	20	21	22	23	24	25
18	Right Left Discrimination	--							
19	Visual Motor Integration	.03	--						
20	Block Design	.12	.27**	--					
21	Vocabulary	-.01	.16*	.31**	--				
22	Information	.10	.24**	.30**	.58**	--			
23	Verbal IQ	.13	.16*	.08	.81**	.80**	--		
24	Performance IQ	.16*	.24**	.35**	.38**	.38**	.40**	--	
25	Full Scale IQ	.17*	.23**	.24**	.72**	.71**	.86**	.81**	--

Note.
*p < .05
** p < .01

Table 23

Sample Size of Intercorrelations Among SALON Subscales and Select Neuropsychological Instruments

		1	2	3	4	5	6	7	8	9	10	11	12
1	Stress Subscale	--											
2	Attention Disorder Subscale	366	--										
3	Language Learning Disorder Subscale	366	366	--									
4	Oppositional Behavior Subscale	366	366	366	--								
5	Nonverbal Learning Disorder Subscale	366	366	366	366	--							
6	Attention Concentration Index	113	113	113	113	113	--						
7	Attention Capacity	122	122	122	122	122	98	--					
8	Attention Vigilance	121	121	121	121	121	98	120	--				
9	Attention Filtering	97	97	97	97	97	96	95	95	--			
10	Knox Cube Age Equivalent	181	181	181	181	181	80	90	88	67	--		
11	Digit Span	202	202	202	202	202	103	112	112	87	160	--	
12	Trails B Time	92	92	92	92	92	51	47	47	43	60	88	--
13	Token Subtest 3	99	99	99	99	99	35	45	45	30	89	87	44
14	Token Subtest 4	119	119	119	119	119	45	59	59	40	103	107	50
15	Token Subtest 5	118	118	118	118	118	45	57	57	39	103	106	48
16	Finger Naming Errors	146	146	146	146	146	74	83	81	66	112	137	71
17	Motor-free Visual Perception	176	176	176	176	176	82	98	97	74	144	156	69
18	Right Left Discrimination	168	168	168	168	168	76	88	87	68	127	153	88
19	Visual Motor Integration	207	207	207	207	207	101	112	111	87	165	189	82
20	Block Design	201	201	201	201	201	101	110	110	85	160	198	88
21	Vocabulary	194	194	194	194	194	97	106	105	81	153	191	83
22	Information	202	202	202	202	202	103	112	112	87	160	198	87
23	Verbal IQ	223	223	223	223	223	111	120	119	95	178	199	90
24	Performance IQ	223	223	223	223	223	111	120	119	95	178	199	90
25	Full Scale IQ	223	223	223	223	223	111	120	119	95	178	199	90

Table 23 (Continued)

Sample Size of Intercorrelations Among SALON Subscales and Select Neuropsychological Instruments

		13	14	15	16	17	18	19	20	21	22	23	24	25
1	Stress Subscale													
2	Attention Disorder Subscale													
3	Language Learning Disorder Subscale													
4	Oppositional Behavior Subscale													
5	Nonverbal Learning Disorder Subscale													
6	Attention Concentration Index													
7	Attention Capacity													
8	Attention Vigilance													
9	Attention Filtering													
10	Knox Cube Age Equivalent													
11	Digit Span													
12	Trails B Time													
13	Token Subtest 3	--												
14	Token Subtest 4	98	--											
15	Token Subtest 5	97	114	--										
16	Finger Naming Errors	60	74	73	--									
17	Motor-free Visual Perception	86	105	103	113	--								
18	Right Left Discrimination	76	95	92	118	132	--							
19	Visual Motor Integration	94	113	112	136	163	154	--						
20	Block Design	87	107	106	136	155	152	188	--					
21	Vocabulary	86	104	104	131	151	146	183	192	--				
22	Information	88	107	107	135	156	152	189	198	193	--			
23	Verbal IQ	97	116	116	144	172	165	204	199	194	202	--		
24	Performance IQ	97	116	116	144	172	165	204	199	194	202	223	--	
25	Full Scale IQ	97	116	116	144	172	165	204	199	194	202	223	223	--

Table 24

Variance Explained by Five Factors Extracted from the SALON

Factor	Percentage of Variance	Cumulative Percentage of Variance
1	20.1	20.1
2	3.2	23.3
3	2.6	25.9
4	2.2	28.2
5	1.9	30.0

Table 25

Structure Matrix from the Factor Analysis

	Item from the SALON	Factor				
		1	2	3	4	5
1.	Is clumsy or uncoordinated.	.210	.536	.099	-.303	-.052
2.	Misunderstands or forgets conversations.	.334	.284	.270	-.572	-.165
3.	Child has witnessed parents arguing or fighting.	.068	.100	.506	-.187	-.110
4.	Manipulates, cons, loving when (s)he wants something.	.409	.109	.334	-.398	-.285
5.	Inconsistent performance in school (good and bad grades).	.270	.326	.379	-.745	-.064
6.	Avoids chores.	.246	.217	.093	-.557	-.260
7.	Does better in outside-of-school activities.	.177	.128	.157	-.471	.086
8.	Close family members have recently left the household (i.e. divorce, separation, death, work, college).	.104	-.056	.563	-.113	.015
9.	Shows indifference to the feelings of others.	.311	.247	.266	-.340	-.556
10.	Is disruptive in almost all situations.	.697	.274	.428	-.549	-.320
11.	Shy and quiet during younger years.	-.298	.162	-.015	-.092	-.053
12.	Recent additions to the family (i.e. new sibling, stepparent, foster child).	.128	.188	.373	-.154	-.222
13.	Dislikes participating in athletic activities.	-.012	.413	-.011	-.156	-.096
14.	Tolerates frustration poorly.	.507	.343	.309	-.549	-.331
15.	Child has changed schools.	.170	.144	.366	-.141	.003
16.	Worries about schoolwork.	-.020	.220	.039	-.153	.062
17.	Gets lost or turned around easily.	.167	.425	.195	-.312	-.112
18.	Deliberately breaks things.	.406	.145	.222	-.438	-.342
19.	Gets along well with friends his age.	-.153	-.346	-.257	.164	.153
20.	Child is picked-on at school.	.255	.539	.329	-.395	-.161
21.	Overly excitable.	.715	.353	.297	-.515	-.164
22.	Lack of guilt or remorse for misbehavior.	.450	.282	.203	-.455	-.451
23.	Serious illness or injury recently happened to other close family member.	.067	.153	.108	-.066	-.063
24.	Resisted cuddling as an infant.	.164	.261	.131	-.096	-.198
25.	Blames others.	.491	.265	.335	-.554	-.405
26.	Has recently had serious injury or illness.	-.035	.111	.085	-.027	-.035
27.	Worries a lot about minor things.	.160	.420	.162	-.268	-.165
28.	Is athletic.	.067	-.435	.037	.096	.085
29.	Purposely breaks rules.	.532	.241	.432	-.511	-.321

Table 25 (Continued)

Structure Matrix from the Factor Analysis

	Item from the SALON	Factor				
		1	2	3	4	5
30.	Due to unforeseen circumstances, child has had to change daily routine (i.e. bedtime, activities).	.159	.110	.490	-.157	.092
31.	Schoolwork makes him/her nervous.	.147	.368	.180	-.444	-.047
32.	Has been warned by the authorities.	.235	.246	.298	-.210	-.164
33.	Difficulty calming down after changing activities.	.755	.178	.325	-.500	-.152
34.	Reading and spelling easier than math.	-.091	.096	-.027	.040	-.288
35.	Has recently joined or dropped-out-of youth programs.	.112	.150	.122	-.082	-.118
36.	Would rather do things than talk about them.	.143	-.137	-.022	-.070	.005
37.	Reduced need for sleep.	.285	.145	.127	-.166	-.197
38.	Dislikes change in routine.	.224	.266	.144	-.219	-.157
39.	Kicks, hits, pinches, bites others.	.453	.283	.367	-.451	-.348
40.	Is accident prone.	.361	.380	.051	-.327	-.188
41.	Recently effected by financial difficulties of family.	.166	.216	.324	-.270	-.060
42.	Loses track of time, dawdles.	.390	.274	.122	-.609	-.165
43.	Impulsive (i.e. can't wait turn, blurts out, grabs)	.751	.279	.373	-.563	-.282
44.	Misplaces things.	.503	.315	.178	-.595	-.135
45.	Fidgety, restless, difficulty sitting still.	.733	.264	.303	-.540	-.113
46.	Generally lower grades on penmanship.	.272	.255	.269	-.476	-.004
47.	History of frequent ear infections.	.151	.193	.079	-.145	-.075
48.	History of being messy and disorganized.	.400	.229	.201	-.678	-.099
49.	Sent to principal's office for discipline problems.	.424	.205	.405	-.467	-.203
50.	Parent has recently changed jobs.	.108	.093	.203	-.212	.054
51.	Shifts from one activity to another.	.583	.216	.245	-.499	-.074
52.	Overly dependent, prefers adults to peers.	.289	.474	.205	-.300	-.050
53.	Talks a lot, often interrupts, asks many questions.	.706	.240	.266	-.414	-.071
54.	Conflicts primarily with adults and not peers.	.351	.068	.272	-.364	-.220
55.	Child has witnessed fights between parents and in-laws.	.143	.226	.618	-.229	-.074
56.	Lack of sleep-overs with peers.	.205	.285	.309	-.340	-.044

Table 25 (Continued)

Structure Matrix from the Factor Analysis

	Item from the SALON	Factor				
		1	2	3	4	5
57.	Never met a stranger, overly friendly.	.516	.095	.209	-.203	.054
58.	Was seen by a speech therapist when young.	.072	.315	.132	-.100	.198
59.	Would rather play alone or with younger children.	.125	.457	.286	-.295	-.045
60.	Refuses to do homework.	.286	.281	.369	-.703	-.066
61.	Leaves things unfinished.	.396	.311	.247	-.813	-.014
62.	Unable to "carry a tune."	.154	.248	.209	-.219	.075
63.	Overactive since birth.	.717	.206	.138	-.380	-.142
64.	Early speech was difficult to understand.	.192	.449	.251	-.203	.111
65.	Family or child has moved or changed households.	.098	.121	.521	-.090	.009
66.	Complications during birth or pregnancy.	.222	.232	.182	-.169	-.024
67.	Math easier than reading and spelling.	.116	.126	.129	-.227	.360
68.	Activity level is slowing with age.	-.006	.312	.136	-.140	-.113
69.	Poor grades in reading, spelling and math (especially after grade 3).	.155	.253	.216	-.688	.032
70.	Other family members have had trouble learning to read.	.219	.287	.134	-.248	.124

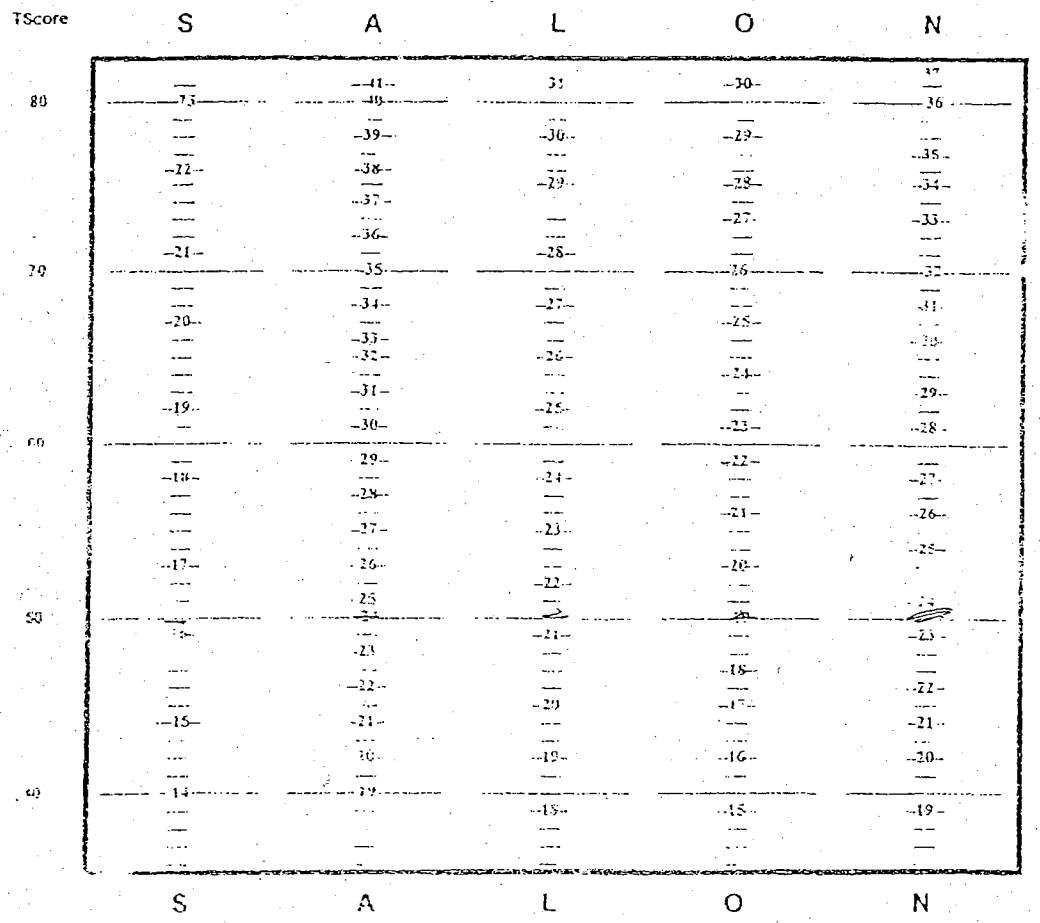
APPENDIX A

SALON

NEUROCOGNITIVE SCREENING QUESTIONAIRE

Name: _____ Age _____ DOB: _____
Gender: _____ Date of Examination: _____

Examiner _____



Raw Score _____ _____ _____ _____ _____

T-score _____ _____ _____ _____ _____

Comments _____

The SALON Differential
(Standardization Format)

by: Terry G. Shaw, Karen K. Cornell, Norris Sonntag

Child's Name _____ Age _____ Grade _____
Rater's Name _____
Rater's Relationship to Child _____
Family History of Major Mental Illness - yes no
(schizophrenia, bipolar/manic-depression, major depression) ____ ____

INSTRUCTIONS: Read each item carefully and decide how often this child displays the behavior in question. Use the following numbers to indicate your choices. Put the number of your choice in the box at the end of the statement.

1 = ALMOST NEVER/NO/DOES NOT APPLY
2 = SOMETIMES/OCCASIONALLY
3 = OFTEN/FREQUENTLY/YES

1. Is clumsy or uncoordinated..... ☐
2. Misunderstands or forgets conversations..... ☐
3. Has witnessed parents arguing or fighting..... ☐
4. Manipulates, cons, loving when (s)he wants something..... ☐
5. Inconsistent performance in school (good and bad grades)..... ☐
6. Avoids chores..... ☐
7. Does better in outside-of-school activities..... ☐
8. Close family members have recently left the household (i.e. divorce, separation, death, work, college)..... ☐
9. Shows indifference to the feelings of others..... ☐

Page 1 - Subtotals ☐ S ☐ A ☐ L ☐ O ☐ N

10. Is disruptive in almost all situations..... ☐

11. Shy and quiet during younger years..... ☐

12. Recent additions to the family (i.e. new sibling, stepparent, foster child)..... ☐

13. Dislikes participating in athletic activities..... ☐

14. Tolerates frustration poorly..... ☐

15. Has changed schools..... ☐

16. Worries about schoolwork..... ☐

17. Gets lost or turned around easily..... ☐

18. Deliberately breaks things..... ☐

19. Gets along well with friends his age..... ☐

20. Is picked-on at school..... ☐

21. Is overly excitable..... ☐

22. Lack of guilt or remorse for misbehavior..... ☐

23. Serious illness or injury has recently happened to other close family member..... ☐

24. Resisted cuddling as an infant..... ☐

25. Blames others..... ☐

26. Has recently had serious injury or illness..... ☐

27. Worries alot about minor things..... ☐

28. Is athletic..... ☐

Page 2 - Subtotals ☐ S ☐ A ☐ L ☐ O ☐ N

29. Purposely breaks rules..... ☐

30. Due to unforeseen circumstances, child has had to change daily routine (i.e. bedtime, activities)..... ☐

31. Schoolwork makes him/her nervous..... ☐

32. Has been warned by the authorities..... ☐

33. Has difficulty calming down after changing activities..... ☐

34. Reading and spelling easier than math..... ☐

35. Has recently joined or dropped-out-of youth groups..... ☐

36. Would rather do things than talk about them..... ☐

37. Reduced need for sleep..... ☐

38. Dislikes change in routine..... ☐

39. Kicks, hits, pinches, bites others..... ☐

40. Is accident prone..... ☐

41. Recently effected by financial difficulties of family..... ☐

42. Loses track of time, dawdles..... ☐

43. Impulsive (i.e. can't wait turn, blurts out, grabs)..... ☐

44. Misplaces things..... ☐

45. Fidgety, restless, difficulty sitting still..... ☐

46. Generally lower grades on penmanship..... ☐

Page 3 - Subtotals ☐ S ☐ A ☐ L ☐ O ☐ N

47. History of frequent ear infections..... ☐

48. History of being messy and disorganized..... ☐

49. Sent to principal's office for discipline problems..... ☐

50. Parent has recently changed jobs..... ☐

51. Shifts from one activity to another..... ☐

52. Overly dependent, prefers adults to peers..... ☐

53. Talks alot, often interrupts, asks many questions..... ☐

54. Conflicts primarily with adults and not peers..... ☐

55. Child has witnessed fights between parents and in-laws..... ☐

56. Lack of sleep-overs with peers..... ☐

57. "Never met a stranger" /overly friendly..... ☐

58. Was seen by a speech therapist when young..... ☐

59. Would rather play alone or with younger children..... ☐

60. Refuses to do homework..... ☐

61. Leaves things unfinished..... ☐

62. Unable to "carry a tune"..... ☐

63. Overactive since birth..... ☐

64. Early speech was difficult to understand..... ☐

Page 4 - Subtotals ☐ S ☐ A ☐ L ☐ O ☐ N

65. Family or child has moved or changed households..... ☐

66. Complications during this birth or pregnancy..... ☐

67. Math easier than reading and spelling..... ☐

68. Activity level is slowing down with age..... ☐

69. Poor grades in reading, spelling and math (especially after grade 3)..... ☐

70. Other family members have had trouble learning to read..... ☐

Page 5 - Subtotals ☐ S ☐ A ☐ L ☐ O ☐ N

SCORING:		S	A	L	O	N
	Page 1 - Subtotals	____	____	____	____	____
	Page 2 - Subtotals	____	____	____	____	____
	Page 3 - Subtotals	____	____	____	____	____
	Page 4 - Subtotals	____	____	____	____	____
	Page 5 - Subtotals	____	____	____	____	____
	Item #14		____			
	Item #25		____			
	Item #38		____			
	Item #40		____			
	TOTALS	☐	☐	☐	☐	☐

APPENDIX B

Identifying Information

Name: | Referral:

DOE: / / | Age | DOB: / / | Sex

CC:

Admit (ER) Sx:

Date: / / | Time Post:

Description:

LOC | CT/MRI

RA | PTA

Sz | EEG

Hosp:

Premorbid Hx

Med/Dev:

OCC/Educ:

Est IQ (FOI) | Voc

Soc:

1. Mental Status Examination

Arous OR P P T

Dom: H E F

App:

Emot:

Mot Sx:

Thougt Proc:

Content:

Speech:

IPS:

Attitude:

2. Attention SX

DS F B V:F B

Ags:(A) (V)

ACQ: 592 0

3. Sensation

A Visual Flds:

DSS: L R

Pupils:

C/J Acty OD 20/ OS 20/

B Audition: CN VIII

DSS: L R

Rhine: A B A B Weber

C Somathesis CN V

Dermatomes

DSS: L R

D Neglect/Inattention

4. Perception

A Visual:Trck FC

VFD/JOL: %

MVPT: %

FAR: %

Faces: %

Hooper %

Sim/GC %

Stroop (C) =t

B Auditory

SRT =Rank

Wepman

C Somathesis

Stereo L R

Graph L R

Fing Nam L R

5. Motor

A CN V VII

III,IV, VI

IX, X

XI

XII

B Strength: L R

C Dexterity: L R

D Speed: L R

E Ext:

F Coord/Tremor:

G AMR:L R FNF L R

H Gait/Station

I Reflexes: DTR:

Release:

6. Perceptual Motor

A Visual: DS:

Trails A: %

BD/3D:

Beery/Ben:

Draw/AS:

B Auditory:

R/L Disc:

Limb

Buccofacial

Ideational

C Somasthetic

TPT(t) =t

Dom =t

NonDom =t

Both =t

Mem Loc

7. Memory/Learning

Rey Port

A Vis/Spat: VR: %

VRII: %

Recognit:: =SS

VIPA

VIQ BVRT/CVMT

Rey Copy =SS

Complex Imm =SS

Del =SS

B Aud/Verb: LMI: %

LMII: %

Recognit: /10 /11

=SS

PA: E:

I:

VEQ SDL %

Bushke

C Delay Q:

8. Language: AS

Recept PPVT %

SIL %

A Aud:: Y/N SSPT

ALPS-L

MAE (AC) %

MAE (Token) %

B Vis: WRAT-R %

Stroop W =t

ALPS-R GG

MAE (RC) %

GORT %

C MAE (SenR) %

Expressive Dysarth

A Voc: MAE (VisN) %

MAE (CFL) %

GORT-P&P Odd

B Graph AS

WRAT-S %

9 Executive MZ:

A Sequencing PA

Trails B %

B Response Inhib

Stroop CW =t

C Regulating

Interleaved

Error Use

Rampart PSV

10 Abstraction

A Verbal:Comp Sim

B Math: AS WAIS-R

WRAT-A %

C Sorting/Problem Solving

WCST

Category

Ravens %

Proverbs

SIL: Voc

AQ CQ

11 Global Indices

WAIS-R: VIQ PIQ FSIQ

DS DRS WMS(I) (D)

MMSQ Folstein Imp Ind AIR

Conclusions:

Recommendations:

APPENDIX C

Neuropsychological Test Battery

Attention
Wechsler Intelligence Scale for Children – R (WISC-R) Digit Span
Wechsler Adult Intelligence Scale-R (WAIS-R) Digit Span
Wechsler Memory Scale-R (WMS-R) Visual Span
Knox Cube Test
592/♦

Sensation
Visual Fields Test
Eye Exam
Auditory Suppressions
Somatosensory Suppressions

Perception
Visual
- WISC-R Picture Completion Subtest
- Judjment of Line
- Motor Free Visual Perception Test
- Facial Affect Recognition Test
- Hooper Visual Organization Test
- Stroop Color Reading

Auditory
- Seashore Rhythm Test
- Wepman

Somasthetic
- Sterognosis
- Graphasthesia
- Finger Naming

Motor
Test of Cranial Nerves III, IV, V, VI, VII, IX, X, XI, XII
Grip Strength Dynamometer
Grooved Pegboard
Finger Tapping Test

Perceptual Motor
Visual
- WAIS-R Digit Symbol/ WISC-R Coding
- Trails A
- Block Design
- 3D Block Design

Beery Visual Motor Integration
Drawings from Aphasia Screen Test

Auditory
Right Left Discrimination
Ideational Apraxia

Somasthetic
Tactile Performance Test

Memory/Learning

Visual/Spatial
WRAML
WMS-R Visual Reproduction I and II
WMS_R Visual Recognition
Rey Complex Figure Test

Auditory/Verbal
WMS-R Logical Memory I and II
WMS-R Logical Memory Recognition Test
WMS-R Verbal Paired Associates
Serial Digit Learning
Bushke

Language

Auditory Receptive
Aphasia Screen
Peabody Picture Vocabulary Test
Shipley Institue of Living Scale
Yes No Reliability
Speech Sounds Perception Test
Multilingual Aphasia Exam Token Test

Visual Receptive
Wide Range Achievement Test-Revised (WRAT-R) Reading
Stroop Word Reading
Grey Oral Reading Test (GORT)
Multilingual Aphasia Exam Sentence Repetition

Expressive
Multilingual Aphasia Exam Visual Naming
Controlled Oral Word Association Test
GORT Paraphasic Errors
Aphasia Screen Writing
WRAT Spelling

Executive
WISC-R Mazes
Picture Arrangement
Trails B
Stroop Color-Word Reading

Stroop Color-Word Inhibition
Interleaved
Error Use
Perseverative Tendencies

Abstraction

Verbal

WAIS-R/WISC-R Comprehension
WAIS-R/WISC-R Similarities

Math

Aphasia Screen
WAIS-R/WISC-R Arithmetic
WRAT Arithmetic

Sorting/Problem Solving

Wisconsin Card Sort Test
Category Test
Ravens Progressive Matrices
Proverbs
Shipley Institute of Living Scale Abstraction Test

APPENDIX D

CARDINAL SIGNS OF ATTENTION DEFICIT DISORDER

I. Behavior and History
1. Fidgety, restless, difficulty staying seated
2. Shifts from one uncompleted activity to another
3. Distracted by noise, activity and/or objects in room
4. Hyper-social, overly engaging, no stranger-danger
5. Doesn't seem to listen and/or prefers to talk
6. Intrusive, interrupts, excitable, disruptive
7. Has trouble transitioning (ex. after recess)
8. Minimal need for sleep and/or onset insomnia
9. Often externalizes blame, poor frustration tolerance
10. Chronic history of symptoms predating school
11. PBC's or similar family history
12. Symptoms persist despite stable environment
13. Variable achievement, peer success
14. No recent upheavals or history of family chaos

II. Symptom Picture

A. Cognitive Signs
1. Poor performance on direct measures of attention
2. Response dysinhibition (e.g. Stroop CW)
3. Difficulty with sequencing, shifting, and divided attention (e.g. Wisconsin)
4. Elevations on ALL rating scales
5. Poor performance on tasks that require sustained attention (e.g. Wepman, Token, Digit Symbol, Search)
6. Inconsistent and or contradictory data (e.g., fails low level tasks and succeeds on more difficult ones, bilateral suppressions, high picture arrangement and poor picture completion, good reading and writing but poor listening, etc.)
7. Variable memory skills
8. Scatter without a consistent pattern
9. No assymetrical sensory or motor signs

B. Behavioral Signs
1. No power struggles, responsive to redirection, not terribly oppositional (e.g. fairly cooperative)
2. Frequently out of seat, changes position
3. Exploratory behavior (fascination with minutiae) at expense of test protocol
4. Draining for examiner, may have to complete in several sessions or take frequent breaks
5. Dominates conversation, asks about everything Orients consistently to outside noises
6. Rarely self-corrects or self-monitors
7. Values speed over accuracy (e.g. whip-it-out)
8. Doesn't persist in face of frustration, no work ethic

APPENDIX E

CARDINAL SIGNS OF LANGUAGE LEARNING DISORDER

Behavior and History

1. Dysarthria or referral for speech in early grades
2. History of chronic ear infections
3. Delayed language development
4. Family history of similar symptoms
5. Anxious in school (fidgety and shy) in early grades
6. Dislikes school by grade 4 - 5 (angry)
7. Usually good peer relations (even if wrong crowd)
8. Possibly athletic, self-esteem tied to other things
9. Acts out versus internalizes, prefers action to thought
10. Achievement problems from day one in school
11. Minimal verbal spontaneity, often described as quiet
12. Seldom initiates conversation outside family
13. Forgets conversations

II. Symptom Picture

A. Primary Cognitive Symptoms

1. Right-sided suppressions, field cuts or motor symptoms
2. Poor auditory/phoneme discrimination
3. Right/Left confusion
4. Poor sentence repetition
5. Poor listening for compound, complex commands

B. Secondary Cognitive Symptoms

1. Auditory attention down
2. Visual verbal search < visual spatial search
3. Dysnomias/ "thing-a-ma-jig, what-cha-ma-call-it"
4. Right or bilateral finger naming or graphesthesia
5. Word recognition speed < color,recognition speed
6. Rote math > reading and spelling scores
7. Poor phonetic decoding and encoding skills
8. Verbal/analytic sequencing skills (Trails B)

C. Tertiary Cognitive Symptoms

1. Dyspraxia of limb
2. Poor story memory, verbal learning
3. Low word knowledge
4. Word generation down/dysfluency
5. Paraphasia's, word substitutions
6. Poor verbal concept formation
7. VIQ < PIQ

APPENDIX F

CARDINAL SIGNS OF OPPOSITIONAL BEHAVIOR DISORDER

I. Behavior and History
   1. Chronic underachievement usually after grade 3
   2. Retentions, suspensions, acting-out
   3. Invites power struggles with authority (not necessarily peers)
   4. Legal juvenile detention problems if old enough
   5. Angry
   6. Externalizes blame
   7. Defies rules
   8. Refuses (or loses) homework
   9. Usually weak family rules and structure or marginal stability (e.g. no-or-the wrong consequences)
   10. May have moved numerous times

II. Symptom Picture
   A. Cognitive Signs (assuming adequate compliance)
      1. All cognitive skills intact (even if within functional limits)
      2. Academic achievement deficits only (e.g. reading, spelling, math)
   B. Behavioral Signs
      1. Give up easily
      2. "I don't know" response frequently
      3. No work ethic, seems under motivated, doesn't want to be here
      4. Power, authority, and control issues
      5. May try to out-last you and wait for rescue

APPENDIX G

CARDINAL SIGNS OF NONVERBAL LEARNING DISORDER

I. Behavior and History (Also see Asperger's syndrome)
1. Delayed motor development and/or clumsy
2. Problems with separation from family in adolescence
3. Social anxiety, poor social development (i.e. few sleep overs)
4. Solitary play, internalizes rather than act out
5. Prefer adult relationships
6. Family history of similar symptoms
7. Monotone speech
8. Hyperactive when young, hypoactive in adolescence
9. Messy and disorganized, forgets where he or she put things
10. Poor time management, procrastinates
11. Poor penmanship and poor drawing ability
12. Prefers sameness, less adaptable
13. Pedantic/detail ridden
14. Good auditory skills
15. Tactually defensive, not cuddly as an infant
16. Gets lost or easily turned around
17. Poor athletic ability

II. Neurocognitive Diagnosis Symptom Picture

A. Primary Cognitive Symptoms
1. Left sided suppressions, field cuts or motor symptoms
2. Left sided somatoperceptual signs
3. Visual perceptual deficits (e.g. closure)
4. Visual-motor integration problems (i.e. poor drawings, poor constructional skills for blocks, slow Trails A)

B. Secondary Cognitive Symptoms
1. Visual spatial attention and visual search-down
2. Poor tactile-motor integration
3. Slower color naming speed versus word speed
4. Slow copying speed
5. Dysprosody (expressive or receptive)
6. Math < reading and spelling
7. Reading passage < comprehension
8. Nonverbal sequencing and planning skills down
9. Nonverbal reasoning and problem solving down
10. Tends to skip lines when reading or omit left

C. Tertiary Cognitive Symptoms
1. Carry-over math errors, better word math versus rote
2. PIQ < VIQ
3. Token V worse than I-IV
4. Eidetic reading errors
5. Concreteness

APPENDIX H

BRIEF DESCRIPTION OF NEUROPSYCHOLOGICAL TESTS SELECTED FOR CORRELATION ANALYSIS

Attention Concentration Index (ACI) is a derived index score modeled after Mirsky's model of attention identifying three components of attention: capacity, vigilance and filtering. Each component is described below. The total index score is based on the average of the three components after each score is converted to a common metric. The computational formula is presented in Appendix I.

Attention Capacity is an index score reflecting the maximum about of information that an individual can hold or attend to. The index score is computed by averaging the participant's performance on a measure of verbal attention span, WISC-III Digit Span, and a measure of visuospatial attention span, Knox Cube Test Age Equivalent. The computational formula is presented in Appendix I.

Attention Vigilance represents the ability to sustain focus to a task without diminishing performance or fatigue. The average of the participant's performance on a measure of verbal attention vigilance, 592 Cancellation Test errors, and visuospatial attention vigilance, Diamond Cancellation Test errors, comprises the index score. The computational formula is presented in Appendix I.

Attention Filtering represents the ability to shift mental resources with flexibility as needed. The average of the participant's performance on the Trail Making Test Part B and the Stroop Interference Task comprise the Attention Filtering Index Score. The computational formula is presented in Appendix I.

Knox Cube Test (Stone & Wright, 1980) is a measure of immediate visual attention span and is similar to the Visual Span subtest of the Wechsler Memory Scale – III (WMS-III; Wechsler, 1991). The examinee is presented with four blocks attached to a strip of wood. After watching the examiner tap the blocks in a prescribed sequence, the participant is asked to reproduce the tapping pattern exactly. The derived score reflects an age-equivalent in months based on an age normed sample.

Wechsler Intelligence Scale for Children - III (WISC-III; Wechsler, 1991) Digit Span subtest consists of the participant being verbally presented with a string of numbers of increasing length and asked to repeat the series of number exactly and followed by directions to repeat the numbers in reverse sequence. The derived score represents an age corrected scaled score.

Trail Making Test (Reitan & Wolfson, 1985) is composed of 2 subtests: Trails A and Trails B. On Trails A, the participant is presented with 15 encircled numbers randomly arranged on a sheet of paper and asked to connect the numbers using a pencil in order as quickly as possible. On Trails B, the participant is presented with 15 encircled numbers and letters and asked to connect the numbers and letters in alternating order as quickly as possible. Trails A and B are recorded as time to completion in seconds.

Multilingual Aphasia Exam (MAE) Token Subtests 3 through 5 (Benton, Sivan, deS Hamsher, Varney & Spreen, 1994) are measures of verbal comprehension. Twenty tokens in 5 colors (red, blue, yellow, white, green), 2 sizes (small and large), and 2 shapes (circle and square) are laid out in front of the participant in a

fixed order. The participant is asked to perform commands of increasing complexity using the tokens. The recorded scores reflect a standard score with a mean of 500.

Finger Localization (Benton, et al, 1994) requires the participant with their hand set in front of them and their eyes closed to identify which finger was touched by the examiner. Scores reflect the cumulative number of errors out of six total for the right and left hand.

Motor-free Visual Perception Test (Colarusso & Hammill, 1996) is a test of receptive visual perception that does not require motor involvement. Scores are recorded as a Perceptual Quotient with a mean of 100 and standard deviation of 15.

Right-Left Discrimination (Benton, 1959) consists of verbal instructions to have the patient identify body parts on his or her own body and on the examiners body. Scores represent the total number correct out of 12.

Developmental Test of Visual Motor Integration (VMI; Berry, 1989) includes the presentation of 24 geometric designs for the patient to copy. The designs increase in difficulty from copying a straight vertical line to copying a three dimensional block. Scores are recorded as a percentile rank.

WISC-III Block Design Subtest (Wechsler, 1991) is a performance subtest which consists of the patient being presented with red and white blocks. The patient is asked to replicate the construction of a design made by the examiner or designs printed on a card. The derived score represents an age corrected scaled score.

WISC-III Vocabulary Subtest (Wechsler, 1991) is a verbal subtest requiring the patient to provide the definitions of words. The derived score represents an age corrected scaled score.

WISC-III Information Subtest (Wechsler, 1991) is a verbal subtest consisting of items assessing the patient's general knowledge. The derived score represents an age corrected scaled score.

WISC-III Verbal Intelligence Quotient (VIQ; Wechsler, 1991) represents a composite score based on the patient's performance on 6 verbally oriented subtests: Information, Vocabulary, Arithmetic, Digit Span, Comprehension and Similarities. Scores are recorded as a standard score with a mean of 100 and a standard deviation of 15.

WISC-III Performance Intelligence Quotient (PIQ; Wechsler, 1991) represents a composite score based on the patient's ability to complete 5 performance oriented subtests: Picture Completion, Picture Arrangement, Digit Symbol-Coding, Block Design, and Mazes. Scores are recorded as a standard score with a mean of 100 and a standard deviation of 15.

WISC-III Full Scale Intelligence Quotient (FSIQ; Wechsler, 1991) is thought to be a measure of global intelligence, composed of both Performance IQ and Verbal IQ. Scores are recorded as a standard score with a mean of 100 and a standard deviation of 15.

APPENDIX I

WORKSHEET FOR ESTIMATED ATTENTION CONCENTRATION INDEX

A Digit Span (WISC-III) – Age Corrected Scaled Score converted to Standard Score = _____ (A)

B 592 Errors – Z score converted to Standard Score = _____ (B)

C Knox Cube Test Age Equivalent – Z score converted to Standard Score = _____ (C)

D Diamond Errors – Z score converted to Standard Score = _____ (D)

E Trails B Time – Z score converted to Standard Score = _____ (E)

F Stroop Interference – T score converted to Standard Score = _____ (F)

Z Score	Scaled Score	T Score	Standard Scale	Z Score	Scaled Score	T Score	Standard Scale
+3.00	19	76	145	-0.33	9	47	95
+2.66	18	74	140	-0.66	8	43	90
+2.33	17	72	135	-1.00	7	40	85
+2.00	16	70	130	-1.33	6	37	80
+1.66	15	67	125	-1.66	5	34	75
+1.33	14	63	120	-2.00	4	30	70
+1.00	13	60	115	-2.33	3	28	65
+0.66	12	57	110	-2.66	2	26	60
+0.33	11	53	105	-3.00	1	24	55
0.00	10	50	100				

A _____ C _____ (A + C)/2 = CAPACITY [ ]

B _____ D _____ (B + D)/2 = VIGILANCE [ ]

(A + B)/2 = [ ] VERBAL (C + D)/2 = [ ] VISUOSPATIAL

E _____ F _____ (E + F)/2 = FILTERING [ ]

(CAPACITY + VIGILANCE + FILTERING)/3 = [ ] ATTENTION CONCENTRATION INDEX (ACI)

VITA

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