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Abstract

This study examined four major assessment profiles associated with learning disabled (LD) students and adults: the discrepancy between Verbal and Performance Intelligence Quotient (IQ), with Performance greater than Verbal, the Bannatyne pattern, and the ACID profile, and a profile suggested by Ozols and Rourke (1988). The validity of these profiles was examined by using more reliable diagnostic criteria to avoid the methodological flaws present in other LD profile studies. Subjects were 120 children and adults defined as having an Academic Skills Disorder according to the Diagnostic and Statistical Manual for Mental Disorders-Revised (American Psychiatric Association, 1987) criteria. The subjects' performances on the Wechsler Intelligence Scale for Children-Revised (WISC-R; Wechsler, 1974), the Wechsler Adult Intelligence Scale-Revised (WAIS-R; Wechsler, 1981) were analyzed in order to determine the profiles' validity as characteristics of LD subjects. It was found that the three groups showed a significant overall difference with regards to the ACID profile ($p < .05$). However, there was no significant difference between any two groups ($p > .05$). The Bannatyne pattern was partially supported by the data; the conceptual factor score was found to be significantly larger than the sequential factor score. No other profiles were supported by this study. These results implicate that the profiles may not be representative of the LD population.

Introduction

For years, research in the field of learning disabilities (LD) has been dominated by the search for a characteristic assessment profile of the learning disabled student. Most research has been done with children who, by use of various methods, are diagnosed as LD within the educational system. Methods of educational diagnosis vary greatly, causing some concern as to their reliability and validity. The most common form of assessment involves individual intelligence and/or achievement testing to determine if a disability exists. The Wechsler Intelligence Scale for Children-Revised (WISC-R; Wechsler, 1974) or the Wechsler Adult Intelligence Scale-Revised (WAIS-R; Wechsler, 1981) are frequently used to measure intelligence in children and adults, respectively. The Woodcock-Johnson Psychoeducational Battery: Tests of Achievement-Revised (WJ-R; Woodcock & Johnson, 1989) are used to assess achievement in subjects of all ages. Assessment measures are analyzed for discrepancies in scores, or profiles of scores, which are believed to predict learning disabilities. For example, a discrepancy between the Performance (PIQ) and Verbal (VIQ) IQ scores on the WISC-R, with PIQ greater than VIQ, has been used extensively to diagnose

learning disabilities (Smith, Lyon, Hunter, & Boyd, 1988). However, many common discrepancy models of LD have come into question as more recent studies question their ability to accurately portray the LD student. This study looked at an alternate, psychological as opposed to educational, definition of learning disability and analyzed the utility of various profiles that have been proposed among educationally defined LD subjects.

Description of Intelligence and Achievement Measures of Learning Disability

The Wechsler Intelligence Scale for Children-Revised (WISC-R), and the Wechsler Adult Intelligence Scale (WAIS-R) are very similar tests of intelligence with the main difference being the age of the subject. The WISC-R is the most commonly-used individual measure of general intelligence in school-aged children (up to 16 years). It includes 12 subtests that assess different aspects of intelligence. These subtests are as follows: Picture Completion, Block Design, Object Assembly, Comprehension, Similarities, Vocabulary, Arithmetic, Digit Span, Coding, Information, Picture Arrangement, and Mazes (optional). A benefit to using the WISC-R is that it yields a Verbal IQ score, a Performance IQ score and a Full Scale IQ score. The reliability of the WISC-R is excellent; each of the three IQ scales displays an internal consistency reliability

coefficient of .89 or greater across the age range covered by the WISC-R (Wechsler, 1974). Studies comparing the WISC-R to various other measures of intelligence reveal that the WISC-R also has satisfactory concurrent validity (Sattler, 1982). The WISC-R employs deviation intelligence quotient measures with a mean of 100 and a standard deviation of 15.

The WAIS-R is very similar to the WISC-R. It is intended for use with adults (16 years or older) and includes the following 11 subtests: Information, Digit Span, Arithmetic, Vocabulary, Comprehension, Similarities, Picture Completion, Picture Arrangement, Block Design, Object Assembly, and Digit Symbol (similar to the Coding subtest on the WISC-R). The WAIS-R also yields three cluster scores: Performance IQ, Verbal IQ, and Full Scale IQ. The WAIS-R is a very reliable measure of intelligence with each of the three cluster scores displaying an internal consistency reliability coefficient of .88 or greater across the age span covered by the measure (Wechsler, 1981). Additionally, the construct validity of the WAIS-R is acceptable when compared with other measures of intelligence in adults. A score of 100 is considered average and a standard deviation of 15 defines deviation IQs on the WAIS-R also.

The Woodcock-Johnson Psychoeducational Battery:Tests of Achievement-Revised is an individually-administered achievement test for subjects of all ages. The norms have been expanded in the

revised edition to include ages 2-90. The test consists of 9 standard subtests: Letter-Word Identification, Passage Comprehension, Calculation, Applied Problems, Dictation, Writing Samples, Science, Social Studies, and Humanities, as well as 5 supplemental subtests including Word Attack, Reading Vocabulary, Quantitative Concepts, Proofing, and Writing Fluency. Scores from the individual subtests are used to determine four cluster scores: Broad Reading, Broad Math, Broad Written Language, and Broad Knowledge. The tests show acceptable reliability coefficients by age or grade level with coefficients in the high .80s and low .90s for the individual subtests and in the mid .90s for the cluster scores (Woodcock & Mather, 1990). The construct validity is also acceptable for the intended uses of the test, as the intercorrelations between subtests within a curricular area are sufficiently high (Woodcock & Mather, 1990). The WJ-R cluster scores display reasonable concurrent validity as well when compared to similar cluster scores on other measures of achievement (WRAT-R, PIAT, K-ABC, etc.) (Woodcock & Mather, 1990). Scoring has also been simplified in the revision of the test, thus reducing the number of scoring errors made. With these credentials, the use of the WJ-R in research is easily justified.

Criteria for the Diagnosis of Learning Disability

The Diagnostic and Statistical Manual Third Edition Revised (DSM-III-R; American Psychiatric Association, 1987) does not recognize the term "learning disabilities." It does, however, define three Academic Skills Disorders which are similar to the definition of learning disabilities. These include: Developmental Arithmetic Disorder, Developmental Written Language Disorder, and Developmental Reading Disorder, defined as follows:

> A. Arithmetic skills (Writing skills or Reading achievement), as measured by a standardized, individually administered test, are markedly below the expected level, given the person's schooling and intellectual capacity (as determined by an individually administered IQ test).
>
> B. The disturbance in A significantly interferes with academic achievement or activities of daily living requiring arithmetic skills (the composition of written texts or reading skills).
>
> C. Not due to a defect in visual or hearing acuity or a neurological disorder (American Psychiatric Association, 1987, p.42-44).

These are the most popular criteria among psychology clinics, mental health centers, and mental health professionals that work with learning disabilities.

The DSM-III-R also includes the diagnosis of Academic Problems, which is not considered a mental disorder as are the

Academic Skills Disorders. The definition of Academic Problems is as follows:

"This category can be used when the focus of attention or treatment is an academic problem that is apparently not due to a mental disorder. An example is a pattern of failing grades or of significant underachievement in a person with adequate intellectual capacity in the absence of a Specific Developmental Disorder or any other mental disorder that would account for the problem" (American Psychiatric Association, 1987, p. 359).

Literature Review

Problems with current research on LD

As in many fields, research on learning disabilities has suffered from methodological problems. Shepard, Smith, and Vojir (1983) classified these problems into distinct areas: absence of proper controls, lack of comparable definitions, and confounding of the disorder with its identification. These flaws in research seriously affect the conclusions made and cast doubts on the results. In the recent past, LD research has sought to alleviate these methodological ills--however, a more comprehensive, sound method for LD research is necessary.

The absence of proper controls in LD research refers to the use of normal children as the comparison group in studies on the

characteristics of LD children. Morris (1988) addressed the problems found in the traditional classification of LD students including the passing of the Education for All Handicapped Children Act in 1975. Morris claims that this law led to more children being classified as LD since the law provided a definition which allowed for a more widespread use of the term learning disability. From this, a more heterogenous groups of students were classified as LD. As a result, this classification obscured the distinction between LD students and non-disabled students. Morris concluded that there is little justification to continue research comparing LD students to normal students alone. In fact, she suggested that comparing LD subjects to students who are impaired learners might be more useful to the development of LD research. This is because comparing LD students to low achievers instead of normals alone may further elucidate the characteristics of true LD students. However, in order to compare the learning impaired to the learning disabled, there must be an empirically valid and reliable definition of LD to distinguish clearly between the two groups.

The establishment of a uniform definition of LD has proven difficult. In 1975, the U.S. Congress passed The Education for All Handicapped Children Act, which required the U.S. Office of Education to submit federal regulations for the definition and identification of learning disabilities. The official definition and criteria for identification were published in 1977 and defined LD as

"a disorder in one or more of the basic psychological processes involved in understanding or in using language, spoken or written, which may manifest itself in an imperfect ability to listen, think, speak, read, write, spell, or do mathematical calculations. The term includes such conditions as perceptual handicaps, brain injury, minimal brain dysfunction, dyslexia, and developmental aphasia. The term does not include children who have learning problems which are primarily the result of visual, hearing, or motor handicaps, of mental retardation, or emotional disturbance, or of environmental, cultural, or economic disadvantage. " (USOE, 1977, p. 65083).

This definition was intended to serve as the uniform definition to be used across the U.S. However, individual states adopted differing definitions. After 1977, the trend was toward adopting the federal definition with few or no revisions (Mercer, Hughes, & Mercer 1985). By 1985, though, the trend had reversed and states began accepting different definitions (Frankenberger & Fronzaglio, 1991). Mercer, et al. (1985) divided the federal definition into four major components: (a) process/language, (b) academic, (c) neurological, and (d) exclusion. In 1985 they found that 86% of states included the process component found in the phrase, "a disorder of one or more of the basic psychological processes involved in understanding or in using language" (USOE, 1977, p. 65083). The academic component is inherent in the phrase "an

imperfect ability to...read, write, spell or to do mathematical calculations,"(USOE, 1977, p. 65083) and was found in 96% of states' definitions and/or criteria (Mercer, et al, 1985). "Such conditions as...brain injury, minimal brain dysfunction, dyslexia, and developmental aphasia,"(USOE, 1977, p.65083) describes the neurological component of the federal definition which was found in 62% of states regulations (Mercer, et al., 1985). Finally, the exclusion component refers to the idea that "the term does not include children who have learning problems which are primarily the result of visual, hearing or motor handicaps, of mental retardation,or emotional disturbance, or of environmental, cultural, or economic disadvantage."(USOE, 1977, p. 65083). Each aspect was included in 86-92% of states' definitions or criteria (Mercer, et al., 1985).

In 1991, 88% of states' definitions included the process component, 100% of states' definitions included the academic component, the exclusion component was found in 96% of states' definitions (Frankenberger & Fronzaglio, 1991). However, only 52% of states now include the neurological component. Also, 20 states specified IQ cutoffs for LD placement with cutoffs varying greatly among the states--between just above the range of mental retardation and average. Thirty-eight states recommended specific ability/achievement discrepancy methods including the standard score method, regressed standard score, regression formula, expectancy

formulas and deviation from grade (Frankenberger & Fronzaglio, 1991). Overall, it was found that 49% of states employ definitions that deviate from the general definition in some way (Frankenberger & Fronzaglio, 1991). These results support Seigel's (1988) call for a more meaningful and operational definition for learning disabilities--a definition that can provide for uniform identification of LD students.

The correct identification of LD students is further confounded by other academic factors. Definitions may be purposefully misapplied by academic personnel. A professional may realize that students who have true academic problems but fail to meet accepted criteria will not receive any support services unless they are identified as LD. Shepard, Smith, and Vojir (1983) found approximately 30% of LD students in Colorado had true academic problems, but were misclassified as LD. Also, some practitioners may recognize faults in the LD construct and make allowances for those shortcomings in practice. Considering the debate over definitional aspects of LD, this explanation seems highly plausible. Furthermore, other factors may influence an educator distinguishing between low achievers and LD students. These factors may include bureaucratic pressures to identify all possibly handicapped students and pressure from parents to place student in remedial classes (Smith, 1982). These academic reasons, combined with the varying

definitions of LD, lead to many children being falsely identified as LD.

It has been estimated that up to 40% of students are misclassified as LD (Ysseldyke, Algozzine, Shinn, & McGue,1979). To make matters worse, these students are accepted as subjects in LD studies because they have been classified as LD, even though they are not truly LD. Epps, Ysseldyke ad Algozzine (1983) found that applying 14 different operational definitions of LD resulted in significantly different numbers of students classified as LD. In addition, Shepard, Smith, and Vojir (1983) found that only 43% of students identified as LD in Colorado met generally accepted criteria. Therefore, when studies select subjects merely on the basis of LD classification, the likelihood is that non-LD subjects included in the study will confound the results. Previous LD studies may have been prone to such confounded results by using biased, accessible samples such as students in LD classes.

Current research in the LD field has suffered methodologically due to lack of appropriate controls, lack of a uniform definition and confounding the disorder with its identification. These problems place serious questions on the validity of the results in many previous LD studies. However, these methodological flaws can be remedied. First, appropriate controls must be used, comparing LD subjects to low achievers rather than normal students alone. Second, a clear, operational definition should

be employed to insure uniform LD identification. Third, the definition should be applied to each subject at the time of the study to avoid reliance on previous identification. Lastly, a fair sample should be used including, for example, adults, who are often not addressed in LD research. Clearly, LD research has a checkered past; however, a clear future lays ahead if some revisions are made.

Literature concerning the WISC-R and WAIS-R with LD subjects

The WISC-R has been used extensively to measure global intelligence. A vast amount of this research has focused on different performance profiles in attempts to determine the effectiveness of such profiles in the diagnosis of LD. Three major profiles with widespread popularity have emerged. The first is the discrepancy between WISC-R measures of Verbal IQ (VIQ) and Performance IQ (PIQ), with PIQ being greater than VIQ in LD subjects. The second profile is the factor structure proposed by Bannatyne (1968) which establishes the factors of Spatial ability (Sp), Verbal conceptualization (C), and Sequential ability (Sq), each composed of various WISC-R subtests. Furthermore, in LD subjects the pattern of Sp>C>Sq has been repeatedly observed (Rugel, 1974; Smith, Coleman, Dokecki, and Davis, 1977). The third profile involves LD subjects' performance on the specific WISC-R subtests of Arithmetic, Coding, Information, and Digit span (known as the ACID representation) (Kaufman, 1982). It is commonly believed that LD

subjects show lower scores on the ACID subtests than do normal subjects. The popularity of these profiles has not guaranteed their diagnostic utility as all three profiles have been questioned in recent studies.

As already noted, the WISC-R was developed to provide three composite scores--Verbal IQ, Performance IQ, and Full Scale IQ. The results of LD subjects on these measures has been explored frequently since 1950, and with great popularity in the 1960s. It was found that LD students showed a greater discrepancy between VIQ and PIQ scores than did normal students. Additionally, they displayed a PIQ>VIQ pattern while normal students displayed a VIQ>PIQ pattern (Smith, et al., 1988). These results were very popular and frequently used in the diagnosis of LD; if a student with learning problems was administered the WISC-R, and if his scores represented the PIQ>VIQ discrepancy, he was identified as LD.

In an effort to improve upon the PIQ>VIQ discrepancy method, Bannatyne (1968) suggested a tripartite recategorization of WISC-R subtests that might evince greater diagnostic utility. The structure he suggested included a Spatial score, a Conceptual score, and a Sequential score. The spatial score was derived from the WISC-R subtests of Object Assembly, Block Design, and Picture Completion which examine the subjects' abilities to manipulate objects perceptually, either concretely or symbolically. The Conceptual score reflects the subtests of Comprehension,

Similarities, and Vocabulary and represents the subject's ability to respond verbally. The last score, Sequential, consists of the Digit Span, Coding, and Picture Arrangement subtests and explores the subjects' abilities to process short term memory items. In LD populations, the pattern of Sp>C>Sq has been widely accepted and is known as the Bannatyne pattern. Bannatyne (1968) first reported this pattern using the WISC with children with dyslexia; Rugel (1974) extended Bannatyne's work to a broader base of LD students, again using WISC measures. The results were confirmed using the WISC-R by Smith, Coleman, Dokecki, & Davis (1977).

The last profile to be introduced was the ACID profile which predicts that LD students display lower scores on subtests of Arithmetic, Coding, Information, and Digit Span (Kaufman, 1982; Swartz, 1974). These subtests assess mental arithmetic skills, visual-motor coordination and speed, general knowledge, and short-term auditory sequential memory in LD subjects. Depressed scores on these subtests are typical of LD students and have been used as a basis for diagnosis.

Results on the validity of these various LD profiles have been equivocal at best. In the case of the PIQ>VIQ discrepancy, Kaufman (1981) reviewed 21 articles that supported the pattern. However, Berk (1982) reviewed the same topic and concluded that for every two articles in support of the pattern, their was one against the pattern. Kavale and Forness (1984) conducted a meta-analysis

involving 94 studies and did not find a significant PIQ-VIQ discrepancy in LD subjects. Hence the diagnostic value of the PIQ-VIQ discrepancy is in serious doubt. Likewise, despite widespread support of the Bannatyne pattern by practitioners, research has led to its decline as a diagnostic tool. Fischer, Wenck, Schurr, and Ellen (1985) found that the diagnostic utility of the Bannatyne pattern was negatively affected by variables such as sex, IQ, and achievement problems of the students. Mueller, Matheson, and Short (1983) found that LD students with average IQ showed the same Bannatyne pattern as normal students with average IQs. Dundon, Sewell, Manni, and Goldstein (1986) found that, as a group, their 159 LD subjects displayed the Bannatyne pattern, but only 18 subjects exhibited discrepancies similar to the Bannatyne pattern on an individual basis. The authors suggest that the Bannatyne pattern is of low diagnostic value, but rather might describe a subgroup of LD students that may be explored. The ACID representation has also been questioned. Rivers and Smith (1988) looked at the ACID profile in 200 LD subjects and found that only 30% of their sample displayed the pattern. This result suggests that the reliability of the ACID profile should be questioned in further research. Contrary to many popular beliefs, the three profiles of LD are not as valid as previously conceived.

There have been few studies concerned with LD adults and their performances on the WAIS-R, but the studies that exist show

similar results as those regarding LD children and the WISC-R. Factor structures similar to the Bannatyne pattern have been recognized in adult subjects (Snow, Cohen, & Holliman, 1985; Snow, Koller, & Roberts, 1987; Blaha, 1987). However, Salvia, Gajar, Gajria, and Salvia (1988) found that LD college students did not demonstrate the Bannatyne pattern. Also, the diagnostic value of the pattern has been questioned in adults (Moore & Wilson, 1987). Salvia, et al. (1988) also found no significant differences in PIQ-VIQ discrepancies between LD college students and random college freshmen. They did find, nevertheless, that LD subjects displayed lower means on the subtests of the ACID profile than did the non-disabled sample. In contrast, though, it has been suggested that the ACID profile does not persist into adulthood and may, in fact, be common among non-disabled adults (Spreen & Haaf, 1986). Studies regarding LD adults have been few, and results of LD adults' performance on the WAIS-R have been inconclusive.

Another interesting pattern among LD students that has received little attention is a pattern that distinguishes between LD students with a stronger arithmetic disability and students with a stronger reading disability according to their performance on various WISC-R subtests (Ozols & Rourke, 1988). Ozols and Rourke (1988) divided a sample of LD subjects into three groups. Group 1 included subjects who were evenly deficient in reading and arithmetic. Group 2 consisted of subjects who were relatively adept

in arithmetic (although still disabled) compared to their performance in reading. Group 3 included subjects who were relatively adept in reading (although still disabled) compared to their performance in arithmetic. They found that Group 3 (stronger arithmetic disabled) performed better on measures of auditory-perceptual/linguistic measures than did Group 1 or Group 2. These measures included the WISC-R VIQ score, and subtests of Information, Similarities, Vocabulary and Digit Span. They also found that Groups 1 and 2 performed significantly better than Group 3 on certain visual-perceptual measures such as WISC-R PIQ, Picture Completion, Picture Arrangement, Block Design, and Object Assembly. There have been no attempts to replicate these results in the literature.

Literature concerning the WJ-R and LD subjects

The Woodcock-Johnson Psycho-Educational Battery: Tests of achievement has only been available since 1989, thus few studies have explored the relationship between the WJ-R and LD subjects. The majority of current research concerning the WJ-R has investigated the measure's utility and validity. The major finding involving the original WJ and LD subjects was the conclusion that LD subjects displayed lower levels of performance on the measure than did a non-disabled group (Dalke, 1988). Considering the current state of research concerning the WJ-R and LD, correlational data are necessary to assist further studies in the field.

Objectives and Rationale of this Study

The primary goal of this study was to determine if there is a profile based on intelligence and achievement test scores that can be used to identify learning disabled students defined by psychological diagnostic criteria. The objectives of this study were:

1. To further explore the validity of characteristic profiles of LD students previously delineated in the literature by using consistent diagnostic criteria and valid and reliable tests of achievement and intelligence.
2. To determine if there are characteristic discrepancies that are useful in contrasting Developmental Arithmetic Disorder with Developmental Reading and Written Language Disorders.
3. To provide support for the use of standard criteria in the diagnosis of learning disabilities.
4. To increase understanding of the characteristic profiles of LD adults.

The rationale for this study was based on the following:

1. The reliability of the educational diagnosis of LD students has been questioned. Therefore more reliable criteria, such as those in the DSM-III-R, should be used in the diagnosis of learning disabilities.

2. Many accepted intelligence and achievement profiles of learning disabilities have fallen into question.
3. There is a considerable lack of data concerning LD adults.

Hypotheses

1. Students with Academic Skills Disorders as defined in the DSM-III-R would show lower scores than students with Learning Problems as defined by the DSM-III-R and non-disabled subjects on WISC-R or WAIS-R measures of Arithmetic, Coding (Digit Symbol on WAIS-R), Information, and Digit Span , known as the ACID representation.

2. Subjects with Academic Skills Disorders as defined by the DSM-III-R would show:
(a) a greater discrepancy than other groups (subjects with learning problems and non-disabled subjects) between Performance IQ and Verbal IQ as measured by the WISC-R or the WAIS-R,
(b) Performance IQ greater than Verbal IQ as measured by the WISC-R or WAIS-R, and (c) a greater discrepancy between IQ and Achievement as measured by the WISC-R or WAIS-R, and the WJ-R.

3. Subjects with Academic Skills Disorders would show discrepancies between three WISC-R factors of Spatial Ability (subtests: Picture Completion, Block Design, and Object Assembly),

Conceptual Ability (subtests: Vocabulary, Composition, and Similarities), and Sequencing Ability (subtests: Arithmetic, Digit Span, Coding) when compared to standardized norms. Also, the factor scores would resemble the pattern Spatial > Conceptual > Sequencing.

4. Subjects with Developmental Arithmetic Disorder would show higher scores on WISC-R subtests of Information, Similarities, Vocabulary and Digit Span when compared to subjects with Developmental Reading or Written Language Disorders, as suggested by Ozols and Rourke (1988).

5. Subjects with Developmental Reading or Written Language Disorder would show higher scores on WISC-R measures of Picture Completion, Picture Arrangement, Block Design, and Object Assembly when compared to subjects with Developmental Arithmetic Disorder, also drawn from the results of Ozols and Rourke (1988).

Method

Subjects

There were 120 subjects, ages 6 to 58 (mean age = 22.717), drawn from people who presented at the University of California-Los Angeles Psychology Clinic for assessment of learning problems. All subjects were from the Los Angeles area and represent a variety of ethnic and socioeconomic backgrounds. The group of subjects

included both children and adults. Subjects diagnosed with an Academic Skills Disorder according to DSM-III-R criteria (LD group) comprised the experimental group. Subjects given the DSM-III-R Academic Problems diagnosis (AP group) made up the clinical comparison group. Finally, subjects who failed to meet criteria for a DSM-III-R academic diagnosis (non-LD group) served as the control group.

Procedure

The subjects were initially given an intake interview, and the subject (or parent) completed a questionnaire of background information. They were also asked detailed questions about their learning problems. Then they were given the choice to continue with testing. If they decided to continue, testing began. Testing was conducted over approximately 3 sessions and included a variety of measures including tests of intelligence and achievement. After testing, a follow-up feedback session was held with the subject to discuss test results and implications. For the present study, no identifying information was gathered, and therefore no subject is identifiable by name or address.

Measures

The WISC-R was individually administered to all subjects 16 years old or younger to assess intelligence. Likewise, the WAIS-R

was individually administered to all subjects over the age of 16. The WJ-R was individually administered to all subjects to assess achievement.

Analyses

Primary Analyses

Hypothesis 1 was analyzed using a one-way analysis of variance (ANOVA) to compare ACID test scores among the 3 groups (Academic Skills Disorders, Academic Problems, non-disabled). Subhypotheses (a) and (c) of Hypothesis 2 were analyzed separately using an analysis of variance. Hypothesis 2(b) required a paired t-test. Hypothesis 3 was analyzed using t-tests to compare LD subjects' performance on Spatial subtests to their performance on Conceptual subtests, and, likewise, their performance on Conceptual subtests to their performance on Sequencing subtests. The factor scores were determined using a standardization formula (Grossman, 1985) to covert the WISC-R and WAIS-R scaled scores to factor scores with a mean of 100 and a standard deviation of 15 (same as the WISC-R and WAIS-R). The subtest scores in question in Hypothesis 4 (Information, Similarities, Vocabulary, and Digit Span or Digit Symbol) were summed and a t-test was used to determine significant differences between the 2 groups. In order to analyze the result relevant to Hypothesis 5, the subtest scores of Picture

Completion, Picture Arrangement, Block Design, and Object Assembly were summed and a t-test was performed to determine significant differences between the two groups.

Secondary Analyses

Correlational data were collected and intercorrelations of all relevant variables were obtained and significant correlations were further explored using post-hoc analyses. Descriptive statistics were also gathered and comparisons between groups were made using t-tests on variables such as age and income and Chi-square analyses on variables such as sex and ethnicity.

Results

Primary Analyses

The results of this experiment in general provided little support for the hypotheses stated. With regards to Hypothesis 1, an analysis of variance revealed a significant overall difference between the means of the three groups (Academic Skills Disorders (LD), Academic Problems, and non-disabled) on measures of the ACID profile ($p = .0241$). However, a Tukey-b procedure revealed that no two groups were significantly different at the .05 significance level.

Hypothesis 2(a) proposed that LD subjects would show a greater discrepancy than the other two groups between PIQ and VIQ

scores. An analysis of variance did not support this hypothesis ($p>.05$). Hypothesis 2(b) required a paired t-test to compare the PIQ and VIQ measures within the LD group. The result of this test was a non-significant difference in the means, contrary to the hypothesis. To test Hypothesis 2(c), namely, that there existed a greater IQ-Achievement discrepancy in the LD group, and analysis of variance was performed. The IQ measure used was the WISC-R or WAIS-R Full Scale IQ score. The achievement score used was the relevant broad scale measure for the LD group (i.e., Math, Reading, or Written Language). For the non-LD group, the average of the three broad scale scores was used. This hypothesis also was not supported ($p > .05$).

Hypothesis 3 considered the Spatial > Conceptual > Sequential pattern and was analyzed using two t-tests (Spatial vs. Conceptual and Conceptual vs. Sequential). This hypothesis was partially supported in that the Conceptual factor score was significantly greater than the Sequential factor score among LD subjects ($p < .01$). However, there was no significant difference between the Spatial and Conceptual factor scores.

Hypotheses 4 and 5 considered 2 groups comprised of Math LD subjects in one group and Reading and/or Written Language LD subjects in the other. If subjects were diagnosed as Math LD, they were placed in the Math LD group, regardless of other LD diagnoses. Hypothesis 4 proposed that the Math LD group would

perform better than the Reading/Written Language group on WISC or WAIS subtests of Information, Similarities, Vocabulary, and Digit Span. These subtests were summed for all LD subjects and differences in means were analyzed using a t-test. The difference in the means was non-significant ($p > .05$). Hypothesis 5 proposed superior performance by the Reading/Written Language group on WISC or WAIS measures of Picture Completion, Picture Arrangement, Block Design, and Object Assembly. These subtest scores were summed and a t-test was performed. Again, the result was non-significant ($p > .05$).

Secondary Analyses

There was no significant difference found between the LD subjects, the subjects with Academic Problems, and the Non-LD subjects on age, sex, income, or ethnicity.

Discussion

The results of this study, although they did not support most of the hypotheses, still provided information on the usefulness of the characteristic profiles associated with learning disabilities. These results strongly suggest that the educational definition and the psychological definition of LD are not comparable on the basis of the characteristic profiles. This could give evidence that the profiles are

not useful to the understanding of LD, or that the psychological definition does not represent the LD population as well as the educational definition. This result may be due to different situations surrounding the implementation of each definition. In other words, a student having trouble reading in class may be diagnosed as LD by a teacher. But this disability may be due to a physical problem, in which case the subject would not be psychologically defined as LD. It may also be the case, considering the debate concerning each profile's validity, that the profiles are not representative of educationally defined LD subjects, and, likewise, not characteristic of psychologically defined subjects.

Allowably, the differences found between the profiles using the educational definition and the psychological definition may suggest that the psychological definition does not represent the LD population well. This may be because our study did not represent the LD population well. The results found no significant difference between groups in the means of the WJ-R Achievement measures. Also, the means for the entire sample on each broad scale score was significantly different from the expected mean of 100. What this result suggests is that the achievement levels in both groups are equal and together lower than the standardized average. Since the difference between the groups largely depends on lower achievement scores among the LD group (assuming IQ scores are equal, which we can assume since our achievement and IQ discrepancies were equal

between groups), this is a significant confounding result which may be alleviated in research using larger samples. However, this result should not negate the ability of the psychological definition to represent the LD population in general without further findings to that effect.

Another interesting result, although not hypothesized, was the difference in results when subjects were selected on the basis of age. If only adults (age 16 and over) were included in the analyses described above, a different profile was found. The LD adults displayed a significantly greater IQ-Achievement discrepancy than did the non-LD adults ($p = .009$), unlike the sample as a whole. In addition, their results were significant in the analyses of Hypotheses 4 and 5 ($p = .005$ and $p = .048$, respectively). This suggested that adults in the Math LD group performed better than adults in the Reading or Written Language LD group on the given WAIS-R subtests. Likewise, adults in the Reading/Written Language LD group displayed superior performance to that of the Math LD group on other WAIS subtests (see Hypotheses 4 and 5). They also displayed a significant Conceptual > Spatial factor score discrepancy, as did the entire sample.

These results suggest that LD adults require a different characteristic framework, perhaps a reflection of the difference in age and life experience. The LD adult may have learned to compensate for their disability by improving their skills in other

areas, which might explain the results found concerning differences among Math LD adults and Reading/Written Language LD adults. The younger LD student may not have learned to compensate yet. The possibility for a greater discrepancy among IQ and achievement measures may be due to the alleviation of a floor effect present in younger students. A 6-year-old can have at most a 2-3 year discrepancy in IQ and achievement, whereas a 16-year-old could easily show a 5-6 year discrepancy or more. Hence, one might expect LD adults to show greater discrepancies.

This study has attempted to use a more consistent definition of LD to assess the relevance of certain profiles that have been associated with LD subjects. As a result of this, it can be concluded that these profiles are not useful in the description (and certainly not the diagnosis) of LD subjects when using the psychological definition as given by the DSM-III-R. This experiment has also provided additional information on the characteristics of LD adults, who have been frequently overlooked in the LD literature.

Directions for Future Research

There is a great need for future research in this area. In order to fully validate these findings, a larger study should be conducted, with comparably sized groups of Math, Reading, and Written Language LD subjects. This study had only 19 Math LD subjects

with 37 Reading and 38 Written Language. Further, many of the subjects classified as Math LD were also diagnosed with another learning disability. Also, the relationship between the educational definition and the psychological definition should be explored to clearly delineate the differences which might explain the difference in the characteristic profiles. One aspect of this exploration might include determining the proportion of subjects who were educationally defined as LD who would qualify for the psychological definition of LD in order to determine the degree to which the definitions are similar. In addition, it is clear that more data are needed regarding LD adults.

References

American Psychiatric Association (1987). Diagnostic and statistical manual of mental disorders (3rd ed. revised). Washington, DC: Author.

Bannatyne, A. (1968). Diagnosing learning disabilities and writing remedial prescriptions. Journal of Learning Disabilities, 1, 28-35.

Berk, R. (1982). An evaluation of procedures for computing an ability-achievement discrepancy score. Journal of Learning Disabilities, 15, 17-21.

Blaha, J. (1987). The hierarchical factor structure of the WAIS-R for learning disabled adults. Journal of Clinical Psychology, 43, 280-286.

Dalke, C. (1988). Woodcock-Johnson psychoeducational test battery profiles: A comparative study of college freshmen with and without learning disabilities. Journal of Learning Disabilities, 21, 567-570.

Dundon, W., Sewell, T., Manni, J., & Goldstein, D. (1986). The Bannatyne recategorization assessment procedure: Is it valid for individual diagnosis of LD children? Learning Disability Quarterly, 9, 208-213.

Epps, S., Ysseldyke, J., & Algozzine, B. (1983). Impact of different definitions of learning disabilities on the number of students identified. Journal of Psychoeducational Assessment, 1, 341-352.

Ferguson, B., & Mamen, M. (1985). Learning disabilities. Psychiatric Clinics of North America, 8, 703-720.

Fischer, W., Wenck, L.S., Schurr, K.T., & Ellen, A. (1985) The moderating influence of gender, intelligence, and specific achievement deficiencies on the Bannatyne WISC-R recategorization. Journal of Psychoeducational Assessment, 3, 245-255.

Frankenberger, W., and Fronzaglio, K. (1991). A review of states' criteria and procedure for identifying children with learning disabilities. Journal of Learning Disabilities, 24, 495-500.

Grossman (1985).

Grossman, F., & Galvin, G. (1987). Clinically and theoretically derived WISC-R subtest regroupings: predicting academic achievement in a referral population. Psychology in the Schools, 24, 105-110.

Grossman, F., & Galvin, G. (1989). Referred children's cognitive patterns on the WISC-R. Perceptual and Motor Skills, 68, 1307-1311.

Hale, R. & Saxe, J. (1984). Profile analysis of the Wechsler Intelligence Scale for Children-Revised. Journal of Psychoeducational Assessment, 1, 155-162.

Kaufman, A. (1981). The WISC-R and learning disabilities assessment: State of the art. Journal of Learning Disabilities, 14, 520-526.

Kaufman, A. (1982). The impact of WISC-R research for school psychologists, In C.R. Reynolds and T.B. Gutkin (Eds.), The Handbook of School Psychology, New York: Wiley.

Kaufman, A., & McLean, J. (1986). K-ABC/WISC-R factor analysis for a learning disabled population. Journal of Learning Disabilities, 19, 145-153.

Kavale, K., & Forness, S. (1984). A meta-analysis of the validity of Wechsler scale profiles and recategorizations: Profiles or parodies? Learning Disability Quarterly, 7, 136-156.

McLeskey, J., & Waldron, N. (1991). Identifying students with learning disabilities: The effect of implementing statewide guidelines. Journal of Learning Disabilities, 8, 501-506.

Mercer, C., Hughes, C., & Mercer, A. (1985). Learning disabilities definitions used by state education departments. Learning Disability Quarterly, 8, 45-55.

Moore, D. & Wilson, B. (1987). On the search for a characteristic WISC-R subtest profile of reading/learning disabled children. Reading Research and Instruction, 26, 133-140.

Morris, R. (1988). Classification of learning disabilities: Old problems and new approaches. Journal of Consulting and Clinical Psychology, 56, 789-794.

Mueller, H., Matheson, D., & Short, R. (1983). Bannatyne-recategorized WISC-R patterns of mentally retarded, learning disabled, normal, and intellectually superior children: A meta-analysis. The Mental Retardation and Learning Disability Bulletin, 11, 60-78.

Ozols, E., & Rourke, B. (1988). Characteristics of young learning-disabled children classified according to patterns of academic achievement: Auditory-perceptual and visual-perceptual abilities. Journal of Clinical Child Psychology, 17, 44-52.

Rivers, D., & Smith, T. (1988). Traditional eligibility criteria for identifying students as specific learning disabled. Journal of Learning Disabilities, 27, 642-644.

Rugel, R.P. (1974). WISC subtest scores of disabled readers: A review with respect to Bannatyne's recategorization. Journal of Learning Disabilities, 6, 45-55.

Saklofske, D., Schmidt, H., & Yackulic, R. (1984). Variations in WISC-R patterns of learning disabled children. Perceptual and Motor Skills, 59, 415-421.

Salvia, J., Gajar, A., Gajria, M., & Salvia, S. (1988). A comparison of WAIS-R profiles of non-disabled college freshmen and college students with learning disabilities. Journal of Learning Disabilities, 21, 632-636.

Sattler, J.M. (1982). Assessment of children's intelligence and special abilities (2nd ed.). Boston: Allyn and Bacon.

Sattler, J.M. (1988). Assessment of children. San Diego: Author.

Seigel, L. (1988). Definitional and theoretical issues and research on learning disabilities. Journal of Learning Disabilities, 21, 264-266.

Shepard, L., Smith, M.L., & Vojir, C. (1983). Characteristics of pupils identified as learning disabled. American Educational Research Journal, 20, 309-331.

Smith, D., Lyon, M., Hunter, E., & Boyd, R. (1988). Relationship between the K-ABC and WISC-R for students referred for severe learning disabilities. Journal of Learning Disabilities, 21, 509-513.

Smith, M.D., Coleman, J.M., Dokecki, P.R., & Davis. E.E. (1977). Recategorized WISC-R scores of learning disabled children. Journal of Learning Disabilities, 10, 437-443.

Smith, M.L. (1982). How educators decide who is learning disabled: Challenge to psychology and public policy in the schools. Springfield, IL: Charles C. Thomas.

Snow, J., Cohen, M., & Holliman, W.B. (1985). Learning disability subgroups using cluster analysis of the WISC-R. Journal of Psychoeducational Assessment, 4, 391-397.

Snow, J., Koller, J., & Roberts, C.D. (1987). Adolescent and adult learning disability subgroups based on WAIS-R performance. Journal of Psychoeducational Assessment, 5, 7-14.

Spreen, O., & Haaf, R. (1986). Empirically derived learning disability subtypes: a replication attempt and longitudinal patterns over 15 years. Journal of Learning Disabilities, 19, 170-180.

Swartz, G. (1974). The language learning system, New York: Simon & Schuster.

U.S. Office of Education. (1977). Assistance to states for education of handicapped children: Procedures for evaluating specific learning disabilities. Federal Register, 42, 65082-65085.

Wechsler, D. (1974). Manual for the Wechsler Intelligence Scale for Children-Revised. New York: Psychological Corporation.

Wechsler, D. (1982). Manual for the Wechsler Adult Intelligence Scale-Revised. New York: Psychological Corporation.

Wood, D. (1991). Discrepancy formulas and classification and identification issues that affect diagnoses of learning disabilities. Psychology in the Schools, 28, 219-225.

Woodcock, R.W., & Johnson. M.B. (1989,1990). Woodcock-Johnson psycho-educational battery--Revised. Allen, TX: DLM Teaching Resources.

Woodcock, R.W., & Mather, N. (1989,1990). WJ-R Tests of achievement: Examiner's manual. In R.W. Woodcock & M.B. Johnson, Woodcock-Johnson psycho-educational battery--Revised. Allen, TX: DLM Teaching Resources.

Ysseldyke, J.E., Algozzine, B., Shinn, M., & McGue, M. (1979). Similarities and differences between underachievers and students

labeled learning disabled: Identical twins with different mothers, Minneapolis: University of Minnesota Institute for Research on Learning Disabilities.