IDENTIFYING LEARNING DISABILITIES BY DISCREPANCY FORMULAS: A COMPARISON OF FOUR MODELS

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Master of Arts

by
Kathryn Garmon Hasty
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ABSTRACT

The recent Public Law 94-142 requires that the Commissioner of Health, Education and Welfare develop regulation which will establish specific criteria for determining whether a particular disorder represents a specific learning disability. At the present time, the only generally accepted manifestation of a learning disability is a major discrepancy between expected achievement and ability which is not the result of other known handicapping conditions. Discrepancy formulas, which examine the difference between a student's ability and achievement, seek to quantify the existence of a severe discrepancy level and lend some consistency to the now inconsistent diagnosis of learning disabilities.

In this study, four discrepancy models are applied to IQ and achievement test score data of children previously identified as learning disabled to determine if they qualify on the basis of a particular formula. These formulas include the recently proposed N.C. guidelines, a revision of these guidelines, a formula based on one required standard deviation discrepancy between ability and achievement, and finally a model proposed by the Charlotte-Mecklenburg Schools, Charlotte, N.C.

Results for two N.C. counties indicate only one significant difference at the one percent level among the
formulas in the proportion of children identified, but a
significant difference exists in each instance between the
original population and those children identified by a
formula. There was 75 percent agreement across all four
formulas, including 15.75 percent of the 207 cases in which
all four formulas indicated a child did not qualify for
learning disability services.
Chapter 1

THE PROBLEM

The recent Public Law 94-142 requires that the Commissioner of Health, Education and Welfare develop regulations which will establish (1) specific criteria for determining whether a particular disorder represents a specific learning disability for purposes of designating children with specific learning disabilities; (2) diagnostic procedures to be used; and (3) monitoring procedures to determine if state and local districts fulfill these criteria (U.S. Department of Health, Education and Welfare, 1976). These requirements are important to insure that children are properly evaluated according to common standards of identification.

At the present time, the Office of Education has determined that it is not possible to exactly specify all components of each learning disability. The only generally accepted manifestation of a learning disability at this time is a major discrepancy between achievement and ability which is not the result of other known handicapping conditions. Therefore, Section 3 of the November 29, 1976 Federal Register, "Proposed Rulemaking, Education of Handicapped Children," states that a specific learning disability may be identified if a severe discrepancy exists between

achievement and intellectual ability in one or more of several areas: oral expression, listening comprehension, written expression, basic reading skill, reading comprehension, mathematics calculation or mathematics reasoning.

At the time of this proposed rulemaking, the following formula was issued to determine if this discrepancy exists:

\[
\text{C.A.} (t - 0.46 + 0.17) - 2.5 = \text{severe discrepancy level (U.S. Department of Health, Education and Welfare, 1976, p. 52407)}.
\]

The resultant figure was the academic grade achievement level at or below which the child must achieve in one or more of the above named seven areas in order to be identified as learning disabled.

In the December 29, 1977 Federal Register, "Education of Handicapped Children," the above formula was deleted as was the requirement that a functional level of 50 percent below the expected achievement level be required for determination of a severe discrepancy (U.S. Department of Health, Education and Welfare, 1977). Deletion of the formula was in response to four major areas of concern expressed by interested parties regarding the effect of the formula's implementation. These major areas of concern were (1) the inappropriateness of attempting to reduce the behavior of children to numbers; (2) the psychometric and statistical inadequacy of the procedure; (3) the fear that the use of the formula might easily lend itself to inappropriate use to the detriment of handicapped children; and (4) the inappropriateness of using a single formula for children.
of all ages, particularly for school children (U.S. Department of Health, Education and Welfare, 1977, p. 65804). The Office of Education conducted a study to determine the effectiveness of the formula and found that although the formula has a certain degree of operational validity, there are also pronounced technical limitations including all four of the concerns listed above. Moreover, several alternative formulas proposed were found to have the same technical limitations.

As a result, there still exists no specific criterion for determining whether a "severe discrepancy" between ability and achievement exists. Any formula inherently contains technical limitations. However, some direction is needed in order to quantify the existence of a severe discrepancy level and lend some consistency to the now inconsistent diagnosis of learning disabilities. This paper will compare and contrast four learning disability models, two of which are beginning to be implemented this year, to determine their usefulness as guidelines, not rigid standards, in the diagnosis of learning disabilities. These models are the proposed N.C. State Department Public Instruction Guidelines (1978) issued from the Learning Disabilities Section, Division for Exceptional Children; a revised form of the N.C. guidelines; a model which defines a severe discrepancy in terms of one standard deviation difference between demonstrated ability and achievement; and finally a model recently presented by the School Psychology Division, Pupil Support Department, Charlotte-Mecklenburg Schools of Charlotte, N.C. (1978).

STATEMENT OF THE PROBLEM

The purpose of this study is to examine the effect of applying four learning disability models to students already diagnosed as learning disabled in two N.C. counties. The parameters (i.e., grade level, IQ, peer comparisons) included and deleted within each formula will be considered, as will the number of presently identified students qualifying under one, two, three or all four models. The effect on federal contributions to the school budget will also be a consideration.

SIGNIFICANCE OF THE STUDY

As no specific guideline has been uniformly accepted for the determination of a severe discrepancy level, a study comparing the effects of several identification models is needed. This will clarify how accurately these specific models and other presently used, less well-defined methods of diagnosis concur and also how the models themselves differ in diagnosis.

The study will illustrate the impact which implementation of the proposed N.C. guidelines may produce in two sample counties and provide an overview of some alternative guidelines. In addition, the impact on numbers of individual students and two school budgets will also be examined.
Discrepancy formulas are useful in setting numerical requirements around the population to be served and funded. However, they do not necessarily increase our understanding of the nature of learning disabilities.

DEFINITION OF TERMS

Part 121a of Title 45 of the Code of Federal Regulations was amended in December 1977, to read as follows:

'Specific learning disability' means 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 to 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, of emotional disturbance, or of environmental, cultural, or economic disadvantage (U.S. Department of Health, Education and Welfare, 1977, p. 65083).

Two criteria are basic to the determination of a learning disability. These are “(1) whether a child does not achieve commensurate with his or her age and ability when provided with appropriate educational experiences and (2) whether the child has a severe discrepancy between achievement and intellectual ability in one or more of seven areas relating to communication skills and mathematical abilities” (U.S. Department of Health, Education and Welfare, 1977, p. 65082).

In addition, children identified under most recent standards must be of potentially normal intelligence according to the North Carolina guidelines (1978) and most other authorities. Amplification of the term "potentially normal intelligence" will be included as a portion of the later description of each learning disability model.
Chapter 2  
REVIEW OF THE LITERATURE

The diagnosis of specific learning disabilities is a complex task, and thus far a common standard of identification has eluded those who seek to define it. The first era of this field, according to Cecil Mercer (1975), was highlighted by use of the term brain-injured and primarily sprang from the works of Strauss and Lehtinen (1947) and Cruickshank, Bentzen, Ratzeburg and Tannhauser (1961). In later years, the same child was referred to as having minimal brain dysfunction, this definition arising from a three-phase project jointly sponsored by Clements (1966), the U.S. Department of Health, Education and Welfare, and the National Society for Crippled Children and Adults. The third era arose from Kirk's use of the term "learning disability" in 1962, now referred to as a specific learning disability. Finally in 1968, PL 91-320 defined learning disabilities at length (U.S. Office of Education, 1968), and this is the basis of the present definition presented earlier which was taken from Title 45 of the Code of Federal Regulations. The latter definition emphasizes a disorder in one or more basic psychological processes necessary for school performance, excluding disorders primarily due to major sensory handicaps as blindness or deafness, retardation and cultural deprivation. In addition, the child must be of normal intelligence according to accepted diagnostic procedures.

Although a common definition of learning disabilities may now exist, a standard for judging whether a particular child fits this definition does not. Divoky (1974) stated, "The truth is that learning disabled are whomever the diagnosticians want them to be" (p. 20). His statement raises questions as to the choice and reliability of assessment instruments, definition of the specific required criteria and subjective input of the diagnostician versus a specific formula guiding identification.

One objective attempt to identify the presence of a learning disability has been to establish a significant discrepancy level between academic potential and achievement. Such formulas have their origin in the determination of severe reading disabilities. Another procedure, less objectively quantifiable and with questionable validity when excluding children, is to establish significant intra-individual differences by measuring perception, cognition, motor and verbal performance abilities. This is accomplished by comparing scores between different tests, comparing subtest scores on the same test and applying clinical judgment based on observation of children's performance on various tasks (Chalfant & King, 1976).

Among the first formulas determining achievement-potential discrepancy were the Reading Expectancy Formula,
the Mental Grade Procedure, Years in School Procedure and Learning Quotient Method. In the Reading Expectancy Formula, Monroe (1932) uses mental age, chronological age and arithmetic computation age to establish a reading expectancy age.

\[
\text{Reading Exp.} = \frac{MA + CA + \text{Arithmetic Computation Age}}{3}
\]

Harris (1970), in the Mental Grade Procedure uses mental age to assess reading expectancy by subtracting five from the mental age.

\[
\text{Reading Exp.} = MA - 5
\]

Bond and Tinker's (1967) formula for establishing the discrepancy between expectancy and achievement considers years in school.

\[
\text{Reading Exp.} = \frac{\text{Years in School} \times IQ + 1.0}{10}
\]

The Learning Quotient Method devised by Myklebust (1968) uses mental age, chronological age and grade age to calculate potential learning ability. The ratio between present achievement level and age, and expectancy age is used to establish a learning quotient. According to Myklebust, if the quotient is 89 or below the child may be classified as learning disabled. This formula is slightly more complex and involves several steps.

Lerner (1971) summarizes the problems which arise in using formulas to establish significant discrepancy levels.

1. Valid measurement of intellectual potential is difficult.

2. Different tests often measure different kinds of intelligence.

3. The amount of discrepancy which constitutes a significant disability seems to vary with chronological age.

4. Although a one- or two-year discrepancy is often used as a criterion, this is inappropriate for kindergarten and first grade children.

5. These procedures neglect the role of background, language and motivation.

Despite their deficiencies, discrepancy formulas are useful as guidelines, and the formulas presented in this paper have attempted to avoid some of the pitfalls listed above. For example, because what constitutes a severe discrepancy appears to vary with age, the N.C. formula requires a smaller level discrepancy in the lower grades than the upper grades. The two formulas based on standard deviations accurately measure a child's performance in comparison with his peers on a constant basis which accounts for achievement differences at varying grade levels.

The second method establishing a discrepancy consists of identifying significant intra-individual differences. Kirk, McCarthy and Kirk (1968) suggest comparing scaled scores on the Illinois Test of Psycholinguistic Abilities (ITPA) with the child's mean scaled score. The difference on a subtest is significant if it is one or more standard deviations from the child's mean. Other practitioners look for consistencies in deviation among abilities running
throughout the WISC-R, Wide Range Achievement Test (WRAT), ITPA, Frostig Test of Visual Ability and the Bender Gestalt Test for perceptual-motor coordination. Clinical judgments also usually form a basis for evaluation. Kass (1969) uses the Bayesian method to determine which behavioral symptoms are being observed by clinical workers, and the tests which correspond most closely for measurement of these symptoms. If tests can be selected in accordance with clinical judgment, Kass believes it may be possible to specify criteria for a learning disabled child at different chronological ages.

In 1976, the Commissioner for the Department of Health, Education and Welfare was mandated to provide a common standard for the identification of learning disabilities (U.S. Department of Health, Education and Welfare, 1976). A discrepancy formula indicating the disparity between achievement and potential appeared to be the most likely candidate. The following federal formula was proposed for consideration:

\[
\text{CA} \left( \frac{\text{IQ}}{300} + 0.17 \right) - 2.5 = \text{severe discrepancy level (p. 52407)}.
\]

Reactions to the proposed federal formula were varied. Four co-authors responded, "We wish to point out that the formula for determining whether a child has a learning disability may be rendered virtually useless by measurement error" (Lloyd, Sabitino, Miller & Miller, 1977, p. 71). As a result, these authors believe students who require services may be ruled out with others remaining eligible.

Consider the following example proposed by these authors. A 9½-year-old child has a full scale IQ of 100. Inserted in the federal formula, we arrive at a severe discrepancy level (SDL) of 2.278.

\[
\text{SDL} = 9.5 \left( \frac{100}{300} + 0.17 \right) - 2.5 = 2.278
\]

If we determine a confidence level such that this score is accurate 95 percent of the time, the severe discrepancy level goes to 1.96 to 2.53 (one half year variance) and more with a 99 percent confidence level. In addition, the standard error of measurement is likely to be even greater with achievement tests. Another topic dealt with by these authors is the issue of whether IQ can be accurately measured without being affected by the learning disability.

A second article (Sulzbacher & Kenowitz, 1977) concerned itself with the genesis of the federal formula, maintaining that its origin and rationale were not explained. The formula had no provisions for the diagnosis of children below school age whereas 20 percent of the states mandate service to the learning disabled population from birth to age five. In addition, fourteen states report serving over 7,000 preschool learning disabled children. Another issue was that a maximum of 50 percent of expected achievement was defined as the severe discrepancy level. Would that percentage be equivalent across different subjects and all grades? The state of Kentucky which does not consider
grades to be equivalent uses the following criteria which are very similar to the North Carolina model (Galloway, Shipper & Wilson, 1976), and which considers grade levels separately.

a. Preschool and first grade children: performance on a standardized readiness measure of minus two standard deviations

b. Second grade: performance at grade level 1.0 or below
c. Third grade: performance at grade level 1.5 or below
d. Fourth grade: performance at grade level 2.0 or below
e. Fifth grade: performance at grade level 2.5 or below
f. Sixth grade: performance at grade level 3.0 or below
g. Seventh grade: performance at grade level 3.5 or below
h. Eighth grade and above: performance at grade level 4.0 and below.

Sulzbacher and Kenowitz felt that the federal regulations met their intention of setting numerical parameters around the population to be served and funded. However, it was felt that although they simplified administration, the regulations probably did not provide a better understanding or definition of the nature of learning disabilities.

The federal formula was consequently rejected due to specific technical limitations. However, the widespread use of formulas as guidelines has not diminished, indicating that some direction is needed in order to quantify the presence of a learning disability. A paper by Terrance Jones and Robert Poole scheduled for presentation at the Spring 1978 convention of the National Association of School Psychologists compares the rejected federal formula and two of the four formulas proposed in this paper, but uses slightly different IQ requirements. With the permission of those authors, the four model formulas in this paper will be applied to those same Davie County, N.C. children with the readjusted IQ requirement, and as a comparison, the formulas will be applied to the learning disabled school population of Watauga County, a county situated in the Appalachian mountains of N.C.

The four learning disability models considered in this paper are proposed as guidelines, not rigid standards, in providing additional consistency to the identification of learning disabilities. In actual practice, formulas should be applied with recognition of their technical limitations and with clinical judgment. Their purpose, according to the proposed N.C. State Department of Instruction guidelines, is to make the definition of learning disabilities practical and operational.
METHOD

SUBJECTS

The subjects of this study include the population of school-age children certified as learning disabled in two North Carolina counties; Group A includes children from a rural Piedmont county whereas Group B includes children from a mountainous N.C. county which is basically rural but does contain a state university. Of the 156 learning disabled children in Group A, twelve children were excluded on the basis of insufficient data. One hundred twelve males and 32 females compose the remaining population of 144 students. Racial composition is 124 white and 20 black children. The diagnosis of a specific learning disability was made by either the local mental health agency, a local school psychologist, a regional psychologist, a developmental evaluation clinic or by contract with a psychologist in private practice. A consensus of these psychologists is that the primary consideration for learning disability identification is an academic achievement standard score which is significantly (one standard deviation) lower than an IQ measure. In addition, some psychologists also consider achievement in relation to grade placement level, identification of a "process" dysfunction, WISC-R subtest scatter, behavioral observations and allowance for varying degrees of subjectivity. There was also a consensus that the IQ score should reflect normal potential.

Of the 71 children diagnosed as learning disabled in Group B, eight children were excluded due to insufficient data. Fifty-one males and 12 females compose the remaining population of 63 students. Of these 63 students, all are white (one child excluded from this study on the basis of insufficient data was black). This basically reflects the extremely low black racial composition of the county. The diagnosis of a specific learning disability was made by the school psychologist. In general, the psychologist looked for low achievement of at least a year below grade level, using more specific diagnostic tests such as Keymath, the Woodcock Reading Mastery Test or the ITPA in borderline situations. In addition, she looked for average scores on an indicator of intellectual functioning, or a scatter of subtest scores on the WISC-R indicating the potential for average functioning.

INSTRUMENTS

The instruments on which this study was based include a minimum of one measure of intellectual functioning and one measure of academic achievement per child. To measure intellectual functioning, either the Wechsler Intelligence Scale for Children-first edition or revised form (WISC or WISC-R) or the Stanford Binet Intelligence Test-Form LM
was administered. To measure academic achievement, scores on the Wide Range Achievement Test (WRAT) or Peabody Individual Achievement Test (PIAT) were used.

The WISC or WISC-R is an individually administered measure of current intellectual capacity which consists of six verbal and six performance subtests, one test in each area being optional. A Verbal IQ is calculated on the basis of five verbal subtests and a Performance IQ on the basis of five performance subtests. A full scale score based on both the verbal and performance scales is the basis of a Full Scale IQ score. The split-half procedure, which provides a measure of internal consistency, reveals that the Verbal, Performance and Full Scale IQs have high reliability across the entire age range, the average coefficients being .94, .90, and .96, respectively. Coefficients of correlation of scaled scores and IQs on the WISC-R with the Stanford Binet IQ were obtained for four groups of children ages 6, 9½, 12½, and 16½. The average coefficients of correlation of the WISC-R Verbal, Performance and Full Scale IQs with the Stanford Binet IQ are .71, .60, and .73, respectively. A comparison of the mean WISC-R Full Scale IQ with the mean Stanford Binet IQ indicates that the Stanford Binet IQ is about 2 points higher at ages 6, 9½, and 12½, while the WISC-R Full Scale IQ is about 2 points higher at age 16½.

The Stanford Binet Intelligence Test-Form LM is an age scale making use of age standards of performance in measuring intelligence regarded as general mental adaptability. There are six questions plus one alternate at each half year level from age two to five, at each year between six and fourteen, and four adult levels. Mental age is found by crediting the subject with his basal age at which all questions are passed plus prorated months credit for additional credit beyond the basal age. As a measure of reliability, biserial correlations were computed between each individual subtest and the total score with a mean correlation of .66. The preceding paragraph contains the average coefficient of correlation between the WISC-R and the Stanford Binet-Form LM.

The Wide Range Achievement Test (WRAT) is divided into Levels I and II. Level I is designed for use with children between the ages of 5 years 0 month and 11 years 11 months. Level II is intended for use with persons from 12 years 0 month to adulthood. The three subtests at both levels are (1) Reading: recognizing and naming letters and pronouncing words out of context; (2) Spelling: copying marks resembling letters, writing the name, and writing words to dictation; and (3) Arithmetic: counting, reading number symbols, solving oral problems and performing written computations. A standard score, grade level and percentile score may be calculated for each subject area. Correlation coefficients range from .92 to .98 for the reading and spelling tests and from .85 to .92 for the arithmetic test. The U.S. Public Health Service designed a study comparing the Stanford and Metropolitan Achievement Tests with the Wide
Range Reading and Arithmetic subtests yielding correlations mostly between .60 and .80. Other measures of validity based on grades, grade level, age and intelligence have also been completed.

The Peabody Individual Achievement Test (PIAT) provides an individually-administered measure of achievement in the areas of mathematics, reading recognition and comprehension, spelling and general information. A basal of five consecutive correct responses and ceiling of five errors in seven consecutive responses is established in each subtest. As in the WRAT, a standard score, grade level and percentile score can be calculated for each subject area. Reliability coefficients obtained by test-retest varied considerably from a low of .42 for kindergarten subjects in Spelling, to a high of .94 for third grade subjects in Reading Recognition, with an overall median of .78. Although the PIAT has been correlated with the Peabody Picture Vocabulary Test which is a measure of intelligence, only one study correlated the PIAT with another achievement test measure as of the manual's printing, and this study measured a group of educable mentally handicapped adolescents on the WRAT and PIAT. Correlations on the arithmetic, reading recognition and spelling subtests were respectively .58, .95 and .85.

PROCEDURE

For Group A, educational disabilities resource teachers were requested to provide data obtained in the evaluations of all students subsequently certified as learning disabled in grades K-12 as of November 1976. Final data were compiled by the county's school psychologist and received as of October 1977. The data reflected evaluations given between January 1973 and December 1976. The instruments used, except in the case of those students not considered for whom there was insufficient data, include the WISC, WISC-R or Stanford Binet-Form LM, and the Wide Range Achievement Test.

Data for Group B students receiving learning disability services in grades 1-8 reflect placement evaluations given between December 1975 and February 1978 and were obtained through the county's school psychologist between February 1978 and March 1978. No kindergarten or high school students were then certified as learning disabled. The instruments used, except in those cases where students were not considered because of insufficient data, include the WISC-R or Stanford Binet-Form LM, and the WRAT or PIAT.

The following four learning disabilities identification models were applied to the data:

Model I: In the most recent position paper issued by the Specific Learning Disability Programs, Division for Exceptional Children, N.C. State Department of Public Instruction (1978), children classified as learning disabled must demonstrate the capability of average intellectual ability and manifest a significant discrepancy between their current educational placement and their current performance.
An IQ of 85 or higher is acceptable for the Verbal, Performance or Full Scale IQ score according to the WISC-R or Stanford-Binet. IQs of less than 85 are subject to clinical judgment, but all protocols judged to represent average potential must include at least two Wechsler subtest scale scores of 9 or higher on either the Verbal or Performance scales. To determine the discrepancy between current educational placement and achievement, the pupil's current educational performance in months is subtracted from his current educational placement in months. This discrepancy must be "of sufficient magnitude to suggest at least moderate learning disabilities in any one or combination of the essential prerequisite skills or academic areas (reading, spelling, mathematics or handwriting) for which a resource room setting may be appropriate" (N.C. State Department of Public Instruction, 1978, p. 2). The following discrepancy levels would determine a moderate level of severity:

In Kindergarten: 6 to 12 months behind.
In Grade 1: 9 to 15 months behind.
In Grades 2 and 3: 12 to 24 months behind.
In Grades 4-6: 24 to 36 months behind.
In Grades 7-12: 36 to 48 months behind.

A pupil with a severe specific learning disability would fall within the following discrepancy levels and be most suitably placed in a self-contained program.

In Kindergarten: 12 or more months behind.
In Grade 1: 15 or more months behind.
In Grades 2 and 3: 24 or more months behind.
In Grades 4-6: 36 or more months behind.
In Grades 7-12: 48 or more months behind.

Smaller discrepancy levels are also provided for identification of mild specific learning disabilities but will not be considered for purposes of this paper as a moderate disability must be present in order to receive help in the resource room setting or on a self-contained basis.

Model II: Model II is identical to Model I except that instead of the current educational placement being compared to achievement, the current educational placement plus any years which a child has been retained is compared to the achievement level. This would insure that a past or present retention does not prevent a learning disabled child from qualifying for services. For example, a child in his last month of second grade with achievement at grade level 1.6 would be eligible for services with a moderate discrepancy. However, if this child were retained, his grade placement the next year would be 2.0, no longer creating a sufficient moderate discrepancy level.

Model III: Because the WISC-R, Stanford Binet-Form LM, WRAT and PIAT all display a standard score mean of 100 and standard deviation of 15 or 16 points, comparisons between ability and achievement can be made on the basis of the statistical, normal curve. In the field of
statistics, one standard deviation (15-16 points) is usually regarded as being statistically significant. Therefore, according to Model III, a specific learning disability may be identified if there is one standard deviation difference, or 15 points, between the highest IQ score and lowest achievement index. In comparison with Models I and II, Model III takes into consideration the intelligence quotient (for example, 125 for a child in the superior range) rather than considering all children with the potential for average functioning as a group. This model also provides for consistent comparison to one's peer group for any age or grade.

Model IV: The School Psychology Division of the Pupil Support Department, Charlotte-Mecklenburg Schools, Charlotte, N.C. has also proposed guidelines which relate to the eligibility category of specific learning disability as currently defined by the North Carolina Department of Public Instruction, but in their statistical amplification of the term "learning disability" suggest guidelines apart from the ones N.C. presently proposes. This model is quite similar to Model III in that identification requires average or above potential school-learning ability and one standard deviation (15 points) difference between ability and achievement in one academic area or a ten-point difference in all three areas of reading, spelling and arithmetic skills which is experientially significant for the pupil (Charlotte-Mecklenburg, 1978, p. 1). Although the written guidelines do not specifically define the method by which optimal school-learning ability is determined, the Jastak Method of Psychometric Analysis is commonly used in the county and recommended by the system's chief psychologist. With this method, an optimal school learning quotient is determined by combining the three highest subtest standard scores on the WISC-R, WRAT, and Beery Test of Visual-Motor Integration or Koppitz scoring of the Bender Gestalt Test (Beery and Bender percentiles translated into standard scores) in a predetermined ratio and projecting 87 percent of this figure as a child's optimal school-learning ability. However, for purposes of this study, optimal functioning will be determined as in the other three models by the highest IQ to provide consistency across models. In addition, there is insufficient research presently to indicate whether or not the Jastak method does predict optimal functioning accurately, particularly as it may be based on subtest scores which show the lower correlations with total general intellectual functioning.
Chapter 4

RESULTS

GROUP A

As indicated in Tables 1 and 2, 106 of the 144 children in Group A or 73.6 percent of those Group A children previously certified as learning disabled qualified under Model I, the N.C. proposed model. In addition to these children, an additional six children who were retained do not qualify under Model I but do qualify under Model II which allows years of retention to be added to educational placement when determining a discrepancy. Of the additional six children qualifying under this model, four of the children do not qualify under either Model III or IV based on standard score deviations, one child qualifies under one additional model and the sixth child under both Models III and IV. A total of 112 children or 77.8 percent of Group A children qualify under Model II.

When Model III is applied to the data of Group A, 100 of the 144 children or 69.4 percent qualify based on a standard deviation difference between the highest IQ and lowest achievement index. According to Model IV, a variation of the Charlotte-Mecklenburg formula, the 100 children of Model III plus an additional two children or 70.8

Table 1

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percent qualify for services. In both instances, the N.C. formula was in agreement for these children.

All four models are in agreement for 107 of Group A's 144 children for a total of 74.3 percent. This includes 18 children or 12.5 percent whom all models identified as not eligible.

According to McNemar's (1969) technique for testing the difference between two percentages for correlated data, there is no statistically significant difference at the one percent level between any of the four models as applied to the data of Group A. However, there is a statistically significant difference at the one percent level between those students already certified as learning disabled and the results obtained through all four models. Table 3 contains the resulting Z value for each comparison, with only values above 2.58 indicating a significant difference at this one percent level. The addition of data on students who were evaluated but not certified as learning disabled originally could possibly affect these significance levels. Also note that for Model I versus Model II and also Model II versus Model III, significance levels were above 1.95, indicating significance at the less stringent five percent level.

The highest IQ for eight students is less than 85, indicating that these students may not be demonstrating normal potential. However, as this matter also involves

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<tbody>
<tr>
<td>Group A</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I</td>
<td>--</td>
<td>2.449*</td>
<td>1.616</td>
<td>1.300</td>
<td>6.164**</td>
</tr>
<tr>
<td>II</td>
<td>--</td>
<td>--</td>
<td>2.060*</td>
<td>1.768</td>
<td>5.657**</td>
</tr>
<tr>
<td>III</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>1.414</td>
<td>6.653**</td>
</tr>
<tr>
<td>IV</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>6.481**</td>
</tr>
<tr>
<td>Group B</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I</td>
<td>--</td>
<td>1.414</td>
<td>1.378</td>
<td>1.378</td>
<td>4.690**</td>
</tr>
<tr>
<td>II</td>
<td>--</td>
<td>--</td>
<td>1.555</td>
<td>1.555</td>
<td>4.472**</td>
</tr>
<tr>
<td>III</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>0.000</td>
<td>4.123**</td>
</tr>
<tr>
<td>IV</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>4.123**</td>
</tr>
<tr>
<td>Combined Groups</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I</td>
<td>--</td>
<td>2.828**</td>
<td>.603</td>
<td>.302</td>
<td>7.746**</td>
</tr>
<tr>
<td>II</td>
<td>--</td>
<td>--</td>
<td>1.180</td>
<td>.905</td>
<td>7.211**</td>
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<tr>
<td>III</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>1.414</td>
<td>7.810**</td>
</tr>
<tr>
<td>IV</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>7.681**</td>
</tr>
</tbody>
</table>

*p < .05.

**p < .01.
clinical judgment, students were not disqualified on this basis alone.

GROUP B

As indicated by Tables 1 and 2, 41 of 63 Group B children or 65.1 percent qualify under the proposed North Carolina formula, Model I. In addition to these 41 children, an additional two children were retained who did not qualify under Model I but do qualify under Model II. Of these two children, one qualifies under both Models III and IV and the other child qualifies under neither model. A total of 43 of the 63 Group B children or 68.2 percent qualify under Model II.

When Model III is applied to the data of Group B, 46 or 63 students or 73.0 percent qualify for learning disability services. Model IV identifies exactly the same population identified by Model III.

All four models are in agreement for 49 of 63 children or 77.8 percent. Twelve of these 49 agreements or 19 percent of the total cases are instances where all four formulas agree a student is non-certifiable. As indicated in Table 3, there is no statistically significant difference between the percentage of students identified by any of the four formulas. However, the difference between each model and those students originally identified is significant at the one percent level. There is only one child in Group B whose highest IQ score is below 85.

COMBINED RESULTS FOR GROUPS A AND B

Of a total 207 children in Groups A and B, 147 qualify under Model I, 155 under Model II, 146 under Model III, and 148 under Model IV, as illustrated in Table 1. The percentage of children qualifying under each model for Groups A and B combined is 69.4 percent for Model I, 73.0 percent under Model II, 71.2 percent under Model III and 71.9 percent under Model IV, as illustrated in Table 2. Table 3 illustrates the difference between models is not statistically significant except between Models I and II, the original and revised N.C. models. The number of children identified by every model is statistically different at the one percent level from the original number in Groups A and B combined.
Of primary importance in applying these four models to Groups A and B is the fact that there is only one statistically significant difference at the one percent level between any two models in the proportion of children identified, and this occurs between Models I and II when the two counties are combined; whereas all four models identify a population statistically different from those students presently certified as learning disabled. This fact alone indicates the consistency any one of these models could yield to the field of identifying specific learning disabilities. In 75 percent of the cases, all four formulas are in agreement, including 15.75 percent of the total cases in which all four formulas indicated a child did not qualify for learning disability services. One alternative to a single model would be to apply two formulas to data of a child suspected of a learning disability, one based on the difference between educational placement and achievement and another based on a minimum standard score discrepancy between IQ and achievement. Those children qualifying under both formulas with valid testing conditions could be identified as learning disabled; children identified by neither formula could be rejected as not possessing a learning disability of at least moderate intensity; those children qualifying under one formula only could be subject to clinical judgment with the following considerations for each model in mind.

Model I, the N.C. formula, is based on a discrepancy between current grade placement and grade level of academic achievement. This formula is educationally relevant and understandable for the regular classroom or resource teacher who refers children. If a child qualifies under a standard score formula and not under Model I, the following attributes of Model I warrant consideration. First, if the child has been retained, in all cases for Groups A and B, adding years retained to current educational placement resulted in identification by the formula. However, five of seven times this did not agree with the standard score formula which should be considered. Second, often a child with an above average IQ will not qualify under Model I as he will under a standard score model because the fact that a bright child would probably be performing above grade level is not considered. The school system must decide whether school-learning deficits which push the superior child one year below grade level are considered as serious as the normal child with an IQ of 90 who is two years behind grade level and qualifies for services. Conversely, a child with a Performance IQ of 115, Verbal Score of 90 and Full Scale Score of 101 may have an academic index of 100 and qualify under a standard score formula, whereas the academic score
is in line with the Verbal and Full Scale IQs. Finally, because the amount of discrepancy required jumps as much as 12 months between the end of one grade and beginning of the next grade, a child 15 months behind academically and qualifying at the end of third grade will no longer qualify at the beginning of fourth grade. Model II deserves the same considerations, except that retentions will not cause a child to be disqualified for services.

Models III and IV are based upon minimum standard score discrepancies between ability and achievement. If a child qualifies under the N.C. original or revised formula and does not qualify under the standard score formula, it is often a child in the low range of normal intelligence or a student judged to be of potentially normal intelligence. An IQ of 90 and academic index of 85 may place a child significantly below his peers, but a lesser amount below his ability or earned IQ score. Often the judgment of whether an IQ of 85 represents a slow learner or potentially normal student whose scores are superficially depressed by the learning disability must be made. Interestingly, only two of the 61 students not qualifying under Model III qualified under Model IV which offers the option of a 15-point discrepancy in one area or a 10-point standard score discrepancy simultaneously required in all three of the major academic areas: reading, spelling and arithmetic. Of these two students, both also qualified under the N.C. formula.

In regards to present school budgets, the federal government provides $52.50 per exceptional child yearly to the school system, and this amount will double by 1982. For Group A, present federal support for 144 students would be $7,560. All four formulas agree at least 12.5 percent of these students are ineligible, which could hypothetically cut this county's federal budget for learning disabled students from $7,560 to $6,615, and this decrease would double by 1982. In the case of Group B, the reduction would be from $4,307.50 to $2,677.50. However, it is also likely that additional students previously rejected for services would qualify under the new formula.

In summary, there is only one statistically significant difference at the one percent level between the four discrepancy models presented in this paper, the difference existing between Models I and II for the combined groups. In contrast, all the models identify significantly different populations from the original Groups A or B. All four models are in agreement, either positively or negatively, in 75 percent of the cases. One possibility in identifying learning disabilities would be to apply two models, one which considers a discrepancy between educational placement and grade level achievement and another which compares an individual's highest IQ score with standard scores on an achievement measure. If the student meets both formula criteria which would consider differences in individual ability plus discrepancies from grade level achievement,
he would qualify. If the student did not meet the required
discrepancy level of either formula, he would be rejected as
having less than a moderate discrepancy necessary for
resource room services. If the student were identified by
one model only, additional clinical judgment based on some
of the characteristics discussed under each model and other
relevant data (personality characteristics, diagnostic
reading or math tests, process deficits, etc.) would
provide additional direction in the determination of a
learning disability.

REFERENCE NOTES

1. Mercer, C. D., Forgone, C., and Woiking, W. D. Definitions of learning disability used in the United
   States, Unpublished manuscript, 1975. (Available
   from the University of Florida).
2. N.C. State Department of Public Instruction, Division
   for Exceptional Children, Learning Disabilities Sec-
   tion. Specific learning disabilities: Definition
   three learning disability models: Local criteria as

REFERENCES

Bond, G. L. & Tinker, M. A. Reading difficulties: Their
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Chalfant, J. C. & King, F. S. An approach to operation-
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Harris, A. J. How to increase reading ability (5th ed.). New York: David McKay, 1970.


Wechsler Intelligence Scale for Children—Revised

WISC-R PROFILE

Clinicians who wish to draw a profile should first transfer the child's scaled scores to the row of boxes below. Then mark an X on the dot corresponding to the scaled score for each test, and draw a line connecting the X's.

<table>
<thead>
<tr>
<th>VERBAL TESTS</th>
<th>PERFORMANCE TESTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Information</td>
<td>Scaled Score</td>
</tr>
<tr>
<td>Similitudes</td>
<td></td>
</tr>
<tr>
<td>Arithmetic</td>
<td></td>
</tr>
<tr>
<td>Vocabulary</td>
<td></td>
</tr>
<tr>
<td>Comprehension</td>
<td></td>
</tr>
<tr>
<td>Digit Span</td>
<td></td>
</tr>
<tr>
<td>Picture Com.</td>
<td>Scaled Score</td>
</tr>
<tr>
<td>Picture Arr.</td>
<td></td>
</tr>
<tr>
<td>Block Design</td>
<td></td>
</tr>
<tr>
<td>Object Assembly</td>
<td></td>
</tr>
<tr>
<td>Coding</td>
<td></td>
</tr>
<tr>
<td>Mazes</td>
<td></td>
</tr>
</tbody>
</table>

**NOTES**

*See Chapter 4 in the manual for a discussion of the significance of differences between scores on the tests.*

**Year**  **Month**  **Day**  **Age**

**Date of Birth**  **Date Tested**  **Age**

**Raw Score**  **Scaled Score**  **Verbal Score**  **Performance Score**  **Full Scale Score**

<table>
<thead>
<tr>
<th><strong>Raw Score</strong></th>
<th><strong>Scaled Score</strong></th>
<th><strong>IQ</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Verbal Tests**  **Performance Tests**

*Prorated from 4 tests, if necessary.*

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The Psychological Corporation, New York, N.Y. 10017

74-10046
## 1. INFORMATION

Discontinue after 3 consecutive failures.  

|--------------|-----------|--------|--------|--------|----------|--------|--------|---------|---------|----------|------------|------------|-------------|-------|----------------|---------|----------|--------|----------|--------|--------|--------|-----------|--------|----------|----------|----------------|----------------|-------------|-----------|----------------|---------|

## 2. PICTURE COMPLETION

Discontinue after 4 consecutive failures.  

|--------------|---------|---------|-------|--------|-------|----------|--------|-------------|---------|-------------|--------|--------|--------|------------------|-----------------|--------|--------|---------|--------|--------|-------|----------|----------|--------|---------|----------|----------------|----------------|--------|

## 3. SIMILARITIES

Discontinue after 3 consecutive failures.  

|--------------|----------------|---------------|--------------|----------------|----------------|-------------|-------------|-------------|----------------|----------------|-------------|----------------|----------------|----------------|----------------|----------------|----------------|

*If the child gives a 1-point response to Item 16, say, "How else are the numbers 49 and 121 alike?"*  

Max. = 26
### 4. PICTURE ARRANGEMENT
Discontinue after 3 consecutive failures.

<table>
<thead>
<tr>
<th>Arrangement</th>
<th>Time</th>
<th>Order</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Fight</td>
<td>45&quot;</td>
<td>1</td>
<td>0 1</td>
</tr>
<tr>
<td>2. Picnic</td>
<td>45&quot;</td>
<td>1</td>
<td>0 2</td>
</tr>
<tr>
<td>3. Fire</td>
<td>45&quot;</td>
<td>1</td>
<td>0 2</td>
</tr>
<tr>
<td>4. Plank</td>
<td>45&quot;</td>
<td>1</td>
<td>0 2</td>
</tr>
<tr>
<td>5. Burglar</td>
<td>45&quot;</td>
<td>0</td>
<td>16 45 11 15 1 10 3 4 5</td>
</tr>
<tr>
<td>6. Sleeper</td>
<td>45&quot;</td>
<td>0</td>
<td>16 45 11 15 1 10 3 4 5</td>
</tr>
<tr>
<td>7. Artist</td>
<td>45&quot;</td>
<td>0</td>
<td>16 45 11 15 1 10 3 4 5</td>
</tr>
<tr>
<td>8. Losso</td>
<td>45&quot;</td>
<td>0</td>
<td>21 40 11 10 1 10 3 4 5</td>
</tr>
<tr>
<td>9. Boat</td>
<td>60&quot;</td>
<td>0</td>
<td>21 40 11 10 1 10 3 4 5</td>
</tr>
<tr>
<td>10. Gardener</td>
<td>60&quot;</td>
<td>0</td>
<td>26 60 16 15 1 10 3 4 5</td>
</tr>
<tr>
<td>11. Bench</td>
<td>60&quot;</td>
<td>0</td>
<td>26 60 16 15 1 10 3 4 5</td>
</tr>
<tr>
<td>12. Rain</td>
<td>60&quot;</td>
<td>0</td>
<td>26 60 16 15 1 10 3 4 5</td>
</tr>
</tbody>
</table>

---

### 5. ARITHMETIC
Discontinue after 3 consecutive failures.

<table>
<thead>
<tr>
<th>Problem</th>
<th>Response</th>
<th>Score 1 or 0</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. 30&quot;</td>
<td>*2, 30&quot;</td>
<td></td>
</tr>
<tr>
<td>2. 30&quot;</td>
<td>*3, 30&quot;</td>
<td></td>
</tr>
<tr>
<td>3. 30&quot;</td>
<td>4, 30&quot;</td>
<td></td>
</tr>
<tr>
<td>4. 30&quot;</td>
<td>5, 30&quot;</td>
<td></td>
</tr>
<tr>
<td>5. 30&quot;</td>
<td>6, 30&quot;</td>
<td></td>
</tr>
<tr>
<td>6. 30&quot;</td>
<td>7, 30&quot;</td>
<td></td>
</tr>
<tr>
<td>7. 30&quot;</td>
<td>8, 30&quot;</td>
<td></td>
</tr>
<tr>
<td>8. 30&quot;</td>
<td>9, 30&quot;</td>
<td></td>
</tr>
<tr>
<td>9. 30&quot;</td>
<td>10, 30&quot;</td>
<td></td>
</tr>
<tr>
<td>10. 30&quot;</td>
<td>11, 30&quot;</td>
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</tr>
<tr>
<td>11. 30&quot;</td>
<td>12, 30&quot;</td>
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<td>13, 30&quot;</td>
<td></td>
</tr>
<tr>
<td>13. 30&quot;</td>
<td>14, 30&quot;</td>
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<td>14. 30&quot;</td>
<td>15, 30&quot;</td>
<td></td>
</tr>
<tr>
<td>15. 30&quot;</td>
<td>16, 30&quot;</td>
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<td>17, 30&quot;</td>
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<tr>
<td>17. 30&quot;</td>
<td>18, 30&quot;</td>
<td></td>
</tr>
<tr>
<td>18. 30&quot;</td>
<td>19, 30&quot;</td>
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</tr>
</tbody>
</table>

---

### 6. BLOCK DESIGN
Discontinue after 2 consecutive failures.

<table>
<thead>
<tr>
<th>Design</th>
<th>Time</th>
<th>Pass-Fail</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. 45&quot;</td>
<td>1</td>
<td>1 0 1</td>
<td>2</td>
</tr>
<tr>
<td>2. 45&quot;</td>
<td>1</td>
<td>0 0 1</td>
<td>2</td>
</tr>
<tr>
<td>3. 45&quot;</td>
<td>1</td>
<td>2 1 2</td>
<td>2</td>
</tr>
<tr>
<td>4. 45&quot;</td>
<td>0</td>
<td>21 45 16 20 11 15 1 10 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>5. 75&quot;</td>
<td>0</td>
<td>21 75 16 20 11 15 1 10 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>6. 75&quot;</td>
<td>0</td>
<td>21 75 16 20 11 15 1 10 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>7. 75&quot;</td>
<td>0</td>
<td>21 75 16 20 11 15 1 10 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>8. 75&quot;</td>
<td>0</td>
<td>26 75 21 25 16 30 1 15 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>9. 120&quot;</td>
<td>0</td>
<td>36 120 36 65 24 35 1 25 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>10. 120&quot;</td>
<td>0</td>
<td>76 125 36 75 41 55 1 49 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>11. 120&quot;</td>
<td>0</td>
<td>81 120 36 65 41 55 1 49 4 5 6 7</td>
<td></td>
</tr>
</tbody>
</table>

---

### 7. VOCABULARY
Discontinue after 5 consecutive failures.

<table>
<thead>
<tr>
<th>Score 2, 1, or 0</th>
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</thead>
<tbody>
<tr>
<td>1. Knife</td>
</tr>
<tr>
<td>2. Umbrella</td>
</tr>
<tr>
<td>3. Clock</td>
</tr>
<tr>
<td>4. Hat</td>
</tr>
<tr>
<td>5. Bicycle</td>
</tr>
<tr>
<td>6. Nail</td>
</tr>
<tr>
<td>7. Alphabet</td>
</tr>
<tr>
<td>8. Donkey</td>
</tr>
<tr>
<td>9. Thief</td>
</tr>
<tr>
<td>10. Join</td>
</tr>
<tr>
<td>11. Brave</td>
</tr>
<tr>
<td>12. Diamond</td>
</tr>
<tr>
<td>13. Gamble</td>
</tr>
<tr>
<td>14. Nonsense</td>
</tr>
<tr>
<td>15. Prevent</td>
</tr>
<tr>
<td>16. Contagious</td>
</tr>
<tr>
<td>17. Nuisance</td>
</tr>
<tr>
<td>18. Fable</td>
</tr>
<tr>
<td>19. Hazardous</td>
</tr>
<tr>
<td>20. Migrate</td>
</tr>
<tr>
<td>21. Stanza</td>
</tr>
<tr>
<td>22. Seclude</td>
</tr>
<tr>
<td>23. Mantis</td>
</tr>
<tr>
<td>24. Espionage</td>
</tr>
<tr>
<td>25. Belfry</td>
</tr>
<tr>
<td>26. Rivalry</td>
</tr>
<tr>
<td>27. Amendment</td>
</tr>
<tr>
<td>28. Compel</td>
</tr>
<tr>
<td>29. Affliction</td>
</tr>
<tr>
<td>30. Obliterate</td>
</tr>
<tr>
<td>31. Imminent</td>
</tr>
<tr>
<td>32. Dilatory</td>
</tr>
</tbody>
</table>

---

*Problems 2 and 3 are given 15 points each if child makes error but con-

<table>
<thead>
<tr>
<th>Total</th>
<th>Max.=64</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

---

*Round half scores upward.
8. OBJECT ASSEMBLY
Give entire test to all children.

Object | Time Entry Number of Correctly Joined Cuts | Multiply by | Score (Circle the appropriate score for each item.)
--- | --- | --- | ---
Apple (SAMPLE) | (0-6) | 1 | 0 1 2 3 4 5
1. Girl 120" | (0-5) | 1 | 0 1 2 3 4
2. Horse 150" | (0-9) | ½ | 0 1 2 3 4 5
3. Car 150'' | (0-12) | ½ | 0 1 2 3 4 5
4. Face 180'' | 1/2 | 0 1 2 3 4 5

*Round half-scores upward.

10. CODING

<table>
<thead>
<tr>
<th>Time</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>120&quot;</td>
<td>(0-50)</td>
</tr>
<tr>
<td>120&quot;</td>
<td>(0-93)</td>
</tr>
</tbody>
</table>

11. DIGIT SPAN (Optional)
Discontinue after failure on both trials of any item. Administer both trials of each item, even if child passes first trial.

DIGIT SPAN Forward Trial | Pass-Fail | Trial 2 | Pass-Fail | Score
--- | --- | --- | --- | ---
1. 3-8-6 | 6-1-2 |
2. 3-4-1-7 | 6-1-5-8 |
3. 8-4-2-3-9 | 5-2-1-8-6 |
4. 3-8-9-7-1-4 | 7-9-6-4-8-3 |
5. 5-1-7-4-2-3-8 | 9-8-5-2-1-6-3 |
6. 1-6-4-5-9-7-6-3 | 2-9-7-6-3-1-5-4 |
7. 5-3-8-7-1-2-4-6-9 | 4-2-6-9-1-7-8-3-5 |

Administer DIGITS BACKWARD even if child scores 0 on DIGITS FORWARD.

DIGIT SPAN Backward Trial | Pass-Fail | Trial 2 | Pass-Fail | Score
--- | --- | --- | --- | ---
1. 2-5 | 6-3 |
2. 5-7-4 | 2-5-9 |
3. 7-2-9-6 | 8-4-9-3 |
4. 4-1-3-5-7 | 9-7-8-5-2 |
5. 1-6-5-2-9-8 | 3-6-7-1-9-4 |
6. 8-5-9-2-3-4-2 | 4-5-7-9-2-8-1 |
7. 6-9-1-6-3-2-5-8 | 3-1-7-9-5-4-8-2 |

Total Forward

TOTAL Backward

12. MAZES (Optional)
Discontinue after 2 consecutive failures.

Maze | Maximum Time | Errors | Score (Circle the appropriate score for each maze.)
--- | --- | --- | ---
SAMPLE | 30" | 1 | 0 1 9-6 0 Errors 1 2 |
1. 30" | 1 | 0 1 9-6 0 Errors 1 2 |
2. 30" | 1 | 0 1 9-6 0 Errors 1 2 |
3. 30" | 1 | 0 1 9-6 0 Errors 1 2 |
4. 30" | 1 | 0 1 9-6 0 Errors 1 2 |
5. 45" | 2 | 0 2 Errors 1 9-6 0 Errors 1 2 |
6. 60" | 3 | 0 3 Errors 2 Errors 1 9-6 0 Errors 1 2 |
7. 120" | 3 | 0 3 Errors 2 Errors 1 9-6 0 Errors 1 2 |
8. 120" | 4 | 0 4 Errors 3 Errors 2 Errors 1 9-6 0 Errors 1 2 |
9. 150" | 4 | 0 4 Errors 3 Errors 2 Errors 1 9-6 0 Errors 1 2 |

Total

Max. = 34

Max. = 28
<table>
<thead>
<tr>
<th>Testing Time</th>
<th>MA Score</th>
<th>Total</th>
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</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
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</tbody>
</table>

**Record Form — Form L-M** Standard Score Intelligence Scale

**General Information**: Name, Address, Date of Test, etc.

**School Code**: Examiner, Age, Grade, etc.

**Factors Affecting Test Performance**: Exception of either, Birthplace of either, etc.

**Emotional Independence**: husbands, wives, etc.

**Reaction Time**: aware of task, aware of object, etc.

**Alertness and Attention**: normal adult, low, etc.

**Test Summary**: MA, WA, MA, etc.
<table>
<thead>
<tr>
<th>Year 11 (6 tests x 1, or 4* tests x 1 1/2)</th>
<th>Year 11-6 (6 tests x 1, or 4* tests x 1 1/2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Sliding beads (3+)</td>
<td>1. Sliding beads (3+)</td>
</tr>
<tr>
<td>2. Picture memories (1+)</td>
<td>2. Picture memories (1+)</td>
</tr>
<tr>
<td>3. Copying circle (1+)</td>
<td>3. Copying circle (1+)</td>
</tr>
<tr>
<td>4. Vertical lines (1+)</td>
<td>4. Vertical lines (1+)</td>
</tr>
<tr>
<td>5. A. Ident. objects by name (5+)</td>
<td>5. A. Ident. objects by name (5+)</td>
</tr>
<tr>
<td>6. Simple commands (2+)</td>
<td>6. Simple commands (2+)</td>
</tr>
<tr>
<td>7. A. Sent. mem. 1 (1+)</td>
<td>7. A. Sent. mem. 1 (1+)</td>
</tr>
<tr>
<td>8. Word combinations (±)</td>
<td>8. Word combinations (±)</td>
</tr>
<tr>
<td>9. Reading comp. (3+)</td>
<td>9. Reading comp. (3+)</td>
</tr>
<tr>
<td>10. Aesth. comp. (3+)</td>
<td>10. Aesth. comp. (3+)</td>
</tr>
<tr>
<td>11. Picture vocabulary (10+)</td>
<td>11. Picture vocabulary (10+)</td>
</tr>
<tr>
<td>12. Blockbridge (±)</td>
<td>12. Blockbridge (±)</td>
</tr>
<tr>
<td>13. Opp. analogies (2+)</td>
<td>13. Opp. analogies (2+)</td>
</tr>
<tr>
<td>14. Picture memories (1+)</td>
<td>14. Picture memories (1+)</td>
</tr>
<tr>
<td>15. Copying circle (1+)</td>
<td>15. Copying circle (1+)</td>
</tr>
<tr>
<td>16. 3 digits (1+)</td>
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</tr>
<tr>
<td>17. Pict. ident. (4+)</td>
<td>17. Pict. ident. (4+)</td>
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</table>

<table>
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<th>Year 11-6 (6 tests x 1, or 4* tests x 1 1/2)</th>
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</thead>
<tbody>
<tr>
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</tr>
<tr>
<td>17. Pict. ident. (4+)</td>
<td>17. Pict. ident. (4+)</td>
</tr>
</tbody>
</table>
Year V (6 tests x 1, or 4* tests x 1½)

1. Pict. compl.: man (2 pts.) [ ]
2. Folding triangle (±) [ ]
3. Definitions (2+) [ ]
4. Copying square (1+) [ ]
5. Pict. sim. & diff. (2+) [ ]
6. Patience: rectangles (±) [ ]
7. Knot (±) [ ]
8. a.--b.--c.----
9. Ja----b----c----

Year VI (6 tests x 2, or 4* tests x 3)

1. Vocabulary (5+) [ ]
2. Differences (2+) [ ]
3. Mut. pictures (2+) [ ]
4. Number concepts (1+) [ ]
5. Maze (±) [ ]
6. Response to pictures (Level II, 2+) [ ]

Year VII (6 tests x 2, or 4* tests x 3)

1. Pict. abs. I (4+) [ ]
2. Simil.: 2 (2+) [ ]
3. Copying diamond (1+) [ ]
4. Comprehension IV (1+) [ ]
5. Opp. analogies III (2+) [ ]
6. 5 digits (1+) [ ]
7. A. 3 dig. rev. (1+) [ ]
8. Reading: rectangles (±) [ ]
9. Ja----b----c----

Year VIII (6 tests x 2, or 4* tests x 3)

1. Vocabulary (8+) [ ]
2. Wet Fall (5+) [ ]
3. Verb. absurd. I (3+) [ ]
4. Sim. & diff. III (3+) [ ]
5. Comprehension IV (4+) [ ]
6. Days of week (order, 2 checks+) [ ]
7. A. Prob. sit. I (2+) [ ]

Year IX (6 tests x 2, or 4* tests x 3)

1. Paper cutting (1+) [ ]
2. Block counting (5+) [ ]
3. Abstract words I (2+) [ ]
4. Finding reasons I (2+) [ ]
5. 6 dig. (1+) [ ]
6. A. Verb. abs. III (2+) [ ]
7. A. Papercutting (2+) [ ]

Year X (6 tests x 2, or 4* tests x 3)

1. Vocabulary (12+) [ ]
2. Block counting (9+) [ ]
3. Abstract words II (4+) [ ]
4. Sent. mem. III (1+) [ ]
5. Word naming (28 in 1 min.) [ ]
6. 6 dig. (1+) [ ]
7. A. Verb. abs. III (2+) [ ]
8. A. Papercutting (2+) [ ]

Year XI (6 tests x 2, or 4* tests x 3)

1. Designs I (1½+) [ ]
2. Verb. abs. IV (2+) [ ]
3. Abstract words III (3+) [ ]
4. Sent. mem. II (1+) [ ]
5. Prob. sit. II (±) [ ]
6. Simil.: 3 (3+) [ ]
7. A. Finding reasons II (2+) [ ]

Year XII (6 tests x 2, or 4* tests x 3)

1. Vocabulary (15+) [ ]
2. Verb. abs. IV (4+) [ ]
3. Design I (1+ or 2 with ½ ca.) [ ]
4. 5 dig. rev. (1+) [ ]
5. Abstract words III (3+) [ ]
6. Minkus comp. I (3+) [ ]
7. A. Designs II (±) [ ]
8. A. Papercutting (2+) [ ]
A. Binet paper cutting (±)

Super. Adult I (6 tests x 4, or 4* tests x 6)

- Vocabulary (20+)
- Enclosed boxes (4+)
- Minkus completion II (2+)
- 6 digit. rev. (2+)
- Sent. building (2+)
- Recon. opp. (4+)

Super. Adult II (6 tests x 5, or 4* tests x 7½)

- Vocabulary (26+)
- Finding reasons (2+)
- Proverbs (1+)
- Ingenuity (3+)
- Essen. simil. (3+)
- Recon. opp. (4+)

Super. Adult III (6 tests x 6, or 4* tests x 9)

- Vocabulary (30+)
- Proverbs (2+)
- Opp. analogies (2+)
- Direction (2+)
- Reasoning (5 min.) (±)
- Para. of Life (±)
- Opp. analogies (2+)

VOCABULARY

1. Orange
2. Envelope
3. Straw
4. Puddle
5. Roar
6. Eyelash
7. Scorch
8. Lecture
9. Skill
10. Brunette
11. Muzzle
12. Hasten
13. Peculiarity
14. Priceless
15. Regard
16. Tolerate
17. Disproportionate
18. Lotus
19. Mosaic
20. Stave
21. Bewail
22. Ochre
23. Repose
24. Ambergris
25. Limpet
26. Frustrate
27. Flaunt
28. Incrustation
29. Retroactive
30. Philanthropy
31. Piscatorial

MINNUS COMPLETION II

1. He is well grounded in geography. His brother.
2. You must work either of us could speak, we were at the bottom of the stairs.
3. We like to pop corn. One cannot always be a man.
4. The stream is dry. There has been little rain.
5. He was not sick.
WIDE RANGE ACHIEVEMENT TEST

By I. F. Jastak, S. W. Bijou, S. R. Jastak

Name ............................................  Sex: M. F.         Birthday   ............... Chron. Age   ............

Scores:   RAW           GRADE          %  ILE         STAND.

School.........................................Grade......Reading

Referred   by    ................................................          Spelling

Date..............Examiner...............................Arithmetic

PAGE I: SPELLING I & II

FOR INDIVIDUAL AND GROUP COMPARISONS USE ONLY STANDARD SCORES ON PAGES 16 TO 42 OF MANUAL.

### ORAL PART

1. Counts 1-5
2. Counts 6-15
3. Reads 17
4. Reads 41
5. Arithmetical Group Comparisons

#### WRITTEN PART

1. 3 + 4 apples
2. 9 marbles, lose 3
3. $6.20 - 5.30$
4. $968 - 27 = 941$
5. $809 	imes 47$
6. $2 - 4\frac{3}{4}$

#### WRITTEN PART

1. $1 + 1 = 6$
2. $24 - 4 \times 2 = 23$
3. $24 - 4 = 20$
4. $4 \times 3 = 12$
5. $9 \times 4 = 36$
6. $3 \times 9 = 27$
7. $48 \div 6 = 8$

#### WRITTEN PART

1. $10 \div 2 = 5$
2. $10 \div 2 = 5$
3. $10 \div 2 = 5$
4. $10 \div 2 = 5$
5. $10 \div 2 = 5$

#### WRITTEN PART

1. $1 \times 1 = 1$
2. $2 \times 2 = 4$
3. $3 \times 3 = 9$
4. $4 \times 4 = 16$
5. $5 \times 5 = 25$

#### WRITTEN PART

1. $6 \div 2 = 3$
2. $8 \div 2 = 4$
3. $10 \div 2 = 5$
4. $12 \div 2 = 6$
5. $14 \div 2 = 7$

#### WRITTEN PART

1. $15 \div 3 = 5$
2. $20 \div 4 = 5$
3. $25 \div 5 = 5$
4. $30 \div 6 = 5$
5. $35 \div 7 = 5$

#### WRITTEN PART

1. $42 \div 7 = 6$
2. $49 \div 7 = 7$
3. $56 \div 7 = 8$
4. $63 \div 7 = 9$
5. $70 \div 7 = 10$

#### WRITTEN PART

1. $78 \div 3 = 26$
2. $84 \div 3 = 28$
3. $90 \div 3 = 30$
4. $96 \div 3 = 32$
5. $102 \div 3 = 34$

#### WRITTEN PART

1. $1 \times 1 = 1$
2. $2 \times 2 = 4$
3. $3 \times 3 = 9$
4. $4 \times 4 = 16$
5. $5 \times 5 = 25$

#### WRITTEN PART

1. $6 \times 6 = 36$
2. $7 \times 7 = 49$
3. $8 \times 8 = 64$
4. $9 \times 9 = 81$
5. $10 \times 10 = 100$

#### WRITTEN PART

1. $11 \times 11 = 121$
2. $12 \times 12 = 144$
3. $13 \times 13 = 169$
4. $14 \times 14 = 196$
5. $15 \times 15 = 225$

#### WRITTEN PART

1. $16 \times 16 = 256$
2. $17 \times 17 = 289$
3. $18 \times 18 = 324$
4. $19 \times 19 = 361$
5. $20 \times 20 = 400$

#### WRITTEN PART

1. $21 \times 21 = 441$
2. $22 \times 22 = 484$
3. $23 \times 23 = 529$
4. $24 \times 24 = 576$
5. $25 \times 25 = 625$

#### WRITTEN PART

1. $26 \times 26 = 676$
2. $27 \times 27 = 729$
3. $28 \times 28 = 784$
4. $29 \times 29 = 841$
5. $30 \times 30 = 900$

#### WRITTEN PART

1. $31 \times 31 = 961$
2. $32 \times 32 = 1024$
3. $33 \times 33 = 1089$
4. $34 \times 34 = 1156$
5. $35 \times 35 = 1225$

#### ARITHMETIC-LEVEL I: FOR INDIVIDUAL AND GROUP COMPARISONS USE ONLY STANDARD SCORES ON PAGES 16 TO 29 OF MANUAL.

#### ARITHMETIC-LEVEL II: FOR INDIVIDUAL AND GROUP COMPARISONS USE ONLY STANDARD SCORES ON PAGES 30 TO 42 OF MANUAL.
Two letters in name t2t

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
<th>O</th>
<th>S</th>
<th>E</th>
<th>R</th>
<th>T</th>
<th>H</th>
<th>P</th>
<th>I</th>
<th>U</th>
<th>Z</th>
<th>Q</th>
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<tr>
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<td>8</td>
<td>7</td>
<td>9</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
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</tbody>
</table>

milk city in tree animal himself between chin split form

Two letters in name A R Z H I Q S E B O

<table>
<thead>
<tr>
<th>A</th>
<th>K</th>
<th>R</th>
<th>Z</th>
<th>H</th>
<th>I</th>
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<td>1</td>
<td>10</td>
<td>1</td>
<td>10</td>
<td>1</td>
<td>10</td>
<td>1</td>
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</table>
31. feather
32. flour
33. igloo
34. liquid
35. purse
36. dangerous
37. lodge
38. stylish
39. accident
40. ruin
41. exercise
42. pigeon
43. moisture
44. artificial
45. anchor
46. elegant
47. gaudy
48. treacherous
49. yacht
50. guerilla
51. boisterous
52. isthmus
53. anticipation
54. vertebrates
55. contemplate
56. heroine
57. unparalleled
58. inaccessible
59. colleague
60. medieval

Subtest 2 Reading Recognition
RAW SCORE CALCULATION
Ceiling item
Errors
Raw Score

Subtest 3 Reading Comprehension
RAW SCORE CALCULATION
Ceiling item
Errors
Raw Score

BASAL AND CEILING RULES:
Basal: 5 consecutive correct responses
Ceiling: 5 errors in 7 consecutive responses

STARTING POINT:
Raw Score on the Mathematics Subtest.

Ceiling item - Errors - Raw Score

RAW SCORE CALCULATION

Demonstration and Training Exercises
Trial Exercise A Exercise B Exercise C Exercise D
1 (3) (2) (4) (4)
2 (3) (2) (4) (4)
3 (3) (2) (4) (4)

BASAL AND CEILING RULES:
Basal: 5 consecutive correct responses
Ceiling: 5 errors in 7 consecutive responses

STARTING POINT:
Raw Score on the Reading Recognition Subtest.

See Manual, Part I, Calculating Raw Scores, for further instructions.
### Subtest 4: Spelling

**Demonstration and Training Exercises**

<table>
<thead>
<tr>
<th>Trial</th>
<th>Exercise A</th>
<th>Exercise B</th>
<th>Exercise C</th>
<th>Exercise D</th>
<th>Exercise E</th>
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<tr>
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<td>(3)</td>
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<td>(4)</td>
<td>(2)</td>
<td>(1)</td>
<td>(2)</td>
</tr>
<tr>
<td>3. (1)</td>
<td>(3)</td>
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<td>(2)</td>
<td>(1)</td>
<td>(2)</td>
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</tbody>
</table>

#### General Information

**BASAL AND CEILING RULES**

- **Basal:** 5 consecutive successes
- **Ceiling:** 5 errors in 7 consecutive responses

**Starting Point:**

<table>
<thead>
<tr>
<th>Trial</th>
<th>Exercise A</th>
<th>Exercise B</th>
<th>Exercise C</th>
<th>Exercise D</th>
<th>Exercise E</th>
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<td>2.</td>
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<td>(3)</td>
<td>(4)</td>
<td>(2)</td>
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</tr>
<tr>
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<td>(4)</td>
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**Raw Score Calculation**

- **Raw Score:** Total number of errors minus 5

---

### Subtest 5: General Information

**Demonstration and Training Exercises**

<table>
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<tr>
<th>Trial</th>
<th>Exercise A</th>
<th>Exercise B</th>
<th>Exercise C</th>
<th>Exercise D</th>
<th>Exercise E</th>
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<tr>
<td>3.</td>
<td>(1)</td>
<td>(3)</td>
<td>(4)</td>
<td>(2)</td>
<td>(1)</td>
</tr>
</tbody>
</table>

**General Information**

- **BASAL AND CEILING RULES**
  - **Basal:** 5 consecutive successes
  - **Ceiling:** 5 errors in 7 consecutive responses

---

**Ceiling Item**

- **Raw Score:** Total number of errors minus 5
a very conscientious countenance was one back a souvenir from a young man an extremely combustible extremely combustible counted her great embara- sson in spelling was out- used her great embar- rassment in spelling was out- sone in the lawyer's house surrepti- tiously into the house surrepti- tiously.

A solar eclipse occurs only in sunny weather, we go to the place would be an act of the young man an extremely combustible extremely combustible counted her great embar- rassment in spelling was out- sone in the lawyer's house surrepti- tiously into the house surrepti- tiously.

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