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A DESCRIPTION OF A POPULATION OF SCHOOL
VERIFIED LEARNING DISABLED CHILDREN IN THE
STATE OF MICHIGAN ACROSS CERTAIN SELECT
VARIABLES.

MICHIGAN STATE UNIVERSITY, PH.D., 1978

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OF SCHOOL VERIFIED LEARNING
DISABLED CHILDREN IN THE STATE
OF MICHIGAN ACROSS CERTAIN
SELECT VARIABLES

By

Robert Bernard

A DISSERTATION

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ABSTRACT

A DESCRIPTION OF A POPULATION OF SCHOOL VERIFIED LEARNING DISABLED CHILDREN IN THE STATE OF MICHIGAN ACROSS CERTAIN SELECT VARIABLES

By

Robert Bernard

Professionals faced with the responsibility of evaluating children to determine whether they have a specific learning disability do not have a clear concept of the term. The matter of definition has become more pressing with the establishment of PL 94-142, the Education for All Handicapped Children Act of 1975. Educators involved in the field have been charged with identifying those children with specific learning disabilities, yet there remains a persistent lack of a clear and workable definition.

The essential purpose of this study was to define a learning disabled population in the State of Michigan in relation to certain important variables. Specifically, an attempt was made to develop a formula which would provide maximum discrimination between children classified as learning disabled in the State of Michigan and four other populations (educable mentally impaired, emotionally impaired, otherwise-impaired and non-impaired). Also investigated

was the degree of overlap in characteristics between populations and the intellectual characteristics of the learning disabled children including the effectiveness of a formula (in identification of children placed as learning disabled) which is designed to measure discrepancy between expected achievement and actual achievement as measured by individually administered tests. The utility of the recategorization of the Wechsler scales as suggested by Bannatyne (1968) was also examined. Finally, the extent to which age, sex, socioeconomic status and professional opinions are relevant to the placement process was investigated.

Earlier investigations have often presented findings based upon limited samples. The present study employed a larger, less restricted sample of children drawn from 45 school districts throughout the State of Michigan. Rural as well as urban areas are represented. The study included four comparative groups in order to provide more meaningful results. It employed a statistical design which allows for the simultaneous analysis of a variety of variables.

In the present study, the characteristics of 1,129 children in grades 1 through 12, drawn from 45 Michigan school districts and representing four handicapped categories as well as one non-impaired category, were analyzed. The population of central interest was those children classified as learning disabled.

The data from this study can be summarized as follows:

1. The proposed discrepancy formula identified 37.8% of the learning disabled children while the 60% formula identified 25.9%.
2. The percentage of children identified by the formula varied across age range: 34.4% (4.6 - 8.11 years), 38.9% (9.0 - 11.11 years), 48.8% (12.0 - 14.11 years) and 25.7% (15.0 - 18.6 years).
3. The formula identified 57.4% of those with IQ's 90 or above and 23.9% with IQ's below 90.
4. While 41% of the males were identified, only 25.4% of the females were identified by the formula.
5. The formula identified 9.2%, 13.4%, 4.9% and 15.3% of the EMI, EI, otherwise-impaired and non-impaired children, respectively.
6. The learning disabled group pattern on the Wechsler scales was Spatial ($\bar{x}=9.15$), Verbal-Comprehension ($\bar{x}=8.33$) and Attention-Concentration ($\bar{x}=7.13$). This analysis was most powerful in discriminating between the learning disabled and EMI groups.
7. No evidence of an SES bias in the placement process was found.
8. The school psychologist and the consultant were in agreement as to learning disability placements 97.1% of the time.
9. A Discriminant Function was developed which predicted placement correctly 67.5%, 67.4% and 67.7% of the

time for the learning disabled, EMI and non-impaired groups, respectively.

10. The discriminating variables in order of power were: F.S.IQ, proposed discrepancy, Attention score, sex, Verbal score, SES and age. The Spatial score was not significant.

11. Wechsler subtests most powerful in discriminating between the learning disabled group and the non-impaired groups were: Arithmetic, Coding and Information. The learning disabled mean scores were significantly lower than the mean scores of the non-impaired group.

12. The intellectual characteristics of the learning disabled group were: Verbal IQ ($x=86.5$), Performance IQ ($x=91.8$), Full Scale IQ ($x=88.5$). These scores were significantly below those of the non-impaired group.

13. Achievement subtests most effective in discriminating between the learning disabled and non-impaired groups were: Word Recognition, Spelling and Arithmetic.

14. The number and percentage of learning disabled children at each successive age were: 85 (30.6%), 90 (32.4%), 64 (23.0%) and 39 (14.0%). The mean grade was 5.1 and the mean age was 10.8 years.

15. The ratio of males to females in the learning disabled group was 3.4 to 1.

16. Practitioners need to exercise caution in identifying children as learning disabled. No single test pattern or formula exists which identifies all such children.

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CHAPTER I

INTRODUCTION

Need for the Study

The importance of accurate and early identification of children with learning disabilities has been strongly emphasized for several years (Kirk and Bateman, 1962; Bannatyne, 1968; Bryan and Bryan, 1976). However, persons faced with the responsibility of evaluating children to determine whether they have a specific learning disability often do not have a clear concept of the term (Hallahan and Kauffman, 1977; Algonzzine and Sutherland, 1977).

While the field of learning disabilities is relatively young, there has been a rapid growth in the number of children being classified and served. After specifying the difficulties that are involved in estimating the incidence of learning disabled children, Kirk (1972) suggests that from one to three percent at the least, and possibly seven percent at the most, of the school population requires special remedial education (p. 45). Cruickshank (1977) quotes one outstanding elementary school principal as stating that 83% of her center-city elementary school pupils functioned as if they were perceptually handicapped. A report from the United

States Health, Education and Welfare Secretary's National Advisory Committee on Dyslexia and Related Reading Disorders (1969) stated that eight million children in America's schools will not learn to read adequately. With such a large number of the school age population experiencing school difficulties, the identification of children as learning disabled becomes of great concern.

The matter of definition has become more pressing with the establishment of PL 94-142. The law is known as "The Education for All Handicapped Children Act of 1975". Section 8 of the law specifies that the number of "countable" handicapped children from the ages of five (5) to seventeen (17) will be no more than twelve percent (12%). This ceiling includes all children classified as learning disabled as well as all other handicapping conditions. Consequently, there remains a very real question here as to who shall be served. It will be necessary to give consideration to the overlooking of children with learning disabilities (false negatives) and the misidentification of those who are not learning disabled (false positives). Since one error will increase as the other decreases, the practitioner needs to consider the risks involved in each type of error.

The issue of identification demands attention if one really does intend to serve the child experiencing school difficulty. Learning problems do not develop suddenly, rather, they are usually long and consistent histories (Keogh, 1970). Fitzsimmons (1969) reports that poorly

performing high school students and dropouts had already experienced their first failure in the elementary grades (50% by 2nd grade, 75% by 4th, 90% by 7th).

A lack of early identification and appropriate programming may aggravate any interaction between academic and social difficulties (Bannatyne, 1968; Call, 1970). The probability of a learning disabled child developing social or emotional difficulties is contingent upon many variables; two of the most important being the severity and chronicity of the handicap. Connolly (1971) believes that the longer a child has sustained the disorder without help, the greater the chance that emotional conflicts have developed and are interfering with his functioning (p. 157).

A major obstacle to early diagnosis is the persistent lack of a clear and workable definition of "learning disabilities". The term "learning disability" evolved from a need to identify and to serve a group of children who experienced school failure and yet eluded the traditional categories of exceptionality (Mercer, 1976). When asked to state specifically the kinds of students who are to be served, responsible individuals usually quote a definition similar to the one offered by the National Advisory Committee on Handicapped Children:

Children with special learning disabilities exhibit a disorder in one or more of the basic psychological processes involved in understanding or in using spoken or written language. These may be manifested in writing, spelling or arithmetic. They include conditions which have been referred to as perceptual handicaps, brain injury, minimal brain dysfunction, dyslexia, developmental aphasia,

etc. They do not include learning problems which are due primarily to visual, hearing or motor handicaps, to mental retardation, emotional disturbance or to environmental disadvantage (p. 4).

While definitions like this one allow broad general descriptions of children, they are too open-ended and subjective to be used as criteria for selecting individual students. Hammill (1976) points out that many of the words used in these definitions do not carry any precise meaning and that several of the ideas expressed or implied are currently surrounded by professional controversy. Questions arise as to the meaning of "basic psychological processes", "perceptual handicaps", "dyslexia" or "minimal brain dysfunction".

Definitions, often contradictory, abound. Lilly (1977) described a study by the Southern Educational Board, in which thirty-five (35) professionals in the field of special education responded to a request to define the term "children with learning disabilities". A total of twenty-two (22) separate terms were used by one or more of the respondents as an exact synonym for learning disorder. In a similar vein, Cruickshank (1972) compiled more than forty (40) terms used to identify essentially the same group of children.

While a variety of terms have been generated to describe learning disabilities, they remain untested. One is left with the impression that virtually any child with any problem falls within the domain of the learning disability specialist (Bryan, 1974). Others concur with Bryan. After reviewing the issue, Hammill (1976) concludes that "Regrettably, we have no completely suitable definition of learning

disabilities" (p. 10). And Cruickshank (1977) is even more pessimistic in stating that in his opinion "The situation is one of the worst in the total field of professional education" (p. 63).

An absence of a workable definition is a matter of concern to all. However, another part of the controversy in the field has to do with the use and misuse of labels. Two primary concerns here relate to a lack of appropriate programming subsequent to the labeling process and the use of labels to lessen the blame surrounding a child's school difficulties.

On the latter point, Ames (1977) remarks that:

Many parents today will tell you, almost smugly, that his or her child has a learning disability, as if the label more or less takes care of things. At least (implied) the parent is not to blame (p. 7).

Shepard (1975) also feels that if the child has a problem, parents want to be told that their child is learning disabled as opposed to another label or none at all. In effect, she sees the label as being viewed as an optimistic diagnosis by many parents and some professional educators. Paradoxically, there are those who resist this label on the grounds that it has no basis for optimism. They argue that there exists little or no relationship between initial diagnosis and later programming. These individuals present a strong case, one which is heavily reinforced in the literature (Hobbs, 1975).

One serious matter here relates to the problem of overlap of characteristics between handicapped populations. Clearly, certain distinctions, such as IQ differences between

educable mentally impaired and other children, can often be made. However, it is still true that those considered learning disabled, mildly emotionally impaired and mildly mentally impaired often share much in common (Huelsman, 1970; Hallahan & Kauffman, 1977). Research evidence demonstrates that it is extremely difficult to separate these children meaningfully into these categories. In addressing this issue, Bryan (1976) writes that learning disabled children:

...demonstrate varying degrees of competence with certain psychological processes. At the same time, the overlap of performance of these children with members of other diagnostic groups is likely to be great, possibly sufficiently great to preclude the use of this classification scheme for the purpose of individual diagnosis (p. 109).

What is needed at this point is an operational definition of children who are being defined as learning disabled. Perhaps Hammill (1976) has stated it best in saying that:

Like it or not, state education agencies and local education agencies are going to be required to set up criteria which are "objective" and which can be converted into numbers. Sitting idly by in the ivory tower hoping for a day when labels will be unnecessary and funding patterns will be different is "pie in the sky" thinking, and will not help those who face problems today (p. 36).

A clear statement is needed that reliably and consistently differentiates learning disabled children from those not so classified. Clarity, however, is only one aspect of an operational definition; the other is utility, i.e., it must be meaningful to later programming (Lerner, 1976).

One method which has been employed to assist in the differential diagnosis of learning disabled children from "normal" children is the WISC profile (Clements, 1964;

Jastak and Jastak, 1965). Two general lines of research have been followed. One has sought to determine whether learning disabled children may be discriminated from non-disabled children on the basis of discrepancy scores on the WISC. The second line of research looks to determine whether a pattern of subtest scores might be unique to children with learning difficulties (Bryan, 1976).

The principle of disparity, or discrepancy between expected and measured achievement, appears to be a key concept in definitions of learning disabilities (Myklebust and Boshes, 1969; Kirk, 1972; Myers and Hammill, 1976). The concept implies that the learning disabled child can be recognized by the presence of a meaningful difference between what he is capable of doing and what he is actually accomplishing; that is, a marked underachievement in school related or language activities. Bateman (1965), for example, defines children with specific learning disabilities as those who:

...Manifest an educationally significant discrepancy between their estimated intellectual potential and actual lack of performance related to basic disorders in the learning process, which may or may not be accompanied by demonstrated central nervous system dysfunction, and which are not secondary to generalized mental retardation, educational or cultural deprivation, severe emotional disturbance, or sensory loss (p. 220).

A number of formulas have appeared which have suggested ways of measuring this discrepancy. Kirk (1972) insists that one must establish "The growth pattern of the child in relation to his peers and the discrepancies in growth within

himself" (p. 35). Helmuth (1965) reports Bateman's definition which includes the use of common sense and experience. Bateman suggests that the child to be considered learning disabled should exhibit a discrepancy of approximately one and one-half years up to fourth grade and two years or more past fifth grade. In any case, Bateman insists a formula should include the factors of chronological age, mental age, background and years in school. Along these lines Myklebust and Boshes (1969) employ a formula which derives a "learning quotient" for psychological tests by dividing the age score on the test by the chronological age of the child. Presently, several states employ a discrepancy criterion as part of their definition of learning disabilities (Brenton and Gilmore, 1976; Danielson and Bauer, 1978).

The concept of scatter, i.e., intra-individual differences in subtest scores as measured by such instruments as the WISC, long thought to be a characteristic of children with learning disabilities, has been called into question (Huelsman, 1970; Kendor, 1972). Kaufman (1976) found, for example, that WISC-R profiles of "normal" children exhibit much scatter, probably more than most test users realize. Based upon this and previous research, Kaufman suggests that the examiner should exercise caution as to interpretations based upon specific subtest scatter and concentrate more particularly upon subtest patterns (Verbal, Perceptual, Freedom from Distractibility).

The concept of particular subtest patterns seems to

hold more promise for researchers. Specifically, recent literature indicates that a subtest pattern may be helpful in identifying the learning disabled child. This research dates back to the work of Witkin and his associates (Witkin, Dyk, Faterson, Goodenough and Karp, 1962) who drew on the earlier work of Cohen (1959). Cohen proposed that WISC subtests fall into three major factors that tap three relatively independent functions. In the most recent interpretation of this scheme (Kaufman, 1975), a Verbal-Comprehension factor is composed of Similarities, Vocabulary and Comprehension subtests from the Wechsler scale; an Analytic-Field Approach factor is made up of Object Assembly, Block Design and Picture Completion subtests; and an Attention-Concentration factor is composed of Arithmetic, Digit Span and Coding subtests. Individual differences in style of intellectual performance are presumed to be reflected in differences in patterning factor scores (Wills and Banas, 1976). Based upon additional research (Witkin, Faterson, Goodenough and Birnbaum, 1966; Keogh, 1971; Ackerman, Peters and Dykman, 1971; Rugel, 1974), the three factor approach to analysis of WISC performance appears promising.

Hall (1973) sees this analysis as particularly useful, as it goes beyond the standard Full Scale IQ and provides information which would be valuable in subsequent programming. He writes:

It is time to begin differentiating the teaching methods in order to see the emergence of real clinical teaching, where the goal is a precise match between the cognitive demands of the task.

Specification of particular areas of strength and weakness through the proposed process analysis may provide some direction for individualized program planning, thus increasing the usefulness of the WISC in psychoeducational evaluation (pp. 4-5).

The recent work of Keogh and her associates (1974), initiated to determine differences in performance between learning disabled children and other groups, has been encouraging. Of particular interest is that learning disabled children, as a group, appear to score lowest in attentional skills relative to their other subtest scores. Again, however, the question that needs to be addressed relates to overlap of characteristics. The number of false positives and false negatives that may be expected using this approach is of considerable importance.

In light of the investigations conducted using attention as a factor in school learning (Dykman, Ackerman, Clements and Peters, 1971), the use of WISC patterns is of particular interest. Dykman (in Myklebust, 1971) found that "hyperactive" children appear overattentive to their environment, whereas "hypoactive" ones are underattentive.

According to Lauria (1961), the effect of over or under attention on performance is the same. Torgesen (1977) interprets the poor performance of the learning disabled child on many tasks as a manifestation of their failure to develop the cognitive and emotional characteristics necessary to adapt to the requirements of a task such as active and efficient task strategies.

Tarver and Hallahan (1974) reviewed twenty-one (21)

studies on attention and found that the learning disabled as compared to controls are more distractible, have poor attention and are situationally hyperactive. Rugel (1974) reviewed twenty-five (25) studies which reported WISC scores. He found disabled readers to be highest in the Analytic category, intermediate in the Conceptual category and lowest in the Attention category. The last of these factors was reported to measure distractibility, attention and short-term memory. Similar results have been reported by others (Witkin, 1966; Bannatyne, 1968; Keogh, 1974).

It appears that attention may very well be a factor that could be effective in the identification of learning disabled children. The possibility of its effectiveness in both identification and remediation of learning disabled children is apparent. However, one needs to consider the extent to which other children such as the emotionally disturbed, mentally impaired and culturally disadvantaged may also be inattentive.

The difficulties involved in the differential diagnosis of learning disabled children and the generic use of the term has raised other important questions as to who shall or shall not be served. These questions concern the factors of IQ, age, sex and socioeconomic status.

The issue of IQ is much debated. While some, such as Cruickshank (1977), assert that IQ should not be a consideration in any diagnosis, others (Ames, 1968; Shepard, 1975) caution that a distinction must be made between the learning disabled and the traditional "slow learner". Ames (1977)

points out that too often those classified as learning disabled are simply overplaced and inevitably fail. She writes that:

It is evident that as intelligence testing and the use of IQ scores becomes less acceptable and less prevalent, the label "learning disabled" has become more comfortable than the label "low intelligence" especially to those parents whose children have low or modest intelligence (pp. 7-8).

Shepard (1975) reinforces this position and warns that adult expectations may not be consistent with the child's ability and may cause erroneous decisions about the type of instruction a child needs, the rate at which learning occurs and the standards of performance a child can be expected to maintain. Recent investigations have found children with learning disabilities to be scoring approximately one standard deviation below the means on standard intelligence tests (Kirk, 1975).

Sex (maleness) has long been seen as a factor related to school difficulty. In reviewing the characteristics of 3,000 children with learning disabilities in 21 states, Kirk (1975) found a sex ratio of three boys to one girl. Findings which reflect a disproportionate percentage of males to females appear consistent (Brenton and Gilmore, 1976; Caplan, 1977).

One final issue in the identification of children with learning disabilities has to do with socioeconomic status (SES) and the placement process. While many students of low socioeconomic status (LSES) experience school difficulty (Telegdy, 1974), there remains the question of whether SES

itself, and not school difficulty per se, is a significant influencing factor in the placement process. The category of learning disability has been accused of being primarily a middle or upper class (USES) phenomenon (Dunn, 1968). Specifically, critics contend that when the choice of classification is learning disabled or educable mentally retarded (EMR), a SES bias influences the placement of LSES children into the latter category (Burke, 1975; Franks, 1977).

Clearly, the Education for All Handicapped Children Act (PL 94-142) contains a clause which excludes those from eligibility as learning disabled if school difficulty is found to be "primarily due to cultural disadvantages". However, this should not preclude the classification of a proportionate number of LSES as learning disabled. It is true that specific learning disorders of the disadvantaged child and the subsequent low degree of scholastic success have long been considered, at least in part, a result of poverty. However, while poverty creates a milieu for the development of childhood learning disorders, it is not necessarily the definitive, singular cause (Kappelman et al., 1969). Overlooked here may be the fact that the LSES child is particularly high risk from the aspects of prenatal deprivation, birth injury, nutritional deficit, childhood accident and chronic illness (Kauai and Pasamaneck, 1958). In effect, the incidence of learning disabilities may be greater in low socioeconomic areas (Kealy and McLeod, 1976).

It remains necessary to explore the socioeconomic

characteristics of handicapped children. While no cause-effect relationships can be established, it seems essential for educators to be cognizant of any possible bias effects in the placement of handicapped children. The fact that children whose disability is found to be primarily the result of environmental, cultural or economic disadvantage makes the issue of socioeconomic status even more sensitive. Those making placement decisions need to guard against a bias effect while being careful to comply to the exclusionary clause.

The area of multi-disciplinary team decision making has come under increased investigation lately (Fenton et al., 1977; Fenton et al., in press). Some of these studies have found that a perfect balance and check system does not necessarily work as well as many had expected it might. Since this entire process may be at least as important as the characteristics of the children being placed, it remains necessary to investigate how effectively it functions. To the extent to which the available data allows, the placement process will be examined in this study.

Children with learning disabilities constitute a relatively recent addition to the field of education. Because interest in these children has developed so rapidly in the last fifteen years, educators may be confused about limits of the classification and characteristics of those being served. The need to clarify definitions in this area could never be more pressing since school districts are now charged with the task of providing education to all handicapped

children under PL 94-142 as well as PA 198 in the state of Michigan.

What appears to be needed at this time is a study which statistically defines a population of children being classified as learning disabled. An attempt to quantify some of the most widely accepted beliefs in this field could be of both theoretical and practical importance. If an operational definition of children with learning disabilities can be established, this would be valuable to those in the field charged with the responsibility of identifying and serving these children. On the other hand, if current concepts about children with learning disabilities do not hold up under empirical investigation, then some important questions are raised as to who is or is not being identified and served. Hence, a study describing selected characteristics of a learning disabled population is most appropriate at this time.

Purpose of the Study

The purpose of this study is to define a learning disabled population in the State of Michigan in regard to certain important variables. The learning disabled population will be compared to four other groups having been identified by the Education Placement and Planning Committee (Michigan Special Education Code), using the State of Michigan Criteria for the identification of the handicapped. The five groups are as follows:

1. Learning Disabled
2. Educable Mentally Impaired

3. Emotionally Disturbed
4. Other Impairment
5. No Recognized Impairment

The six major purposes of this study are: (a) to attempt to develop a formula which provides maximum discrimination between the learning disabled (SLD) and other populations, (b) to determine the degree of overlap in characteristics between SLD and other children, (c) to investigate the extent to which the State of Michigan's discrepancy guidelines identify SLD, (d) to assess the characteristics of SLD on the WISC-R as suggested by Bannatyne (1968), (e) to investigate the extent to which age, sex and socioeconomic status are relevant to the identification of handicapped children, and (f) to measure the degree of congruence between the opinion of the school psychologist and the learning disabilities consultant as to the placement of a child.

Organization of the Study

In Chapter II, a review of the pertinent literature is presented, including a brief discussion of socioeconomic status and the placement process and previous research relating to this issue. Detailed in Chapter II is the design of the study. The results are presented in Chapter IV. Chapter V includes a discussion of these results and Chapter VI contains a summary of this study and the conclusion.

CHAPTER II

REVIEW OF THE LITERATURE

In this chapter, the literature pertinent to the present study is reviewed. Examined first are previous studies that have investigated the characteristics of children classified as learning disabled. This section is subdivided into studies examining (a) general characteristics, (b) discrepancy formulas, (c) profile analysis and (d) attention. Then relevant studies related to socioeconomic status and the special education placement process are presented.

Learning Disability General Characteristics Studies

Meier (1971) conducted both a pilot study and a major study to determine the prevalence and characteristics of learning disabilities as found in a total of 110 second grade classrooms located in eight Rocky Mountain states. The pilot study was conducted in all 30 of the second-grade classes of the Greeley Public Schools in Greeley, Colorado. The second study was conducted using instruments and procedures which were refined as a result of the original study. The pilot study found approximately 100 children of average or above average intelligence to be at least one year retarded in reading. On the basis of an 11% prevalence figure, the second

research design was established.

The major study included a screening of 2,400 students, ages seven to eleven, in eight Rocky Mountain states. They were children reported by their teachers as having unusual difficulty in learning and who were observed with the Classroom Screening Instrument (N=478). Ultimately, 284 were tested and compared to a normal sample (N=87) selected from the same population.

The experimental group as compared to the control demonstrated significantly greater discrepancy between expected and actual achievement using the formula proposed by Myklebust (1968). This formula is designed to take into account the child's mental age, his chronological age and his school experience in order to arrive at an expectancy age which, in turn, may be divided into the child's performance age for various specific behavioral dimensions such as reading, spelling and arithmetic. Additional variables, which were entered into calculation of these overall learning quotients, are those suggested by Bannatyne (1968). (Findings are reported in Table 2.1.)

Deficiencies in the Meier (1971) study include the use of the term learning disabled to a sample of students who were referred by teachers as having learning problems. The extent to which these children may or may not be learning disabled is unclear. The study does not report the degree to which these children's difficulties were due to social or emotional problems. In addition, a number of children

Table 2.1 - Results of the Meier study of characteristics of learning disabled children.

Variable	Mean	
	Exp.	Control
Chronological Age (months)	101.95	101.51
Grade Age (months)	96.00	96.00
Mental Age (CA X IQ)	97.43	102.00
Expectancy Age $\frac{(MA + GA + CA)}{3}$	98.50	99.86
Test Administered		
1. Perceptual Quotient (DTVP)	89.48	104.94
2. Language Quotient (ITPA)	90.73	99.00
3. Cognitive Quotient (WISC)	97.52	100.74
4. Visual-Motor Quotient (VMI)	99.34	110.05
5. Articulation Quotient (Temp-D)	103.70	106.85
6. Reading Quotient (WRAT)	90.32	105.79
7. Spelling Quotient (WRAT)	88.38	99.03
8. Arithmetic Quotient (WRAT)	90.30	94.95
Results		
Spatial Score $\frac{(PC + BD + OA)}{3}$	96.01	100.69
Conceptualizing $\frac{(Comp + Sim + Voc)}{3}$	102.29	103.53
Sequencing $\frac{(DS + PA + Coding)}{3}$	89.98	101.80
Learning Quotient $\frac{(\text{Sum of 1 thru 8})}{8.00}$ Expectancy Age	94.79	101.60
Verbal IQ	97.43	100.56
Performance IQ	96.10	101.23

were not included as teachers and/or school districts refused to participate in the study. The study is important, however, in that it involved subjects randomly selected from eight states and included indices of both discrepancy scores and WISC subtest scores.

Kirk and Elkins (1975) reported on the characteristics of over 3,000 children enrolled in the Child Service Demonstration Centers for learning disabilities in 21 states. They were concerned about the practice of each state developing its individual programs in conformity with its own concept of learning disabilities. This study provided the opportunity to study empirically the various kinds of children admitted to these federally funded projects.

Kirk and Elkins found the bulk of the children to be in the lower elementary grades, with a median chronological age of 8 years, 10 months. The lowest mean age for any state was 7 years, 2 months. Only three projects dealt exclusively with secondary age children. The mean IQ of the children ranged from 83 to 105, with a median IQ value of 93. Approximately 35% of the children had IQ's below 90, as compared to an average population where 25% were below 90. The sex distribution among the states was fairly consistent, with approximately 3 boys to 1 girl receiving services. The median percentage of children being served was 4% of the population.

Those whose problems were primarily with reading comprised 62% of the subjects, while 29% had problems primarily

in arithmetic and 23% were disabled in spelling. The children were 1.7 grades retarded in reading, 1.2 grades retarded in arithmetic and 1.8 grades retarded in spelling. When mental age was compared to reading grade expectancy (MA minus RA), the children were one grade retarded in spelling.

One important conclusion was that some children were being served as learning disabled who were underachieving for any number of reasons other than being learning disabled. Some of the children might better be served as slow learners or disadvantaged rather than learning disabled.

Limitations of the Kirk and Elkins study include the failure of one-half of the funded projects to report, the fact that many reporting projects were not yet well established, the use of different methods of determining the intellectual level of the children by each project and the possibility of self selection in reporting data by the projects. Additionally, Kirk and Elkins did not calculate discrepancies between capacity and achievement from mental age for each individual child. They reported a group estimate which leaves the question of overlap of characteristics unanswered. Nevertheless, the reported results are important because of the large sample size and its distribution across states. It appears the most comprehensive study of its kind to date.

Mercer et al. (1976) examined the results of a survey of 42 state departments of education regarding their respective definitions of learning disabilities; they attempted

to operationalize the definitions. The authors' research reflects their concern as to the lack of a standard accepted definition of learning disabilities throughout the country.

Results of the analysis of the state definitions reflect the generic nature of the term "learning disabilities". These results have been included in Table 2.2. While some criteria, such as the inclusion of a process and language disorder, were reported from a large majority of the states (85%), as was an exclusion category (61.9%), more often there appeared little consensus between the states. For example, intelligence was not stated in the majority of the state guidelines (54.8%) and academic achievement was not included as a consideration from many states (26.2%). Mercer et al. (1976) expressed concern about the fact that most states listed descriptive criteria for identifying learning disabled children but have not operationalized these definitions in terms of explicit criteria such as test scores. For the most part, they identify learning disabled children on the basis of the expert opinion of an interdisciplinary team. This, too, is troublesome, as recent studies (Yoshida et al., 1977; Fenton et al., in press) demonstrate that the system of balances and checks in a team approach is often not as effective as has been previously expected. Furthermore, the formulation or revision of learning disabled definitions reported by most states had occurred recently. The authors concluded that there is a nationwide concern as to the best method of defining the target populations which are included

Table 2.2 - Summary of Mercer et al. (1976) study.

COMPONENTS	NO. OF STATES	PERCENT
Definition		
Nat. Adv. Comm. Hand.	9	21.4%
NACHC with variations	15	35.7%
Different	16	38.1%
None	2	4.8%
Intelligence		
Average and above	11	26.2%
Above mental retardation	8	19.1%
Not stated	23	54.8%
Process		
Process disorder	36	85.7%
Language disorder	35	83.3%
Academic		
Reading	31	73.8%
Writing	31	73.8%
Spelling	31	73.8%
Arithmetic	31	73.8%
Exclusion - primary		
Visual impairment	26	61.9%
Auditory impairment	26	61.9%
Motor impairment	23	54.8%
Mental retardation	21	50.0%
Emotional disturbance	25	59.5%
Environmental disadvantaged	23	54.8%
Exclusion - primary & secondary		
Visual impairment	3	7.1%
Auditory impairment	3	7.1%
Motor impairment	2	4.8%
Mental retardation	11	26.2%
Emotional disturbance	1	2.4%
Environmental disadvantaged	1	2.4%
Neurological Impairment		
Included	4	9.5%
Not included	0	.0%
Possible	26	61.9%
Not stated	12	28.6%
Affective		
Includes emotionally disturbed	4	9.5%
Includes socially maladjusted	6	14.3%

Table 2.2 (cont'd.)

COMPONENTS	NO. OF STATES	PERCENT
Miscellaneous		
Attention deficits	5	11.9%
Motor deficits	7	16.7%
Thinking deficits	30	71.4%
Discrepancy component	12	28.6%
Special education required	14	33.3%
Intraindividual differences	4	9.5%
Prevalence	2	4.8%
Chronological age	4	9.5%

under the term learning disabled.

Limitations to the Mercer et al. (1976) study include the failure of eight states to participate and the reporting of group, rather than individual, characteristics. The extent to which these state guidelines are adhered to is uncertain. The study is important, however, as it underpins the lack of consensus as to the nature of what constitutes a learning disability. It suggests the need to continue research which may better help to operationalize a definition for the identification and programming of learning disabled children.

Evans and Smith (1977) examined the behavioral characteristics of 60 children referred for psycho-educational evaluation (49 boys, 11 girls) as reported by parents. They hoped to determine if shared perceived characteristics existed. All children had F.S.IQ's greater than 85 and ranged in age from 6 to 13 years. Each was from middle or upper-middle socioeconomic backgrounds. Frequency of most often behavioral characteristics (15 instances or more)

reported are as follows: sensitive to criticism (57%), short attention span (50%), easily discouraged (48%), stubborn (32%), daydreams (30%), show offs (25%) and overly dependent (25%). Evans and Smith conclude that the notion that distractibility is intimately involved in SLD or MBD as a cause and/or effect is supported. They are uncertain as to whether this is related directly to central nervous system dysfunction, a symptom of emotional disturbance, or both. In any case, they believe that the constellation of behaviors found may well be the effect of continued school failure rather than the cause.

Deficiencies in the Evans and Smith (1977) study include a limit to the generalizability of results due to the subjective nature of reporting procedures. Parental observation may be subject to any number of distortions. Additionally, the sampling of subjects and the absence of a control group further limit the results.

Becker (1978) attempted to determine the efficacy of mixing learning disabled and mentally retarded children into one generic category. The author noted that a review of the literature revealed a limited number of studies directly comparing educationally handicapped (learning disabled and emotionally disturbed) and educable mentally retarded children, and no data base studies examining the possibility of combining or keeping separate the two groups of children. Subjects selected for participation in this study were 40 educationally handicapped and 20 educable mentally retarded

children. They were randomly selected from special education classes for children 9 to 13 years of age in a large metropolitan school district in Southern California. Each subject was tested individually during two 30 minute testing sessions by graduate students in education from the University of California.

Results indicated significant differences between the groups in mental age and IQ consistent with current definitions. Differences in sex distribution were also noted. The educationally handicapped sample was predominantly boys, while the number of boys and girls in the educable mentally retarded sample was smaller. Also, the mentally retarded children were 1 to 2 years older than the educationally handicapped children. Test results favored the educationally handicapped group over the mentally retarded group on the Digit Span subtest and the Raven's Progressive Matrices. Additionally there was a 15 point difference in IQ between the two groups. The authors conclude that substantial differences do exist between these groups and the underlying assumption of homogeneity or overlap in characteristics in proposed generic grouping is questionable. They believe that the results, taken as a whole, may be interpreted to indicate some basic differences in problem solving strategies and learning characteristics between the groups.

The results of the Becker (1978) study were limited in that both learning disabled and emotionally disturbed children were included in one category. If results had been reported

separately for these two groups it would have been of greater utility. The study is important, however, in addressing the important and current issue of homogeneity of characteristics between different handicapped groups.

A summary of the major findings of studies describing the characteristics of children classified as learning disabled is presented in Table 2.5. While not entirely consistent, these studies do reveal certain trends. These children appear to have a mean age of approximately 8.5 years and are more often males than females. As compared to controls they score lower on both intelligence tests and achievement tests and exhibit a substantial discrepancy between actual and expected achievement. Language difficulties are often present as well.

Discrepancy Formula Studies

McIntosh (1974) attempted to determine if a ratio could be applied to WISC scaled scores which would effectively differentiate children with neurological dysfunction from normal children. The ratio involved summing WISC scaled scores of Picture Arrangement, Picture Completion and Block Design, dividing the total score by three and subtracting one. The derived relationship is then used to obtain a Rating Equivalent from published norms previously used with adult populations. The study involved two samples. The experimental sample consisted of 20 subjects, 14 boys and 6 girls ranging in age from 9 years to 14 years, 10 months ($\bar{x}=11.6$) and

ranging in IQ from 61 to 113 ($\bar{x}=79.9$), selected from a larger sample of children identified as having neurological dysfunction. The control group consisted of 20 subjects, 14 boys and 6 girls (age range 9.0 to 16.5, $\bar{x}=11.3$, $\bar{x}IQ=79.3$, range 67-97) evidencing no history of neurological dysfunction.

In comparing the index scores derived from the WISC, 30 of 40 subjects (15 brain damaged; 15 control) were correctly identified. The author concluded that these findings suggest that this scaled score relationship may be a valid index of brain dysfunction in children. He also concluded that the index appears to be sensitive to organic dysfunction in either cerebral hemisphere.

Deficiencies in the McIntosh (1974) study include the need to verify the proposed index in discrimination between brain-damaged children and emotionally-disturbed, functionally dyslexic and other non-brain-damaged exceptional children. Additionally the study employed a sample which may not be representative since it was limited to children at the Crippled Children's Service. Also, WISC subtest scaled scores and indexes for each child are not reported. Thus, the degree to which the index does discriminate is not entirely clear. The study is of interest, however, in that it presents a discriminating ratio which resembles the three factors as proposed by Bannatyne (1968) and others. In effect, it lends additional support to looking at the difference between the WISC factor called Spatial and the Digit Symbol subtest which is part of Bannatyne's attention factor.

Brenton and Gilmore (1976) attempted to develop an operational definition of discrepancy between expected and actual achievement to assist in identifying learning disabilities in the cognitive domain. The subjects were all children (N=60) who had been placed in the seven elementary resource rooms for learning disabled within one county in Michigan. This was 1% of the total elementary school population. The WISC and the PIAT were administered. Each child's expected achievement was calculated using the formula suggested by Dunn and Markwardt (1970). This is accomplished by calculating the adjusted MA, using the formula, adjusted MA IQ/100 x CA. The 60 children were dichotomized into the categories "may be learning disabled" - an educationally discrepant score on one or more relevant subtest - and "may not be learning disabled" - no educationally significant discrepant subtest scores. They defined an educationally significant discrepant score as any score which fell below the lower limits of the adjusted MA (calculated at the 95% level of confidence).

Using the discrepancy index as the criterion, 40, or 67% of the 60 children were classified as learning disabled, while 20, or 33%, were classified as "may not be learning disabled". The 40 children constitute 2/3 of 1% of the total elementary school population. Separating the children by sex, 37, or 74% of the males and 3, or 30% of the females were classified as may not be learning disabled. This suggests that unusual caution should be exercised when

considering eligibility of females for learning disabled programs. Brenton and Gilmore warn that the discrepancy index developed here functions effectively in identifying less than 1% of a given elementary school population, in the cognitive domain. They stress considerable caution in using this index as 25% to 33% of the children measured were not considered to be learning disabled in the cognitive domain.

Deficiencies of the Brenton and Gilmore (1976) study include the limitations to the generalizability of the results because of the small, restricted sample of subjects. In addition, no control group was included in the study, the WISC rather than the more widely used WISC-R was employed and WISC subtest results were not reported.

An important finding, however, is that the discrepancy formula worked less well for females as compared to males. The finding also supports the contention that in some cases children being served as learning disabled may actually manifest more generalized learning problems (Ames, 1968).

Grill (1977) attempted to determine the characteristics of adolescents found to be learning disabled. The criteria as suggested by Wiederholt was used as the basis of this study. This criteria includes academic achievement below second grade level, measured IQ of not less than 85 and no severe emotional or attendance problems. Subjects were 231 adolescent students from five school systems currently identified as learning disabled. Complete information was available for 136 of these students.

Overall, usable data were available on a total of 161 students already identified as learning disabled pupils. Of these, 29 (18 percent) met all or nearly all criteria specified by Wiederholt and an additional 16 were probably learning disabled candidates, for a total of 45 (27.95 percent) students. The authors conclude that an obvious incongruity exists between proposed identification criteria and observed characteristics of learning disabled adolescents. One factor here may be related to the criteria itself. Many of these children were classified based upon a two year disparity between expected and actual achievement, a procedure that Grill finds inadequate. Grill believes that Weiderholt's criteria is more realistic than a simple two year discrepancy. Additionally, the author proposes that many of these students are mislabeled. Results indicated that a number of the students did not even exhibit a two year discrepancy and that others were reported to have measured IQ's in the mentally retarded range. Taken together these findings suggest that a large number of adolescent students were classified as learning disabled and yet did not meet even the minimum criteria for such classification.

Results of the Grill (1977) study are limited in that much of the data was incomplete. Only 136 of the original 231 subjects had complete profiles. Additionally, the author's presentation of the results leaves important gaps. He fails to report IQ ranges, tests used and precise achievement levels for the subjects. His study does stand, however,

as one of the few specifically designed to determine the characteristics of adolescent learning disabled students.

Danielson and Bauer (1978) attempted to field test a formula which called for a 50% discrepancy between actual achievement and expected achievement as a criterion for placement as learning disabled. With the passage of the Education for All Handicapped Children Act, the Bureau of Education of the Handicapped (BEH) was charged with the task of establishing regulations for the enactment of the new law. This study was an important consideration in the ultimate decision to drop a specific discrepancy criterion from the federal regulations.

To examine the applicability of the proposed formula, the authors obtained information from 14 existing data bases. These samples ranged in size from 30 to 2,428. Results demonstrate that, when the 50% formula was applied, between 38% and 95% of the subjects still qualified as learning disabled. With the largest single sample (N=2,425), 59% of the subjects met the criterion. Across all data bases in the analyses, 58% of the children currently classified as learning disabled were classified as learning disabled by the formula.

Results also suggest that among those children not currently classified as learning disabled, 8 to 12% were classified as learning disabled by the formula. The authors found no clear variations across IQ levels. These distributions were found to be irregular and to vary considerably

from one data base to the next. However, they did find that children were not uniformly distributed across age levels. It was concluded that children under eight years old were somewhat more likely to be identified as learning disabled by the formula than older children. The authors conclude that the proposed discrepancy formula could be effectively implemented and suggest that it would produce more uniformity in the identification procedures. They warn, however, that variation in the way the procedure might be implemented (e.g., tests used, number of areas tested) could produce large variation in prevalence.

Limitations to the Danielson and Bauer (1978) study include the use of data collection which was post hoc. Only two data bases included an urban area; a wide range of tests was used to measure achievement; not all children were administered the same number of tests; and in some cases, the population from which the sample was drawn was not known. However, the study remains the most comprehensive of its type to date and was important in drawing up the final federal guidelines for eligibility as learning disabled.

Results of studies examining the discrepancy between actual and expected achievement demonstrate much variability in findings. These studies effectively identified from 38 to 95% of the samples. The success of such formulas may be a function of the original sample, the criterion or the manner in which it is applied such as the number and type of tests used. Generally however, the findings suggest that

these children often do demonstrate a discrepancy between expected and actual achievement.

Profile Analysis Studies

Huelsman (1970) analyzed subtest patterns of 101 "under-achievers" and 56 "achieving" fourth grade readers and results were contrasted with those from 20 previously published studies. After his review of the earlier studies, he concluded that a pattern of low WISC subtest scores was characteristic of poor readers despite differences in procedure, design and subjects. Specifically, the disabled-reader pattern would indicate low scores on WISC subtests of Information, Arithmetic and Coding; low scores on each subtest appeared in 16, 20 and 19 of the 20 studies, respectively. Low scores in Digit Span and high scores in Picture Completion appeared in 12 and 10 of the 20 studies. Additionally, his review revealed that high Performance IQ scores in relation to Verbal scores appear in about 60% of the disabled readers.

Huelsman's (1970) own study compared WISC subtest scores of underachievers to that of achieving students selected across 27 school districts. Underachievement was defined as having a reading score at least 1 year and 5 months below expectancy. The comparison of the numbers (and percentages) of underachievers with achievers who had low Information, Arithmetic and Coding subtest scores led him to conclude that the pattern is characteristic of the group. He cautioned,

however, that while characteristic of the group, the profile does not allow a conclusion as to individual underachievement.

Deficiencies in the Huelmsman (1970) study include the absence of a specifically defined learning disabled population and the use of a population which was initially referred for evaluation due to underachievement. However, the study and the review do provide evidence that low scores on WISC subtests of Information, Arithmetic, Coding and Digit Span do characterize disabled readers as a group.

Ackerman et al. (1971) examined the WISC profiles of children with specific learning disabilities (SLD) and compared them with a control group of 34 males who had a history of adequate academic performance. The SLD children were 82 caucasian boys ranging in age from 8 years to 11 years, 11 months; the control group were 34 caucasian boys with a median age of 10 years, 6 months. All subjects were screened to eliminate those whose history of school failure was determined to be primarily due to emotional impairment or cultural deprivation. Each child was administered the WISC, the Gray Oral Reading Test and the Bender-Gestalt Test. Two dimensions of special interest within the SLD population were activity level and neurological maturity. The authors hoped to determine characteristics which could be used to refine classification of SLD, provide more accurate identification procedures, and for more effective instruction.

The SLD children scored lower, on the average, than the control group, particularly on WISC subtests of Arithmetic,

Digit Span, Information and Similarities. For 29 CLD-control pairs, matched for chronological age and mental age, the verbal superiority of the control group was more rigorously demonstrated. A summary of these results is presented below.

- (1) Full Scale IQ - Control 111; CLD 104
- (2) Verbal IQ - Control 114; CLD 103
- (3) Performance IQ - CLD reported as superior to controls
- (4) 15 of 22 CLD with full scale IQ greater than 110 had mild to severe reading difficulties
- (5) CLD showed a significant discrepancy (greater than 15 points) between verbal and performance WISC scores than did controls
- (6) CLD showed no greater (perhaps less) WISC subtest scatter than controls
- (7) CLD were reliably lower than controls in WISC subtests of Information, Similarities, Arithmetic and Digit Span
- (8) WISC subtests of Information, Comprehension, Arithmetic, Digit Span and Block Design separated the two groups (76%) as effectively as all 10 subtests
- (9) Neurological status was unrelated to WISC or Gray Oral Reading scores
- (10) Severely disabled readers could not be separated from mildly disabled readers

Deficiencies in the Ackerman et al. (1971) study include the failure to report the criteria upon which the CLD group had been previously classified. In addition, subjects were arbitrarily classified by neurological test findings despite an absence of norms, the study did not include female subjects, nor did it include those with a Full Scale IQ below 90, despite the fact that learning disabled children may be found at any intelligence level. Further, the amount of overlap between samples would be too great to be of much diagnostic significance. Finally, the differential validity of the results is limited in that no comparison was made between the learning disabled sample and other handicapped

groups such as the mentally impaired or emotionally impaired. However, this study is one of the more comprehensive in terms of attempting to define the intellectual characteristics of learning disabled children.

Keogh et al. (1973) analyzed the WISC subtest scores of three independent samples: students in classes for educable mentally retarded (N=26), children considered serious learning and behavior problems (N=24) and a sample referred for hyperactivity and learning problems (N=26). All subjects had been given intelligence tests as part of a diagnostic evaluation. Scaled scores for WISC subtests were analyzed as suggested by Witkin (1966). It was hypothesized that WISC subtests would reflect process or functional aspects of intellectual performance.

Keogh found the EMR means to be clearly different from the two learning disabled groups. The patterns for the EMR sample showed lowest mean scores on Verbal-Comprehension subtests and highest mean scores on Analytic subtests. These differences were consistent with findings reported by Witkin et al. (1966). In contrast to the EMR sample, both learning disabled groups were adequate in Verbal and Analytic abilities; their lowest scores were on Attention-Concentration items. This pattern was especially noticeable for children referred with a major complaint of hyperactive behavior (LD-HA sample). Keogh proposed that this provided support to the role of attentional difficulties in learning problems. Differences for the LD-HA sample were not reflected in WISC

Verbal-Performance IQ's, masking functional differences. A summary of these results is presented in Table 2.3.

Deficiencies in the Keogh et al. study (1973) include the inclusion of the Information subtest rather than the Similarities subtest in the Comprehension factor, the absence of certain individual subtests and the use of a sample drawn from a private facility. In addition, generalizability of results are limited in that the learning disabled population is not defined in terms of placement criteria. Furthermore, the study does not address the issue of overlap of characteristics between the groups. The study does, however, lend substantiation to the hypothesis that learning disabled children exhibit a unique pattern of WISC subtest scores which could have implication in terms of both identification and remediation.

Keogh and Hall (1974) conducted a subsequent study to investigate patterns of WISC performance of 157 children classified educationally handicapped (F.S.IQ: males - 96, females - 91) and educable mentally retarded (F.S.IQ: males - 71, females - 70). The authors hypothesized that true differences between the groups that might be masked by the traditional WISC Verbal-Performance IQ's might be more adequately detected by analysis of WISC patterns as suggested by Witkin (1966). Scores were analyzed for possible differences between groups as well as to identify within group patterns of performance.

Results of this study with public-school special

Table 2.3 - Results of the Keogh et al. study comparing WISC profiles of EMR, LD and LD-HA students.

MEANS AND STANDARD DEVIATIONS OF VERBAL-COMPREHENSION, ANALYTIC-FIELD-APPROACH, AND ATTENTION-CONCENTRATION FACTOR SCORES FOR EMR, LD, AND LD-HA GROUPS

Sample		Verbal		Analytic		Attention	
		M	SD	M	SD	M	SD
EMR	(N=26)	17.04	3.41	21.78	5.09	18.15	4.51
LD	(N=24)	31.83	8.35	32.46	7.30	28.25	9.13
LD-HA	(N=26)	31.08	5.80	34.23	5.87	25.69	3.97

MEANS AND STANDARD DEVIATIONS OF AGE AND IQ BY SUBSAMPLES

Sample	N	CA (Months)		VIQ		PIQ		FSIQ	
		M	SD	M	SD	M	SD	M	SD
EMR	26	140.0	14.99	73.07	5.90	80.52	10.40	74.26	7.67
LD	24	121.7	16.53	102.46	15.37	103.21	15.58	103.13	15.62
LD-HA	26	118.0	20.90	103.38	11.76	104.62	13.25	104.12	10.83

education pupils confirmed and expanded previous findings of WISC patterns identified with selected samples of children in private educational facilities (Keogh et al., 1973). For the EMR pupils, the Verbal-Comprehension score was consistently lower than either the Attention or Analytic scores. Second, the consistent finding of poor Attention-Concentration scores for EH boys with average or better IQ was seen as underscoring the importance of attention in learning problems. Although there were no significant differences across index scores for EH girls, the mean value for EH girls' attention scores was similar to that of EH boys. Keogh and Hall took this to mean that both EH boys and EH girls may have attention problems. In the case of boys, the low Attention scores relative to higher Analytic and Verbal-Comprehension scores suggested the possibility of a specific attention problem. In the case of EH girls, Attention as well as the Verbal and Analytic scores were low which suggests a broader and possibly more pervasive problem. Results of this study are presented below.

MEANS AND STANDARD DEVIATIONS OF INDEX SCORES FOR
EH AND EMR GROUPS BY SEX

EH							
	N	Verbal- Comprehension		Attention- Concentration		Analytic Field Approach	
		M	SD	M	SD	M	SD
EH							
Boys	125	28.23	6.38	25.03	5.15	29.87	6.58
Girls	32	25.50	6.10	25.09	5.45	26.28	4.55
EMR							
Boys	47	16.47	4.27	17.11	4.55	20.91	6.25
Girls	36	16.64	4.04	18.67	4.70	18.31	3.85

Limitations of the Keogh and Hall (1974) study are similar to their previous study and include the use of the Information rather than the Similarities subtest, the failure to report statistical overlap of the test results and the inclusion of an educationally handicapped rather than a learning disabled sample.

The EH category in California includes pupils who are average or above in intelligence and exhibit serious school problems associated with neurological impairment, emotional disturbance or behavioral disorders. The generic nature of this category limits the generalizability of the results. This limitation is confounded by the use of a unified urban sample and the absence of below average IQ pupils. It is important, however, in that it confirms and expands the appropriateness of the three factor analysis of WISC profiles for diagnostic and remedial purposes.

Rugel (1974) reviewed the WISC subtest scores of twenty-five studies of disabled readers in terms of Bannatyne's suggested (1968) recategorization. These studies involved 27 populations where the usual criterion for a reading disability was two or more years below the expected reading level as measured by standardized tests. He also factor analyzed previous research in order to determine if justification existed for Bannatyne's (1968) recategorization. On the basis of these studies, he concluded that this justification did exist as three categories rather than two emerged. In all studies, both a Verbal and a Spatial factor were

apparent; a third factor called Distractibility or Attention was also found. The one exception, however, was that Picture Arrangement had its highest loading on a Spatial factor and, thus, appeared misplaced in Bannatyne's Sequential category.

In the 22 of 27 populations of disabled readers where complete recategorization was possible, Rugel found the Spatial category received the highest rank 18 times. It received the intermediate rank four times and never achieved the lowest rank. The Conceptual category received the highest rank four times, the intermediate rank fourteen times and the lowest rank four times. The Sequential category received the highest rank zero times, the intermediate rank four times and the lowest rank 18 times. These findings agree with Bannatyne's findings with genetic dyslexics. The pattern found with normal readers appeared different than that of disabled readers. For the "normal" group, the rank order (1st, 2nd, 3rd) was reached as follows: Spatial (1-8-4), Conceptual (8-4-1) and Sequential (4-1-8).

Rugel also compared the disabled readers to the normal groups in order to determine if the disabled readers' patterns were above average, average or below average in the three categories. In the Sequential (Attention) category, disabled readers showed a clear deficit with respect to normal readers. In the Conceptual category, disabled readers showed a mild relative deficit. In the Spatial category, disabled readers appeared to be superior to normal readers. Rugel concluded that this may suggest short-term memory

process deficits and attentional process difficulties, as well as difficulty with language skills in disabled readers. Furthermore, it may indicate these children to be visuo-spatial in orientation and partial to three-dimensional situations. Finally, Rugel found the Picture Arrangement subtest to be misplaced and proposed the Arithmetic subtest as substitute in the Sequential category.

Limitations to the Rugel (1974) study include populations that were not "learning disabled" and consequently limited the generalizability of conclusions. The disabled population included children with genetic dyslexia, minimal cerebral dysfunction, emotional disturbance and cultural deprivation. The normal populations included children with similar characteristics. The study is important, however, in that it suggests a broader potential application of Bannatyne's recategorization of WISC subtests. The study was also instrumental in Bannatyne's (1974) decision to replace the Picture Arrangement subtest with the Arithmetic subtest.

Rugel (1974), in a subsequent study, factor analyzed WISC subtest scores from two previously reported populations of disabled readers. The first sample included 240 children with a mean age of 12 years and a mean F.S.IQ of 96. The second sample consisted of 71 children with an age range of 9 years to 10 years, 11 months and a F.S.IQ range of 85 to 127. A third population used was Wechsler's (1949) standardized sample. Rugel was seeking further support for

Bannatyne's recategorization.

Results substantiated Bannatyne's scheme of subtest recategorization. Rugel found both a Verbal factor and a Spatial-Performance factor in the WISC subtest scores reviewed. Results further indicated that Digit Span and Coding do not load on either of the first two factors and, therefore, can be legitimately placed in a separate category. However, he concluded, this category cannot be considered a separate factor. Rugel saw no substantiation to the claim that low scores on these two subtests could be accounted for by a single factor of memory ability. Rugel suggested that these low subtests may also reflect a deficit in coding and decoding skills as well as a distractibility factor.

Limitations to the Rugel (1974) study are similar to his earlier (1974) study in his failure to report individual differences as well as the limited age range (9 years to 10 years, 11 months) in one disabled population. He also failed to report age ranges in the second sample of disabled readers (mean age=12 years). The study is important, however, in that it provides support for regrouping the WISC into Spatial, Conceptual and Sequential categories. These categories, although not characteristic of all disabled readers, may provide valuable information about three areas of intellectual functioning: visuo-spatial ability, language ability and memory-attention.

Kaufman (1975) factor analyzed the WISC-R using the total standardization sample reported in the WISC-R manual.

The results indicated that three factors, Verbal-Comprehension, Perceptual-Organization and Freedom from Distractibility, could efficiently describe the scale. These factors are similar to those obtained by Cohen (1959) in his factor analysis of the WISC.

Kaufman's results demonstrated that WISC-R subtests of Vocabulary, Information, Comprehension and Similarities have high loadings on the Verbal-Comprehension factor. Subtests of Block Design, Object Assembly and Picture Completion have high loading in the Perceptual-Organization factor. The Perceptual-Organization factor appears to measure a variable common to the Performance Scale subtests. The subtest of Arithmetic and Digit Span have high loadings on a Freedom from Distractibility factor, followed by Information and Coding. While there is some difficulty in interpreting the meaning of this third factor, Kaufman describes it as Freedom from Distractibility, recognizing that the factor may be closely correlated with a measure of numerical ability.

An important finding was that while WISC subtests tend to have a large error variance and limited subtest specificity, most WISC-R subtests have an adequate degree of subtest specificity. He recommends, however, that because of subtest overlap on their measurement properties, unusual ability or weakness should be determined only after scores on other relevant subtests are examined. He points out, for example, that a low score on Digit Span, together with low scores on Arithmetic and Coding (relative to other subtests)

may indicate that the child is highly distractible. Kaufman proposes that meaningful psychological dimensions can be obtained from factor scores obtained from the WISC-R. The Verbal-Comprehension factor score measures verbal knowledge and comprehension, which includes knowledge obtained from formal education. The Perceptual-Organization factor is a nonverbal factor involving perceptual and organizational dimensions and reflects the ability to interpret and/or organize visually perceived materials against a time limit. The Freedom from Distractibility factor score measures the ability to remain undistracted (to attend or concentrate) but also may reflect numerical ability. The Information subtest is not included in the Freedom from Distractibility factor because it did not load substantially when other factor analytic procedures were used. Kaufman's (1975) factors are similar to those proposed by Bannatyne as shown below.

Kaufman's factors (WISC-R)

Verbal- Comprehension	Perceptual- Organization	Freedom from Distractibility
Information	Picture Completion	Arithmetic
Similarities	Picture Arrangement	Digit Span
Vocabulary	Block Design	Coding
Comprehension	Object Assembly	
	Mazes	

Bannatyne's factors (WISC)

Conceptual	Spatial	Attention- Concentration
Similarities	Picture Completion	Arithmetic
Vocabulary	Block Design	Digit Span
Comprehension	Object Assembly	Coding

Although under different labeled categories and despite the fact that Kaufman includes three additional subtests, Kaufman's three factors correspond closely to Bannatyne's and remain essentially unchanged. Moreover, it appears that the potential psycho-educational and diagnostic utility of Bannatyne's recategorization is at least as great with the WISC-R as with the WISC. Results indicate that the three factor analysis may be applied to any child, regardless of his age, because of the age to age consistency of the factors. Finally, Kaufman suggests that these findings might be helpful in the psycho-educational diagnosis of reading-disabled children, and severely and moderately learning disabled children.

Vance and Gaynor (1976) investigated the WISC-R subtest pattern scores of 58 learning disabled children (42 boys and 16 girls) ranging in age from 6 to 15 years, 10 months. Evidence from the study offers support for previous findings that these children tend to obtain lower scores on subtests involving attentional and concentrating processes (skills) than on other subtests. Low WISC-R subtests of Arithmetic ($\bar{x}=7.5$) and Coding ($\bar{x}=7.7$) on the WISC-R characterized the learning disabled group. High subtest scores were obtained on Object Assembly, Picture Completion and Comprehension ($\bar{x}=10.4$, 9.8 and 9.7). These differences did not vary significantly across sex and age.

This study is important for several reasons. Here, the design included a "purer" population in that the children

were all classified as learning disabled which is less generic than samples in earlier studies. Each child met criteria as proposed by Bateman (1965) and McCarthy (1974). Moreover, the study involved WISC-R subtest scores (an area only recently examined), rather than WISC subtest scores. Finally, the study examined age and sex effects, often neglected in other studies.

Limitations to the Vance and Gaynor (1976) study include the failure to report (or administer) the Digit Span subtest, a relatively small sample size and one that was restricted to a rural population in North Carolina. The study failed to report the effect of IQ on the subtest scores or the degree of overlap involved. Generalizability of results are also limited due to the absence of a control group.

Smith et al. (1977) examined the results of the WISC-R administered to 208 children enrolled in 23 learning disability classrooms in a large metropolitan school system (age range 6 years - 12 years, 1 month). The sample was divided into high and low IQ groups by using criteria that embodied both an overall (Full Scale) IQ of 76 and a requirement that the child obtain a Verbal or Performance IQ of at least 90 (see Table 2.4). Examination of WISC-R subtest patterns added support for Bannatyne's (1968) recategorization. For both the high and the low IQ group, the highest mean Verbal scaled score was obtained on the Comprehension subtest (7.8, 6.2), while the lowest scores were obtained

Table 2.4 - Results of the Smith et al. (1977) study.

Scale description	Classifications		
	Total sample ^a	High IQ subgroup ^b	Low IQ subgroup ^c
	Mean	Mean	Mean
IQ scores			
Full scale IQ	87.1	93.3	76.3
Verbal IQ	84.8	90.1	75.7
Performance IQ	92.7	99.6	80.5
Verbal subtests			
Information	6.6	7.5	5.0
Similarities	8.0	9.0	6.3
Arithmetic	7.2	7.8	6.2
Vocabulary	7.9	8.9	6.3
Comprehension	8.2	9.1	6.6
Performance subtests			
Picture completion	9.7	10.8	7.7
Picture arrangement	8.9	10.1	6.8
Block design	8.6	9.6	7.0
Object assembly	10.2	11.4	8.2
Coding	7.3	8.0	6.1

^aN 208, or 100%

^bN 132, or 63%

^cN 76, or 37%

in Arithmetic (7.5, 6.2) and Information subtests (7.5, 5.0). On the Performance subtests, the highest mean scores for both groups were obtained in Object Assembly (11.4, 8.2) and Picture Completion (10.8, 7.7) subtests, while the lowest score was obtained in Coding (8.0, 6.1). Interestingly, 76 (37%) of the participants did not meet the criterion most commonly accepted as a requisite of learning disabled classification, that of being free from mental impairment. The authors concluded that many children classified as learning

disabled might better be served as educable mentally impaired.

Results of studies examining WISC profiles appear to demonstrate justification for subtest analysis based upon Bannatyne's (1968) proposed recategorization. Learning disabled children score highest on the Spatial factor, followed by the Verbal-Comprehension factor; they score lowest on the Attention-Concentration factor. This profile may be more useful than the traditional Verbal-Performance dichotomy for purposes of identification and programming.

Attention-Concentration Studies

Bryan (1972) studied the effect of specific instruction (forced rehearsal, voluntary rehearsal and attention) upon the learning of 15 words presented either visually by slides or orally by tape to learning disabled and normal children. Subjects were selected from a suburban Chicago school. The learning disabled subjects (N=22) had been identified by special services staff and were receiving remedial assistance. Fifteen boys from the school served as control subjects and groups were matched on age (8 years, 1 month - 10 years, 11 months) and IQ's (range: 85-115). The task was a Multitrial Free Recall problem which presented unrelated items in random sequence over a series of trials. The subjects were required to report, in any order, all the items they could remember.

Results demonstrated that the learning disabled subjects did significantly poorer than the control group on

recalling words in both the auditory and visual treatments. Under visual conditions, the mean score for the learning disabled (N=12) was 12.83, for the controls (N=10) was 13.70. Under the auditory condition, the mean score for the learning disabled was 10.50, for the control group 12.54. These results were consistent, irrespective of instructor.

One purpose of this study was to determine whether enforced mediation (attention and verbal rehearsal) would aid learning disabled children and result in performance equal to normal learners. Clearly it did not. Bryan concludes that learning disabled children, under the simplest stimulus conditions, with types of mediations suggested to them, still do not perform as adequately as normal readers. This suggests differences between learning disabled and normal children in both attention and short-term memory.

Deficiencies in the Bryan (1972) study include a small and limited sample size, which employed a learning disabled population but failed to report the criteria upon which these children were identified. Additionally, the task presented may have been too simple and perhaps the age group was not appropriate. These children may have developed their own strategies and, thus, rehearsal was a hindrance rather than a help.

Bryan (1974) conducted both a pilot study and a major study designed to measure the task-oriented behavior of learning disabled and normal children in the classroom. In the first study (Bryan and Wheeler, 1972), significant

differences were found as the learning disabled (LD) children spent significantly less time engaged in task oriented behavior (e.g., reading) and more time in non-task oriented behaviors (e.g., fooling around) than their "normal" peers.

The Bryan (1974) study had a sample of 10 third-grade boys selected from a suburban school district. Five of the boys had been classified as having learning disabilities. A comparison group was selected and subjects were matched for grade, sex and IQ. The purpose of the major study was to confirm the findings of the pilot study and to further empiricize the task oriented behavior of learning disabled and normal children in the classroom. Each learning disabled-comparison pair was observed for five school days over a period of five months. Interaction Process Analysis developed by Bryan was used to code individual behavior.

Results of the Bryan (1974) study confirmed earlier findings. The learning disabled group spent significantly less time engaged in attending behavior ($p < .002$) and more time in task oriented behavior ($p < .002$) than the average achiever (learning disabled attend=68%, normal=87%; learning disabled non-task=33%, normal=10.9%). This pattern existed for both groups in arithmetic, language, art and attending to teacher during instruction. Additionally, the learning disabled group spent considerably more time engaged in task oriented behavior (89%) and less time in non-task oriented behavior (68%) in special education rather than regular classes. The same comparison revealed an increase in

attending behavior in reading (69-83%), language (61-91%) and attending to the teacher (90-97%).

These results led Bryan to conclude that the learning disabled children spend less time in attending than normal children in the regular classroom. The children became more attentive as the children were placed in special classes. Bryan believes this change may be related to teacher competence but is unclear why, if this is true, the improvement was not apparent with the normal group. He suggests that the learning disabled children have learned to look busy and not get into trouble while not learning. The implication is that they are capable of producing much more than is seen in regular classes.

Limitations of the Bryan (1974) study include a small sample size, a lack of independence between subjects (they were drawn from the same classes), the possibility of chance results due to observational sampling error and the failure to control for interactions between the teacher and the two groups. Nevertheless, the study is one of the few efforts to attempt to quantify the belief that learning disabled children spend less time attending than other children in the regular classroom.

Samuels and Turnure (1974) applied a behavior observation schedule to investigate sex differences in classroom attentiveness and the relationship of such attentiveness to reading achievement. Subjects were 88 first graders, 53 boys and 35 girls, selected from 4 classrooms in 2 middle

class school in the Minneapolis school system. They attempted to replicate previous studies (Lahaderne, 1968; Cobb, 1972) which found such relationships for grade 6 and grade 4, respectively. However, in the present studies they hoped to determine if attentiveness was related to academic achievement (reading) prior to the effects of long-term success-failure school experiences.

Girls were found to be significantly superior to boys in word recognition ($\bar{x}=30.03$ vs $\bar{x}=22.68$) as well as percentage of time attending ($\bar{x}=84\%$, $\bar{x}=76\%$). In addition, increasing degrees of attention were related to superior word recognition ($r=.44$). The authors concluded that sex differences in attention did exist prior to school failure and that overt task-relevant oriented behavior was related to scholastic achievement. In effect, it may be that the sex differences favoring girls frequently found in reading achievement may be mediated by attentional variables.

These results are limited in that a sample of learning disabled children was not included. Additional deficiencies include a limited sample, the possible effects of the observer on performance, the unreliability of the instrument used and the failure to match for F.S.IQ. It is important in that it reports a possible mediating effect of attention on sex differences as reported in reading achievement scores.

Forness and Esveldt (1975) attempted to determine whether children with learning or behavior problems are observably different from their classroom peers in attending

behavior. Twenty-four boys (grade 1-3) under evaluation for school learning or behavior problems were observed in their classroom over a period of six days each. Observable behavior was compared with that of male peers in the same reading or math group. Target subjects had a mean CA of 7.2 (range 6.0 to 8.6), a mean WISC IQ of 104.6 (range 81-132) and a mean score on the Peabody Individual Achievement Test of .86 years below grade level (range=.3 to 1.9). Six trained observers carried out the observations.

Results demonstrated that attending to the academic task was the behavior which both groups engaged in most often. However, the target groups engaged in this attending behavior significantly less often than their peers (53% to 66% respectively). Additionally, the target subjects engaged in non-attending behavior significantly more often than their peers (23% to 13% respectively). Each of these differences held up in both reading and math groups (between setting, correlation coefficients for attending behavior were .81 for target subjects and .62 for peers). No differences were found between groups as to percentage of time engaged in disruptive behavior. The authors conclude that task-oriented (attending) behaviors do differ between groups of children, with learning or behavior problems spending less time attending to the task. They suggest that systematic observation could locate these differences which might normally be missed by teacher observation.

Deficiencies in the Forness and Esveldt (1975) study

include limitations to the generalizability of results due to the sample used. The fact that the target children were referred to a Child Psychiatry Outpatient Department may mean that these children are not characteristic of children experiencing difficulties in a typical public school setting. Independence between the groups was not established and the effect of observers on the children's behaviors may also be a factor.

C. Mercer et al. (1975) examined the influence of attention-retention functions of learning disabled boys on a modeling task. They specifically wanted to examine the relationship of attention-retention to both modeling and academic achievement. Twenty boys were randomly selected from a population of 40 boys at a residential school for the learning disabled. The mean age was 12 years, 4 months (range 9.6 - 14.4) and the mean IQ was 91 (SD 9.2). Each subject was individually administered a modeling test. Subjects were told that a film would be presented on television which showed an adult and a child performing certain activities and that he was to watch and listen closely so that when his chance came to perform the same, he could copy everything he saw and heard on the screen. Each child was promised a cup with money in it if he did well when he had a chance to perform. Vicarious reinforcement was also included as the adult model rewarded the child model with money and praise.

The high modelers recalled significantly more central

information than the low modelers ($p < .002$). Also, the high modelers scored higher than low modelers on an index of selective attention-retention ($p < .05$).

Significant correlations were also found between achievement scores and modeling performance (vocabulary=.47; spelling=.50; arithmetic=.46). The results were taken to confirm the hypothesis that attention-retention of relevant information is related to modeling ability (high modelers scoring higher than low modelers). This supports the hypothesis that attention and retention processes are essential aspects of modeling. Those learning disabled children who were better modelers were the ones that focused on and remembered the relevant stimuli without being distracted. One other important conclusion is that children labeled learning disabled represent a heterogeneous group who are not necessarily characterized by a single syndrome such as short attention span. It is, in effect, necessary to consider each child's unique strengths and weaknesses and manipulate the appropriate variables accordingly.

Deficiencies in the Mercer et al. (1976) study include the failure to include a control group. It would have been of interest to determine the degree to which modeling and retention are characteristic of learning disabled as opposed to normal learners. Additionally, the population was selected from a residential school which may or may not draw from the same population of learning disabled children that are serviced by the public schools. Finally, there is a question

as to whether these short-term results would be maintained over time.

Results of studies evaluating lack of attention as a characteristic of children classified as learning disabled demonstrate a trend. These children appear to spend less time attending to school tasks than control groups. What may limit these results however, is the extent to which other handicapped children are also characterized by a lack of attention.

A summary of the major findings of the studies defining the characteristics of children classified as learning disabled is presented in Table 2.5. General areas of agreement appear to be that the learning disabled, as compared to "normal" control groups, achieve a lower F.S.IQ on individual intelligence tests and typically score higher on the Performance than the Verbal scale. They score relatively low on WISC subtests of Information, Arithmetic, Coding and Digit Span. When Bannatyne's suggested recategorization is examined, the learning disabled score highest on the Spatial factor (Picture Completion, Block Design, Object Assembly) and lowest on the Attention-Concentration factor (Arithmetic, Digit Span, Coding). As a group, these children achieve at a level less than would be expected on standardized achievement tests; this appears especially true in arithmetic skills. Studies examining attending behavior lend support to the premise that the learning disabled exhibit difficulties with on-task behavior. They are reported to be more

Table 2.5 - Major findings of studies describing learning disabled populations.

Researcher	Sample	Procedure	Characteristic		
Witkin et al. (1966)	29 EMR boys from a state institution and 30 EMR boys from the N.Y.C. public schools.	WISC scores of Analytic, Comprehension and Sequential factors analyzed.	Analytic IQ Comprehension IQ Attention IQ	Institutional 80.8 61.2 71.3	Public School 73.4 60.5 63.4
Huelsman (1970)	101 underachievers and 56 achievers selected from 4th grade of 27 public schools.	Comparison cognitive pattern as demonstrated by WISC profiles.	Significantly low subtests Information Arithmetic Coding	Underachievers 13% 11% 18%	Achievers 0.0% 4% 7%
Ackerman et al. (1971)	82 cases of CLD and 34 cases of academically adequate children from Little Rock, Ark. public schools.	Results of WISC, Gray-Oral Reading Test and Bender Gestalt Test compared.	P.S.IQ 90 xVIQ xPIQ xP.S.IQ p-V 15	CLD 73% 107 109.5 26.6% 26.6%	Control 0.0% 114 105 17.6% 12.3%
Meier (1972)	284 cases of children referred for suspected learning problems from 8 Rocky Mt. states and 87 normal children. Ages 7-11 years.	Results on WISC, WRA? and ITPA analyzed and characteristic outlined.	C.A. (mos.) M.A. (mos.) E.A. (mos.) Learning Quotient (mos.) VIQ PIQ Attention Score	CLD 101.95 97.43 98.50 94.79 97.43 96.10 89.98	Control 101.51 102.00 99.86 101.60 100.56 100.23 101.80
Bryan (1972)	15 CLD identified by special services staff and 15 non-impaired from a suburban Chicago school. Age range = 8 years, 1 month - 10 years, 11 months	Analyzed the effect of instruction on learning 15 words presented verbally or aurally.	Visual Auditory	LD 12.03 10.50	Normal 13.73 12.54

Table 2.5 (cont'd.)

Researcher	Sample	Procedure	Characteristic			
Keogh et al. (1973)	26 EMR, 24 LD and 26 LD-HA children referred for learning difficulties. Ages (mos.) = 140, 121, 118, respectively.	WISC scores on Analytic, Comprehension and Attention factors compared between groups.	Analytic	LD 32.46	EMR 21.78	
			Comprehension	31.83	17.04	
			Attention	28.25	18.15	
Keogh and Hall (1974)	157 EH children (125 males, 32 females) and 83 EMR children (47 males, 36 females) from an urban public school system.	Comparison of WISC subtest patterns between and within groups.		LD M F	EMR M F	
			Analytic	29.8 26.2	20.9 18.3	
			Comprehension	28.2 25.5	16.4 16.6	
			Attention	25.0 25.0	17.1 18.6	
Rugel (1974)	22 previous studies of disabled readers as reported in literature.	Factor analyzed to determine justification for Bannatyne's recategorization.	Highest Score	No. of studies		
			Spatial	18		
			Conceptual	4		
			Sequential	0		
Rugel (1974)	240 disabled readers (x age=12 years; xP.S.I.Q=96); 71 disabled readers (age range=9 years to 10 years, 11 months); Wechsler's (1949) standardized sample.	Factor analyzed WISC subtest scores to determine support for Bannatyne's recategorization.	Factors found			
			Spatial - Performance			
			Verbal - Comprehension			
			Distractibility - Memory			
McIntosh (1974)	20 children with neurological dysfunction (age range=9 years to 14 years, 10 mos.) and 20 normal children (age range=9 years to 16 years, 5 mos.)	Ratio leased on WISC results applied to determine if 2 populations could be identified.	30 of 40 subjects (15 brain damaged, 15 control) were correctly identified.			

Table 2.5 (cont'd.)

Researcher	Sample	Procedure	Characteristic	
Bryan (1974)	10 third grade boys selected from a suburban school district and a control group matched for grade, sex and IQ.	Interaction Process Analysis used to observe task oriented behavior in school.	CLD Time Attending Time Non-attending	Control 87% 10.9%
Samuels and Turnure (1974)	88 first graders, 53 boys and 35 girls, selected from 4 classrooms in 2 middle-class public schools in Minneapolis.	Behavioral observation to investigate sex differences in classroom attentiveness.	Males Time Attending Word recognition score	Females 87% 30.0
Forness and Esvelt (1975)	24 boys selected from children referred to the UCLA Child Psychiatry Dept. for evaluation of school difficulty and a control group. Age range=6.0 to 8.6 years. Mean age=7.2 years.	Behavioral observation of attending behavior in reading and math groups compared.	Target Time Attending Time Non-attending	Control 66% 13%
Mercer et al. (1975)	20 boys randomly selected from 40 boys at a residential school for the learning disabled. Age range=9.6-14.4 years. Mean age=12.4 years.	Analyzed the effect of modeling on attention-retention and academic achievement.	High modelers recalled more information than low modelers ($p < .002$).	
Kirk and Elkins (1975)	3,000 children enrolled in Child Service Demonstration Centers in 21 states.	Project centers requested to report characteristics of each child served.	Median Age: Age Range: Mean P.S.IQ: Sex Ratio: Years below E.A.:	8 years, 10 mos. 7 years, 2 mos. to 15 years, 2 mos. 93 (range: 83-105) 3 boys to 1 girl Reading=1.7 Arithmetic=1.2 Spelling=1.0

Table 2.5 (cont'd.)

Researcher	Sample	Procedure	Characteristic																
Kaufman (1975)	Total standardized sample reported in WISC-R manual.	Factor analyzed WISC-R subtest scores.	Factors found Perceptual - Organization Verbal - Comprehension Freedom from Distractibility																
Vance and Gaynor (1976)	58 learning disabled children, 42 males and 16 females (age range=6 to 15 years, 10 mos.).	Analyzed WISC-R subtest scores.	<table><tr><td></td><td>Mean</td></tr><tr><td>Arithmetic</td><td>7.5</td></tr><tr><td>Coding</td><td>7.7</td></tr><tr><td>Object Assembly</td><td>10.4</td></tr><tr><td>Picture Completion</td><td>9.8</td></tr><tr><td>Comprehension</td><td>9.7</td></tr></table>		Mean	Arithmetic	7.5	Coding	7.7	Object Assembly	10.4	Picture Completion	9.8	Comprehension	9.7				
	Mean																		
Arithmetic	7.5																		
Coding	7.7																		
Object Assembly	10.4																		
Picture Completion	9.8																		
Comprehension	9.7																		
Brenton and Gilmore (1976)	All students (N=40) placed in 7 elementary resource rooms for the learning disabled in a county in Michigan.	Application of a discrepancy formula as suggested by Myklebust used to determine percentage identified.	Correctly Identified Total: 40 or 67% Males: 37 or 74% Females: 3 or 30%																
Mercer et al. (1976)	42 State Departments of Education and their respective definitions of Learning Disabilities.	Analysis of questionnaire as to definitions of LD used.	<table><tr><td></td><td>Percentage of States using Characteristic</td></tr><tr><td>Intelligence:</td><td>45.3</td></tr><tr><td>Process Disorder:</td><td>85.7</td></tr><tr><td>Language Disorder:</td><td>83.3</td></tr><tr><td>Academic:</td><td>73.8</td></tr><tr><td>Neurological:</td><td>61.9</td></tr><tr><td>Attention Deficit:</td><td>11.9</td></tr><tr><td>Discrepancy Component:</td><td>28.6</td></tr></table>		Percentage of States using Characteristic	Intelligence:	45.3	Process Disorder:	85.7	Language Disorder:	83.3	Academic:	73.8	Neurological:	61.9	Attention Deficit:	11.9	Discrepancy Component:	28.6
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Attention Deficit:	11.9																		
Discrepancy Component:	28.6																		

Table 2.5 (cont'd.)

Researcher	Sample	Procedure	Characteristic		
Smith et al. (1977)	208 LD children enrolled in 23 special classes in urban school system. Age range=6 years to 12 years, 1 mos. Mean age=9 years, 9 mos.	Analyzed WISC-R sub-test scores across all IQ levels.	Comprehension	High IQ 7.8	Low IQ 6.2
			Arithmetic	7.5	6.2
			Information	7.5	5.0
			Object Assembly	11.4	8.2
			Picture Completion	10.8	7.7
Evans and Smith (1977)	60 children (49 male, 11 female) referred for psycho-educational evaluation. Age range=6 to 13 years; F.S.IQ greater than 85.	Evaluated behavioral characteristics as reported by parents.	Percentage reported		
			Sensitive to Criticism	57%	
			Short Attention Span	50%	
			Easily Discouraged	48%	
			Overactive	16.5%	
Grill (1977)	161 adolescents from 5 school systems previously classified as learning disabled.	Application of Wiederholt's criteria for eligibility as learning disabled.	Meet/nearly meet criteria	29 (18%)	
			Probably learning disabled	16 (10%)	
			Total likely disabled	45 (28%)	
Becker (1978)	40 educationally handicapped and 20 educable mentally retarded children ages 9 to 13 years.	Analysis of sex, age, IQ, Digit Span and Raven's Progressive Matrices.	Chronological Age (mos.)	EH 130	EMR 151
			Mental Age (mos.)	107	91
			IQ	83	59
			Digit Span	5.2	4.6
			Raven's	17	13
Danielson and Bauer (1978)	14 existing data bases of learning disabled children ranging in size from 30 to 2,428.	Application of 50% discrepancy between expected and actual achievement.	Range identified	38-95%	
			Avg. Percent identified	58%	
			Misidentification	8-12%	

often young and male according to the studies presented.

Socioeconomic Status Studies

Since the advent of learning disability (LD) programs, it has been suggested by some observers (Burke, 1975; Franks, 1977) that learning disabled classes are predominantly composed of white, middle and upper social class children while classes for the educable mentally retarded (EMR) are becoming depositories for the ethnically different and economically disadvantaged. While a number of studies have reported differences in characteristics between lower and upper socioeconomic status children (Deutsch, 1960; Moffitt, 1972), others report overlapping characteristics to a degree which calls into question the need to draw any distinction between the culturally disadvantaged and the learning disabled (Kappelman et al., 1969). Addressing this issue, the author writes that:

...It is simply not adequate to label the poor achiever in the inner-city classroom as culturally deprived and allow this all-inclusive term to explain his poor approach to and response to the learning experience (1969, p.32).

One purpose of this study was to examine the possible effect of SES on the subsequent placement of children. Consequently, a number of relevant studies are presented which relate to the characteristics of children across several SES levels, the possible role of an SES bias in special class placement and consideration to the placement process as an objective procedure.

Kappelman et al. (1969) evaluated the characteristics of 506 socioeconomically disadvantaged children referred to an urban health center in order to determine the extent to which they were experiencing learning disabilities. The children were referred to a child study team for evaluation of their learning abilities and the basis underlying a suspected disorder. The evaluation team consisted of a pediatrician, psychologist, psychometrician, speech and hearing specialist, psychiatric consultant, educational consultant and a psychiatric social worker. A thorough team evaluation was conducted for each of the children referred.

In 306 of these children (5.8% of the total enrolled population), significant learning disabilities were identified. The predominant underlying basis for the learning disorder was thought to be a neurological handicap in over 50% of the children studied. Approximately one quarter of the children studied had significant emotional disturbances as the predominant cause of their inability to learn.

These results confirmed the suspicion that too little attention had been focused on the specific learning disabilities of individual children who live in deprived areas. Kappelman et al. (1969) believe that for too long poverty has been considered the singular reason for lack of scholastic success in low socioeconomic children. They perceive this population as being a high risk one from the aspects of prenatal deprivation, birth injury, nutritional deficits, childhood accidents and chronic illness. They conclude that

it is simply not adequate to allow the term "culturally deprived" to be all-inclusive in explaining the learning experience of the deprived child. They warn that visible socioeconomic handicaps should not obscure learning disabilities in deprived children.

Deficiencies in the Kappelman et al. (1969) study include the failure to report quantitative test data as well as other characteristics of the sample. Additionally, the term "neurological handicap" serves to obscure the results as does the lack of a definition of the term "socioeconomic deprivation." The study is important in pointing out the need to consider the presence of learning disabilities in children normally falling under the heading of "culturally deprived".

Telegdy (1973) conducted a study comparing the scores of 30 learning disabled children on the WISC. The sample was divided into two socioeconomic groups based upon the occupation of the head of the household. The group means of the low socioeconomic group (LSES) were age=10.5, VIQ=93.7, PIQ=92.1 and F.S.IQ=91.3. The values for the upper socioeconomic group (USES) were age=10.5, VIQ=93.3, PIQ=106.6 and F.S.IQ=99.8. While significant differences existed between the groups for PIQ and F.S.IQ, no significant differences between the groups existed for VIQ. Telegdy (1973) observed that the psychological processes that define learning disabilities are specifically the ones measured by the Verbal subtest of the WISC. This being the case,

the results of this study indicate that classification of learning disabled overrides socioeconomic status differences and results in similar Verbal scores for USES and LSES children. Additionally, results demonstrate that regardless of SES status, the lowest WISC subtest scores appear to be Coding, Arithmetic, Information and Comprehension.

A limitation in generalizability of the Telegdy (1973) study is the small sample size. Further, he fails to report the criteria upon which the children were classified as learning disabled; he uses only male subjects and he restricts the age of the sample. The study is important, however, in that it demonstrates the similarities of WISC verbal profiles among learning disabled children regardless of SES. Further, it adds some confirmation to previous studies where low scores on Arithmetic, Coding and Information were found to characterize learning disabled children.

Rubin et al. (1973) attempted to identify factors associated with placement in classes for the educable retarded as compared to students with similar intellectual characteristics that were not placed in special classes. Subjects were drawn from a population of 1,230 children within the state of Minnesota. The focus of the study was on subjects enrolled in special classes and those who would be eligible for special class placement on the basis of IQ test performance but thus far had remained in regular classes. Comparisons were made between a group of 17 low IQ (less than 80) regular class subjects and three groups of special class

subjects: (a) 19 low IQ (less than 80) subjects, (b) 9 average IQ (greater than 80) subjects and (c) the total group of 32 special class subjects (5 subjects were not classified based on large IQ fluctuations).

No differences were found between regular and special class subjects on pre-school readiness and language development or on achievement prior to differential placement. At 9 years of age, significant differences favoring regular class subjects were found on measures of academic achievement. Socioeconomic status was the one factor that significantly ($p < .05$) differentiated between groups, with the special class subjects obtaining lower socioeconomic index scores. The authors concluded that low socioeconomic status predisposes to special class placement when IQ and achievement levels are held constant.

Deficiencies in the Rubin et al. (1973) study include limits to the generalizability of results since variables other than socioeconomic status that relate to placement may not have been controlled. Further, the study did not include a learning disabled sample. There appears no reason to believe, however, that if such socioeconomic bias does exist, it would not enter into all placement decisions.

Burke (1975) examined the racial composition of classes for the learning disabled and the educable mentally retarded in order to determine if proportionate numbers of each race existed in the two classes. She hypothesized that a larger proportion of Blacks would appear in the EMR classes and a

larger proportion of Whites would appear in the learning disabled classes. The sample included 107 educable mentally handicapped students and 73 learning disabled students.

Results of the Burke (1975) study confirmed the expected phenomenon. A disproportionate number of Black children were observed in EMR rooms while more Whites were in rooms for the learning disabled. These results were consistent across all grade levels.

Limitations to the Burke (1975) study include the failure to report placement criteria used for these children, the use of the WISC rather than the WISC-R in evaluation, the failure to hold the criteria constant for each subject and the analysis of each group separately. The results would have been more revealing if the subjects in the two types of rooms were compared. Finally, the use of race exclusively serves to obscure more meaningful comparisons such as socioeconomic or intellectual characteristics. Nevertheless, it is an empirical evaluation of the factor of race in the identification and placement of children in special education classes.

Kealy and McLeod (1976) conducted one of the few studies that exist relating to socioeconomic status and the placement process. Specifically, they hypothesized that there is a higher proportion of children diagnosed as learning disabled from families of higher socioeconomic status than from families of lower socioeconomic status. From a sample of 333 children in grades 4 and 6, 35 were defined as

learning disabled according to a criterion of educational age less than 85% of measured mental age and chronological age. Eighteen were from families whose socioeconomic status was above the median for the total group and 17 were below the median.

Kealy and McLeod (1976) found that of the upper SES children, 13 (72.5%) had been diagnosed by the Pupil Service Department, whereas only 5 (35.2%) of the lower SES group had been diagnosed. Thus, no significant differences in defined learning disability were found between children of above average and below average socioeconomic status. However, the difference in the rate of diagnosis between the socioeconomic groups was statistically significant in favor of children from higher socioeconomic status homes.

The authors suggest that their results indicate the learning disabled children from lower socioeconomic status families do, in fact, have generally less chance of receiving diagnosis and treatment and that this underlines the need for greater emphasis on special education services in schools located in lower class areas. One fear is that low achievers in inner city schools are seen as "retardates" while their "cousins" in the suburbs are seen as learning disabled.

Franks (1977) attempted to define the ethnic and social status characteristics of children in EMR and LD classes. The assumption was that a disproportionate number of children in EMR classes are from low income and non-white

families. To assess these characteristics, a random sample of 274 EMR children (CA range=6 to 15.4, IQ range=45 to 93) was selected. The learning disabled sample consisted of 215 children (CA range=6 to 14, IQ range=43 to 129). A questionnaire was forwarded to the teacher of each child. The questionnaire was designed to gather the following information: (a) the occupation of the principle wage earner, (b) the child's ethnic origin and (c) the child's IQ.

Franks reported the percentage of Afro-American children in EMR classes to be 34.21%; for Whites, the percentage was 65.79%. Afro-Americans in learning disabled classes was 3.22% while Whites in these classes was 96.28%. Franks (1977) admits that no causal relationship was found but cautions educators to review the ethnic composition of EMR and LD classes.

Franks' results are limited in that no criterion was kept constant for the subjects. The question remains as to whether the learning disabled children were eligible for EMR placement and the reverse for EMR children. Further, the use of the questionnaire limits the study's validity. For example, the respondents (teachers) may have self selected (66.79% of EMR sample and 86.5% of the LD sample responded). The results suggest, however, that ethnic and social characteristics of children do vary according to placement.

The preceding studies suggest that there is evidence that while children across SES levels exhibit similar characteristics, they may be subject to different special education placements. Additional evidence exists to indicate

that placement decisions may be subject to considerable limitations. The present study attempted to investigate the question of an SES bias in the placement of children in the public schools. Because of the characteristics of the data collected in the present study, all variables affecting placement decisions cannot be examined. However, to the extent that the data allows, the study will attempt to determine if SES is a factor in the placement of children as learning disabled, educable mentally retarded or non-impaired.

Team Decision Making Studies

Oskamp (1965) investigated whether psychologists' confidence in their clinical decisions is justified. It was hypothesized that as psychologists study information about a case (a) their confidence about the case increases markedly and steadily but (b) the accuracy of their conclusions about the case quickly reaches a ceiling.

Subjects included 32 judges, including 8 clinical psychologists, who read background information about a published case, divided into 4 sections. After reading each section of the case, judges answered a set of 25 questions involving personality judgement about the case. Results strongly confirmed the hypotheses. Accuracy did not increase significantly with increasing information, but confidence increased steadily and significantly. All judges except 2 became overconfident, most of them markedly so. The author concluded that increasing feelings of confidence

are not a sure sign of increasing predictive accuracy about a case.

Morrow et al. (1976) attempted to evaluate the effect of relevant information on the decision to place pupils in special education services. Ten placement decision committees were given information on 12 referred pupils, half of which were recommended for special education services by an outside psychologist and half of which included social history information on the pupils. An analysis of the committees' 120 decisions revealed no significant relationship either between the psychologist's recommendation and the committees' decisions or between the presence of social histories and the committees' decisions.

The results of the study by Morrow et al. (1976) cannot be generalized because of the use of only one sort of evaluation committee restricted to Texas. Beyond this, the results of two committees were eliminated in analysis and the data-collecting procedures did not reveal enough information to explain results. For example, the simple yes/no response should have been a five point response scale; the use of audio or video tape recordings or personal interviews could have revealed more about committee policy. The study is important, however, in that it stands as an early effort to identify variables and decision-making policies related to the placement of children in special education.

Beatty (1977) attempted to identify the decision-making policies upon which practitioners base their diagnostic

decisions in identifying learning disabled children. Through the statistical technique of Judgment Analysis (JAN), Beatty proposes a methodology whereby an analysis of individual policies and the diagnostic variables employed in group decisions may be identified and examined. JAN is set forth as a procedure which may be used to locate individuals with similar policies and analyze policy subgroups as well as inter-group comparisons. Beatty believes this will allow for increased precision and consistency in judgments. He also believes the technique has value for pre-service, in-service and research training.

An initial validation of the technique involved profiles for 10 children who had been in a learning disabled classroom for at least one year. The profile scores consisted of the following six variables: the WISC Verbal, Performance and Full Scale score; the Bender Gestalt; the age of the child; and results from the ITPA. The judges were a school psychologist, two interns, one consulting psychologist and a teacher of the learning disabled. The judgment policy of each and the variables involved were analyzed through JAN. Results indicated that scores on the WISC were considerably more important to the judges than the Bender, age or the ITPA results. According to Beatty, 96% of the variance in the classification of the children could be explained by a knowledge of the predictor variables.

Limitations to the Beatty (1977) study include the small and restricted sample. However, it does provide an

effort to evaluate the effectiveness of JAN, a statistical analysis of judgment policy of the learning disabled. The approach, if validated, could have many practical applications for developing policies in screening learning disabled children. The system presents a possibility for evaluators to have an opportunity to examine their policies and the policies of others, while learning what is needed to function effectively as a diagnostician for learning disabled children.

Caplan (1977) administered a questionnaire to 280 university undergraduates who were asked to establish priorities for assigning tutorial help to children failing in school. They were to rate the children on the basis of various combinations of sex, age, kind of behavior problem and subject of school difficulty. It was predicted that adults would consider the scholastic achievement of boys more important than that of girls. It was predicted also that the child's sex would interact with the child's behavior to influence the degree of adult concern. These predictions were founded upon conventional sex-role stereotypes.

Highly significant main effects were reported. Subjects rated boys, withdrawn behavior, older (8 years) and reading difficulty were noted as requiring more immediate help than girls, acting out behavior, younger (6 years old) and arithmetic difficulty. These results supported the hypothesis that a societal bias tends to arouse greater concern when boys have learning problems than when girls do, which

possibly exaggerates the lopsided boy/girl ratio in reports of these problems. A more complex bias produces greater concern, however, for children of either sex whose behavior deviates from sex-role stereotypes. The authors found, for example, that withdrawn boys and acting out girls were rated as requiring the most immediate help.

The findings are limited in generalizability due to the fact that college undergraduates were selected as subjects. The use of individuals normally involved in the referral process would have been more appropriate. Additional deficiencies include the failure to report on the subjects in detail and the lack of attention to the degree of overlap involved in respondents (for example, how many respondents placed withdrawn males first). Nevertheless, the results are important in addressing the issue of sex bias in the referral process. While this bias alone cannot explain the disproportionate number of males referred for attention it may help to explain a portion of the issue.

The area of multidisciplinary team decision making has come under increased investigation lately. In part this is because many states have replaced a single individual, such as a school psychologist, with a committee for making placement programming decisions. Some of these studies have found that a perfect balance and check system does not necessarily work as well as many had expected it might.

Fenton et al. (1977) investigated the issue of role expectation of multidisciplinary teams in determining

programs and placement for special education students. The sample included all public senior (N=165) and junior (N=136) high schools and a random sample of one third of the public elementary schools (N=121) in Connecticut. More than one half of these schools agreed to participate. The study examined responses from four subgroups of the final sample including principals (N=231), school psychologists (N=155), special education teachers (N=245) and regular education teachers (N=216). Twenty-five items were selected from a discussion of decision-making activities by Vroom and from a list of PT functions. The placement team members indicated which activities were perceived as appropriate for their own role and which were perceived as appropriate for the other roles.

Results of the Fenton et al. (1977) study indicated that there was intra- and inter-role ambiguity about what activities were appropriate for each of the four target roles. The authors point out that spending time and effort on sorting the differences between ones own expectations and those of others may decrease the time available to spend on task activities. They suggest the need for role clarification and consideration of role expansion through in-service training.

Fenton et al. (in press) investigated the degree to which pupil programming members are in agreement with organizational goals. This study explored PT goals as perceived by PT members who represented ten school staff roles from

the three mandated subgroups of administration, instructional and support personnel.

The study sample was the same as employed in their (1977) investigation. The study used items from the questionnaire which required PT members to indicate the goals they perceived as PT responsibilities from a list of 11 possible goals. Results indicated the percentage of teams cognizant of PT responsibility ranged from 11% to 37%. About one-third of the PT's were aware of responsibilities related to goal setting, placement decisions and program appropriateness. Overall, less than 40% of the PT's had a three-fourth majority who recognized their responsibility to make the specified decisions.

The authors conclude that PT members are neither fully aware of, nor in agreement about, their duties. They suggest that what is needed is an increased awareness of goals as desired outcomes, an understanding of the consequences of failing to attain a goal and a willingness to make the internalization of the ideal goals by periodic review of the members' perceptions of PT responsibilities.

Even more revealing are the results of a subsequent study of multidisciplinary decision making by Fenton et al. (in press). In this investigation, the authors attempted to determine: (a) whether team members have a clear idea of the goals of the planning teams, (b) if members have a consensus about expectations for their own roles and for other team members, (c) whether team members were satisfied with

the team process and (d) the magnitude of the relationship between participation and satisfaction.

Results of this study indicated that role was significant for goal clarity; administrators were most knowledgeable and regular teachers, the least. Additionally, regular education teachers were lowest in participation and satisfaction, whereas school psychologists were ranked highest on both variables. The authors suggest that these results raise concerns that the intent of teaming is not served. It appears that instructional personnel appear to be disenfranchised from the process, despite the fact that they are the individuals most responsible for implementing team decisions.

Studies examining the special education placement process reveal that this approach is not as effective as had been previously expected. All team members do not participate equally. In fact, decisions seem to be made by perhaps as few as one or two members. Importantly, those making these placement decisions are the ones least involved in the subsequent implementation. There appears a need for systematic analysis of special education decision making.

CHAPTER III

METHOD

Presented in this chapter is a detailed description of the subjects and the general procedures employed in the data collection and analysis. In addition, the study's hypotheses are set forth.

Data Collection

The data used in this study were collected as part of a project initiated by the Michigan Department of Education, Special Education Services, for the 1975-76 school year. The purpose of the project was to evaluate and operationalize a definition of learning disabilities. It was hoped that such a definition would lend itself to a more consistent identification of learning disabled children who require special programs and/or services.

Potential participants were sent a letter describing the project and its purpose (Appendix A). They were asked to notify Dr. M. Diane Hodson at the State of Michigan, Department of Education, if they were interested in participating. Those who expressed an interest were directed to complete a data collection form for each child seen by the Educational Placement and Planning Committee. This form,

completed by the school psychologist, consisted of 28 factors designed to describe the child's characteristics as well as to report certain demographic information. Children not classified as learning disabled were either found to be non-impaired or were classified as educable mentally retarded, emotionally impaired or otherwise impaired, according to existing special education eligibility procedures.

The important factors from the State of Michigan Department of Special Education Services Pilot Project (1975) relevant to this study are:

1. Scores from the Wechsler Intelligence Scale for Children - Revised.
2. Scores from the Wide Range Achievement Test.
3. Scores from the Peabody Individual Achievement Test.
4. Reported grade placement of each child.
5. Reported sex of each child.
6. Reported socioeconomic status of each child.
7. Judged by an Educational Placement and Planning Committee as meeting the criteria for special education placement.
8. Reported opinion of the school psychologist and the learning disability consultant as to the child's eligibility as learning disabled.

Subject Sample

Forty-five Michigan school districts agreed to report the requested information on each child evaluated during the 1975-76 school year. Initially each of Michigan's 645 school districts were invited to participate. Thus, the final sample represented 7% of the total public schools in Michigan.

Conversations with Dr. Diane Hodson and Ralph Turnbull revealed that no systematic effort was made to establish a stratified random sample. The initial data included 1449 individual cases of which 1129 were used in this study. Each child has been referred for psycho-educational evaluation. All children were attending regular classes and/or receiving special education programs and services. Assignment to groups was done by Educational Placement and Planning Committees. A summary of subject characteristics appears in Table 3.1. There is no reason to believe that these children are different from other children previously referred for psycho-educational evaluation in the State of Michigan.

The sample employed in this study had the following limitations:

1. Complete data is not reported for each case. The reason for this is not clear, but the net effect is that certain cases (19%) could not be used in this study.
2. The sample classified as non-impaired may not truly be representative of the entire public school population. Although found to have no apparent handicap, these children were referred for psycho-educational evaluation and the inference is that learning or behavioral difficulties may be characteristic of this group.
3. The WISC-R subtest of Digit Span was not reported. As it is an alternate subtest, it may very well not have been administered.
4. Due to the method of reporting data, much of it is not continuous. This limits somewhat the statistical treatments employed.
5. No systematic effort was made to establish a stratified random sample.

Table 3.1 - Subject characteristics (N=1129).

	L.D.	E.M.I.	E.I.	Other	Non-Impaired
<u>REFERRAL</u>					
1. New Referral	242	80	72	45	316
2. Re-evaluation of Special Education Student	76	83	11	25	18
<u>PRIMARY REASON FOR REFERRAL</u>					
1. Behavior Problem	37	10	52	7	64
2. Academic Achievement Problem	278	151	30	58	263
3. Physical Disability	3	2	1	4	6
<u>SEX</u>					
1. Male	248	101	62	53	242
2. Female	72	62	21	17	91
<u>LANGUAGE IN THE HOME</u>					
1. English	317	160	79	68	327
2. Other	3	1	4	0	2
<u>SOCIOECONOMIC STATUS</u>					
1. Middle-High	173	49	29	38	181
2. Low	78	65	34	22	67

Table 3.1 (cont'd.)

	L.D.	E.M.I.	E.I.	Other	Non-Impaired
<u>TYPE OF SCHOOL DISTRICT</u>					
1. Urban	49	5	9	3	26
2. Suburban	76	41	28	10	73
3. Rural	194	116	46	57	229
<u>AGE LEVEL</u>					
1. Young (0-11.0 years)	174	63	46	32	206
2. Old (11.1-24.0 years)	149	100	37	38	128
3. Mean (years)	10.8	12.1	10.7	11.2	10.4
<u>ABILITY CLASSIFICATION</u>					
1. Above average (F.S.IQ above 110)	21	1	4	0	24
2. Average (F.S.IQ 90-109)	117	9	35	14	164
3. Below average (F.S.IQ less than 90)	180	150	42	56	142
4. Mean (F.S.IQ)	88.5	68.8	89.5	80.6	92.5
<u>GRADE LEVEL</u>					
Below 1st	8	6	4	1	14
1st	40	16	11	11	52
2nd	46	5	10	3	43

Table 3.1 (cont'd.)

	L.D.	E.M.I.	E.I.	Other	Non-Impaired
GRADE LEVEL (cont.)					
3rd	32	9	10	5	47
4th	37	9	4	6	37
5th	32	10	7	7	31
6th	31	5	7	11	25
7th	26	13	6	3	18
8th	21	26	5	3	21
9th	17	11	9	7	18
10th	13	7	4	2	16
11th	5	2	1	1	4
12th	3	1	1	1	3
Mean grade	5.1	6.1	5.3	5.6	4.8

NOTE: Columns represent disposition of cases.

Design

In order to analyze the data most effectively, several different designs were used in this study. Variables were analyzed separately and then all variables under consideration were combined into a series of discriminant analyses designed to maximize differences between the learning disabled and other children. The total study includes five levels of groups (learning disabled, EMI, EI, otherwise impaired and non-impaired), three levels of WISC factors which are a combination of specific subtests (Spatial - Picture Completion, Block Design, Object Assembly; Verbal-Comprehension - Similarities, Vocabulary, Comprehension; Attention-Concentration - Arithmetic, Coding). Percentage of discrepancy between expected and actual achievement is included using two criteria. The first considers a 60% discrepancy across all age levels; the second varies according to age level (0-8 years = 40%, 9-12 years = 50%, 13-15 years = 60%, 16-18 years = 70%).

Each of the five groups was included in this study as a variable to compare the characteristics of the learning disabled group to other groups. While a variety of profiles are often cited as being characteristic of the learning disabled, many of them have been called into question (Cruikshank, 1977; Hallahan and Kauffman, 1977). One question here relates to the issue of overlap in characteristics between groups (Bryan and Bryan, 1976). The matter of false positive and false negative is essential in any identification

process. While a cluster of characteristics for the learning disabled may be established, they would be more meaningful if they could be shown to discriminate the learning disabled from other groups.

Previous research has pointed to the use of a discrepancy formula in the identification of learning disabled children (Meier, 1971; Brenton and Gilmore, 1976). At one time, proposed federal guidelines included the use of a specific formula in arriving at a discrepancy for purposes of identification. Presently, states such as New York include a formula and Michigan has given serious consideration to it as well. If there is one characteristic that has been considered indicative of the learning disabled as a group, it is this discrepancy between expected achievement based upon mental age and actual achievement as determined by individual achievement tests. The effectiveness of a discrepancy formula, however, has been severely criticized (Salvia and Clark, 1973; Sulzbacher and Kenowitz, 1977).

The role of age was also investigated as a variable in the identification of learning disabled children. The research reviewed in Chapter II, which dealt with previous studies characterizing the learning disabled child, showed a greater percentage of learning disabled children to be identified at a younger age (C. Mercer, 1971; Elkins, 1975). Importantly, the proposed Michigan guidelines for the use of a discrepancy formula present criteria which expect the discrepancy to increase as the child increases in age. It

seems important to determine if the use of such a formula functions effectively at all age levels.

Research (Bannatyne, 1968; Smith et al., 1977) points strongly to a unique profile on WISC subtests which would be helpful in the identification of the learning disabled. This group has been found to score highest, relative to their own profiles, on the Spatial factor, second highest on the Verbal-Comprehension factor and lowest on the Attention-Concentration factor. Based upon these findings, three factors have been included in this study. The extent to which previously reported profiles are characteristic of all children and not the learning disabled exclusively, needs further investigation (Huelsman, 1970; Kauffman, 1975).

Sex has been included as a variable in this study since previous research has found sex effects across several variables. Keogh and Hall (1974) found males to have lower scores on the WISC factor of Attention relative to their own performance. Caplan (1977) found a sex bias in the rate in which children are referred for psycho-educational evaluation, and males have consistently been found (Ames, 1968; Kirk and Elkins, 1975) to be overrepresented in populations of learning disabled children. The existence of any age effect in the use of the discrepancy formula has also been examined.

Previous research examining the F.S.IQ of learning disabled children presents conflicting findings. Kirk and Elkins (1974) found the mean F.S.IQ to be 93 while Sobotka

(1977) reported 102.5 and Ackerman et al. (1971) reported 108.5. Since many states (C. Mercer, 1971) use average intelligence or better as a criterion for eligibility as learning disabled, it appears important to determine if this is a realistic position. The effect of F.S.IQ in the use of a mental age discrepancy formula has also been examined in this study, since it has been claimed that such a formula would not apply equally at all levels (Hammill, 1976).

Several studies have pointed to a possible socioeconomic effect (Rubin et al., 1973; Kealy and McLeod, 1976) in the placement process. These researchers report that placement as learning disabled is more often made in the case of middle or upper-middle class children. They also suggest that lower SES children are more likely to be placed as EMR due to a placement bias. Any possible bias, however, may only be evaluated after any difference in intellectual ability between SES levels is first analyzed. Consequently, the effect of SES in the placement process, as well as the degree of congruence between the opinions of both the school psychologist and the learning disability consultant, have been analyzed in this study.

Testable Hypotheses

The following hypotheses were formulated and tested in this study:

Hypothesis 1a: There is no significant difference between the learning disabled group and other groups in percentage of discrepancy between expected and actual achievement when

a 60% criterion is applied.*

Hypothesis 1b: There is no significant difference between the learning disabled group and other groups in percentage of discrepancy between expected and actual achievement when the proposed** Michigan guidelines are applied.

Hypothesis 2a: There is no significant relationship between the factors of age range and percentage of discrepancy between expected and actual achievement in the identification of learning disabled children.

Hypothesis 2b: There is no significant relationship between the factors of F.S.IQ and percentage of discrepancy between expected and actual achievement in the identification of learning disabled children.

Hypothesis 2c: There is no significant relationship between the factors of sex and percentage of discrepancy between expected and actual achievement in the identification of learning disabled children.

Hypothesis 3a: There is no significant difference between the learning disabled group and other groups on Attention-Concentration scores as measured by the Wechsler scales.

Hypothesis 3b: There is no significant difference between the learning disabled group and other groups on Spatial scores as measured by the Wechsler scales.

Hypothesis 3c: There is no significant difference between the learning disabled group and other groups on Verbal-Comprehension scores as measured by the Wechsler scales.

Hypothesis 4a: There is no significant relationship between the factors of group (learning disabled-non-impaired) and socioeconomic status in the identification of children by an Educational Placement and Planning Committee.

- * Present achievement in one or more of the basic skill areas is approximately 40% or less of expected achievement.
- ** A severe discrepancy is defined as follows: For ages up to 8-11, present achievement is 60% or less of expected achievement; for age 9-0 to 11-11, achievement is 50% or less; for ages 12-0 to 14-11, achievement is 40% or less; for ages 15-0 and above, achievement is 30% or less.

Hypothesis 4b: There is no significant relationship between the factors of group (learning disabled-educable mentally impaired) and socioeconomic status in the identification of children by an Educational Placement and Planning Committee.

Hypothesis 4c: There is no significant relationship between the opinion of the school psychologist and the opinion of the learning disability consultant in the placement of children as learning disabled.

Hypothesis 5: There is no significant contribution made to a formula which discriminates learning disabled children from other children by the factors of percentage of discrepancy, Attention-Concentration, Spatial, Verbal-Comprehension and Full Scale IQ Scores, sex, age and socioeconomic status.

Analysis

A series of separate analyses, as well as a series of discriminant analyses, were conducted to test the hypothesis of the study. The first one-way ANOVA included five levels of group (LD, EMI, EI, Other, None) crossed with the 60% discrepancy formula. This design is included in Figure 3.1. The second ANOVA was the same, except that the proposed discrepancy formula was used. A series of one-way ANOVAS between groups was also conducted for each achievement test with both the 60% discrepancy and the proposed discrepancy formula. These findings are reported in Chapter IV under the heading of Supplementary Analysis.

Three one-way ANOVAS were conducted in order to examine differences between the learning disabled group and other groups on the WISC subtest factors. The first one-way ANOVA between groups was crossed with the WISC factor called Attention-Concentration. The next two were the same except the

Group	Count	Mean	SD	Min.	Max.	95% Int.
Learning Disabled	278					
Educable Mentally Impaired	141					
Emotionally Impaired	67					
Other Impaired	61					
Non-Impaired	294					

Figure 3.1 - Design of first analysis of variance and cell size (60% criterion).

WISC factors of Verbal-Comprehension and Spatial were crossed with the five groups. Confidence intervals at the 95% level were established to allow for examination of both between and within group differences.

Three separate Chi Squares were conducted to determine the effect of the new discrepancy formula in the identification of learning disabled children. The first Chi Square examined the relationship between age range (young=4.6 years to 11.11 years; old=12.0 years to 18.6 years) and percentage of discrepancy. These designs are shown in Figure 3.2. The next two Chi Squares are the same, except that they examined the effects of Full Scale IQ (0-89, 90 and above) and sex (male-female). Fisher's Exact Test was used where Chi Squares were not appropriate. The same procedure was conducted for

Age Range	Discrepancy formula	
	Identified	Not Identified
4.6 - 11.11	n=	
12.0 - 18.6	%=	

Full Scale IQ	Discrepancy formula	
	Identified	Not Identified
0 - 89		
90 - above		

Sex	Discrepancy formula	
	Identified	Not Identified
Male		
Female		

Figure 3.2 - Design of Chi Squares for relationship between discrepancy and Age Range, Full Scale IQ and Sex.

each of the other four groups separately. These findings are reported in Chapter IV under the heading of Supplementary Analysis.

Chi Squares were also conducted to investigate the relationship between socioeconomic status and placement by the E.P.P.C. The first Chi Square had two levels of group (LD-EMI) and two levels of socioeconomic status (middle-low). The second Chi Square was the same except the groups examined were learning disabled and non-impaired. Chi Square was also conducted to examine the degree of congruence between the school psychologist and the learning disability consultant as to whether they believed the child to be learning disabled or not. This design includes 3 levels of response (yes-no-uncertain) for each of the two professionals as to their opinion of whether or not the child was learning disabled.

A series of one-way ANOVAS was also conducted between the five groups and crossed with factors of PIQ, VIQ, F.S.IQ and each of the separate subtests comprising the total WISC scale. These findings are presented in Chapter IV under the heading Supplementary Analysis.

Four separate Discriminant Analyses were conducted. The first analysis included two levels of sex (male-female), two levels of SES (middle-low), two levels of discrepancy (meets 60%-does not), as well as age, Full Scale IQ and WISC factors of Attention-Concentration, Verbal-Comprehension and Spatial, each of which is a continuous variable. This

design was used to investigate the maximum discrimination that could be made between the learning disabled group and the other groups. This design is shown in Figure 3.3 and Figure 3.4. The second Discriminate Analysis was the same, except two groups (emotionally impaired and otherwise impaired) were eliminated and the proposed discrepancy formula replaced the 60% formula. Full Scale IQ was not included in the third analysis. In the fourth analysis, Full Scale IQ was again included while WISC scores on the factors of Attention-Concentration, Verbal-Comprehension and Spatial were eliminated.

Finally, to determine the magnitude of the relationship between IQ and achievement scores for this population, correlation coefficients between Verbal IQ/Full Scale IQ and WRAT subtests were established. These findings are presented in Chapter IV under the heading Supplementary Analysis.

Procedure

The data used in this study were collected by the Michigan Department of Education as described previously in this chapter. After receiving the data, contact was made with the project director, Dr. M. Diane Hodson, at the State of Michigan, Department of Education. Dr. Hodson explained the purposes and procedures of this project, which was conducted during the 1975-76 school year.

Modifications and assumptions made about the data include:

Group Counts

	Group 1	Group 2	Group 3	Group 4	Group 5	Total
	LD	EMI	EI	Other	None	
Count	197	95	46	50	189	577

Means

	Group 1	Group 2	Group 3	Group 4	Group 5	Total
	LD	EMI	EI	Other	None	

Sex (Female = 1
Male = 2)

SES (High = 1
Middle = 2
Low = 3)

Age

PSIQ

Spatial

Comprehension

Attention

60% Discrepancy

Figure 3.3 - Design of first Discriminant Analysis: Group counts and classification technique.

Prediction Table

Actual Group		No. of Cases	Predicted Group Membership				
			LD	EMI	EI	Other	None
Group LD	1	197	N= %=				
Group EMI	2	95					
Group EI	3	46					
Group Other	4	50					
Group None	5	189					

Figure 3.4 - Design of first Discriminant Analysis: Predicted group membership.

1. All cases which had the relevant data were used even if other data was missing. It was assumed that missing data did not reflect a self selection process. This means that separate analyses oftentimes have unequal number of subjects.

2. The cases with WISC scores were dropped so that where possible, all subjects had IQ's determined by a WISC-R administration only.

3. Where expected achievement was reported but not Full Scale IQ, the case was not analyzed.

4. All children with a reported chronological age less than 4 years, 6 months or greater than 18 years, 6 months were eliminated, since these students were probably not enrolled in the public schools and their referral for evaluation may well indicate a more severe disability than would be typical within the schools.

5. Analyses were conducted for both the learning disabled group and those children classified as educable mentally impaired, emotionally impaired, otherwise impaired and non-impaired. This procedure was conducted in order to maximize the meaning of any findings.

6. Because of the nature of the data, several procedures were employed in analyses. These include the use of Chi Square, Fisher's Exact Test, ANOVA, Discriminate Analysis and Correlations.

The validity of the mental age formula in the identification of learning disabled children was examined in this study. The initial formula proposed by the State of Michigan (1975-76) established as a criterion that a child demonstrate at least a 60% discrepancy between expected and actual achievement. More recently (1977), Michigan proposed a new formula which varies the discrepancy percentage by age range. Specifically, the new formula proposed the minimum discrepancy at each age range to be as follows: 0-8.11 years = 40%, 9-11.11 years = 50%, 12-14.11 years = 60%, 15 years and above = 70%. Both formulas were applied to each

of the five groups. This is similar to the procedure employed by Brenton and Gilmore (1976). Analysis was conducted initially to examine overall group differences, as well as group differences on each of the reported achievement tests. The effectiveness of the new formula was also examined for each of the five groups across age range, sex and Full Scale IQ. In the last instance, two levels of IQ (0-89, 90 and above) were established. These procedures will help to determine the number (if any) of children who would be correctly or incorrectly identified if such criteria were established. Empirical verification of a mental age formula is also being examined.

Between group differences were analyzed according to the three factor scheme as proposed by Bannatyne (1968). These factors are comprised of the following Wechsler subtests: Spatial (Picture Completion, Block Design, Object Assembly); Verbal-Comprehension (Vocabulary, Similarities, Comprehension); Attention-Concentration (Coding, Arithmetic, Digit Span). The Digit Span subtest was not reported and, consequently, the last factor was prorated in order to correct for this. This is similar to the technique used by Keogh et al. (1973) and Keogh and Hall (1974). Initially, a multivariate ANOVA was used here, including the factors of group, sex and grade. Small and unequal cell sizes, however, obscured results. One-way ANOVAS combined with a series of Discriminant Analyses were subsequently employed in analysis.

Investigation of the role of socioeconomic status in

the placement process was somewhat limited. While differences in SES between groups could be examined, no cause-effect relationship could be examined. Previous investigations have experienced similar problems (Morrow, 1976; Kealy and McLeod, 1976). Subjects classified as either high or middle in socioeconomic status were combined into one category since cell sizes in the former cases were small. When the learning disabled group was compared to the educable mentally impaired group, only cases with F.S.IQ's below 70 and a discrepancy of at least 60% were included. While this limited the sample size, it was judged to be the only valid way to examine the relationship.

Examination of the relationship between the opinion of the school psychologist and the learning disability consultant represents an effort to explore another aspect of the placement process as suggested by Beatty (1977). It appears necessary to examine not only the characteristics of children being served in the schools but, where possible, to explore the placement process as well.

Finally, a series of Discriminant Analyses were employed in order to maximize the discriminating value of each variable included. This procedure is similar to that employed by Ackerman (1971) and Leton (1972). Discriminate Analysis was chosen to assess discriminate variability of the validity of the variables in this study and to establish classification analysis. This procedure enters all variables through a stepwise method selecting the best set of

discriminating variables. It is a powerful technique often used to distinguish between two or more groups of cases and to distinguish the group variables that measure characteristics on which the groups are expected to differ. In effect, the procedure analyzes, i.e., measures the extent to which each variable discriminates. It also classifies or predicts classification. It is helpful in a design which includes a variety of variables with unequal cell sizes. Plots are also created which are useful in visualizing statistical differences.

Summary

This chapter described in detail the sample and the procedures employed in this study. In addition, the research design, data analysis and testable hypotheses were discussed. The results of these procedures are presented in the next chapter.

CHAPTER IV

RESULTS

Findings

The findings of the tests of the hypotheses of this study, plus supplementary analysis, are presented in this chapter.

Hypothesis 1a: There is no significant difference between the learning disabled group and other groups in percentage of discrepancy between expected and actual achievement when a 60% criterion is applied.

The difference between the learning disabled group and other groups' mean discrepancy scores was statistically significant. Hypothesis 1a was rejected at the $p < .0001$ level ($F=25.169$; $df\ 4,836$). A complete ANOVA table is presented in Table B1. It was concluded that the 60% criterion does discriminate the learning disabled group from other groups.

Hypothesis 1b: There is no significant difference between the learning disabled group and other groups in percentage of discrepancy between expected and actual achievement when the proposed Michigan guidelines are applied.

The difference between the learning disabled group and other group mean discrepancy scores was statistically significant. Hypothesis 1b was rejected at the $p < .0001$ level ($F=21.936$; $df\ 4,836$). The proposed discrepancy formula does

discriminate the learning disabled group from other groups. In addition, it is a more powerful discriminator than the 60% criterion for the learning disabled, mentally impaired and other group but not for the emotionally impaired or non-impaired groups.

Hypothesis 2a: There is no significant relationship between the factors of age range and percentage of discrepancy between expected and actual achievement in the identification of learning disabled children.

The relationship between age range and percentage of discrepancy (see Table 4.1) was not found to be statistically significant. Hypothesis 2a was not rejected ($X^2=0.2886$; $df=1$; $p < .5911$). A complete Chi Square table is presented in Table B2. The percentage of learning disabled children identified increases with each age range with the exception of the oldest age range where the percentage decreases. The proposed discrepancy criteria is more effective than the 60% criterion at the first two age ranges, equivalent at the 3rd age range and is less effective at the 4th age range.

Hypothesis 2b: There is no significant relationship between the factors of Full Scale IQ and percentage of discrepancy between expected and actual achievement in the identification of learning disabled children.

The relationship between Full Scale IQ and percentage of discrepancy (see Table 4.1) was found to be statistically significant. Hypothesis 2b was rejected ($X^2=32.127$; $df=1$; $p < .0001$). A complete Chi Square table is presented in Table B2. A direct relationship was found in which the percentage of children identified increased with Full Scale IQ. At each level, the new discrepancy criteria were more

Table 4.1 - Frequency and percentage of LD children identified by 60% and proposed formulas, improvement rate using the proposed formula, cases not identified and total cases.

	Discrepancy 60%	Proposed	Improve. Rate Difference	Not Identified by Proposed	Total
Age Range					
4.6-8.11	4 (4.7)	29(34.1)	25 (29.4)	56(65.9)	85(30.6)
9.0-11.11	16(17.8)	35(38.9)	29 (21.1)	55(61.1)	90(32.4)
12.0-14.11	31(48.4)	31(48.4)	0 (0.0)	33(51.6)	64(23.0)
15.0-18.6	21(53.8)	10(25.7)	-11(-28.1)	29(74.3)	39(14.0)
Total	72(25.9)	105(37.5)	44 (15.8)	173(62.2)	278(100%)
F.S.IQ					
0 - 89	37(22.7)	39(23.9)	2 (1.2)	124(76.1)	163(58.6)
90 - above	35(30.4)	66(57.4)	31 (27.0)	49(42.6)	115(41.4)
Total	72(25.9)	105(37.8)	33 (11.8)	173(62.2)	278(100)
Sex					
Male	61(28.5)	88(41.1)	27 (12.6)	126(58.9)	214(77.3)
Female	10(15.8)	16(25.4)	6 (9.5)	47(74.6)	63(22.7)
Total	71(25.7)	104(37.5)	33 (11.9)	173(62.5)	277(100)

effective in identifying students now placed as learning disabled in Michigan than the 60% criterion. This relationship is represented graphically in Figure 4.1.

Hypothesis 2c: There is no significant relationship between the factors of sex and percentage of discrepancy between expected and actual achievement in the identification of learning disabled children.

The relationship between sex and percentage of discrepancy (see Table 4.1) was found to be statistically significant. Hypothesis 2c was also rejected ($\chi^2=5.132$; $df=1$; $p<0.023$). A complete Chi Square table is presented in Table B2. A relationship was found in which the percentage of children identified was greater for males (41.1%) than for females (25.4%). The proposed discrepancy criteria are more effective than the 60% criterion. This relationship is represented graphically in Figure 4.1.

Hypothesis 3a: There is no significant difference between the learning disabled group and other groups on Attention-Concentration scores as measured by the Wechsler scales.

The differences in Attention-Concentration scores between the learning disabled group and the other groups were found to be statistically significant (see Table 4.2) at the $p<.0001$ level ($F=63.312$; $df\ 4,920$). Therefore, the hypothesis was rejected. The complete ANOVA table is presented in Table B3. An inspection of the mean group differences (see Table 4.2) revealed that the Attention-Concentration scores discriminate the learning disabled group from the EMI and non-impaired groups but not from the EI and other groups.

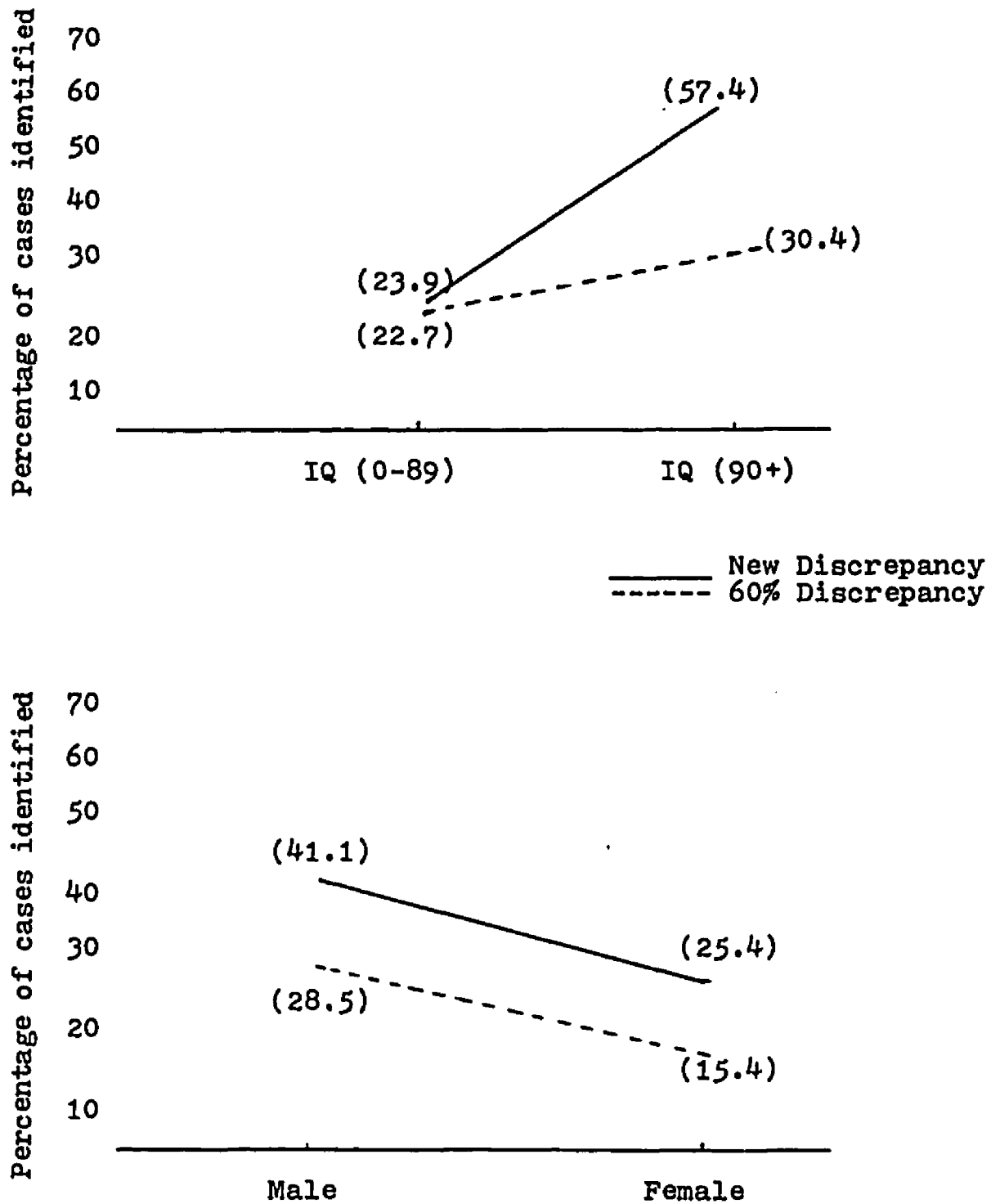


Figure 4.1 - Relationship between percentage of Learning Disabled children identified by 60% proposed formulas and F.S.IQ and Sex.

Table 4.2 - Comparison of WISC Spatial, Verbal and Attention mean scores and discrepancies between mean scores for each group.

	WISC Spatial	WISC Verbal	WISC Attention	WISC S-V Discrepancy	WISC S-A Discrepancy	WISC V-A Discrepancy
Learning Disabled	9.15	8.33	7.13*	0.82	2.02	1.20
Educable Mentally Impaired	6.15	4.76	5.04	1.39	1.11	-0.28
Emotionally Impaired	9.58	8.31	7.72	1.27	1.86	0.59
Other	8.34	7.13	7.10	1.21	1.24	0.03
Non-Impaired	9.55	8.75	8.30	0.80	1.25	0.45

* Learning disabled mean Attention score significantly ($p < .05$) below non-impaired mean score.

Hypothesis 3b: There is no significant difference between the learning disabled group and other groups on Spatial scores as measured by the Wechsler Scales.

The differences on Spatial scores between the learning disabled group and the other groups were found to be statistically significant (see Table 4.2) at the $p < .0001$ level ($F=51.292$; $df\ 4,776$); therefore, the hypothesis was rejected. An inspection of the F ratios presented in Table B3 revealed the Spatial score to be a less effective discriminator than the Attention-Concentration score. In effect, it is only powerful enough to discriminate between the learning disabled and the EMI group. However, the discrepancy between the Attention-Concentration score and the Spatial score for the learning disabled group is larger than in any other comparison.

Hypothesis 3c: There is no significant difference between the learning disabled group and other groups on Verbal-Comprehension scores as measured by the Wechsler scales.

The differences on Verbal-Comprehension scores between the learning disabled group and other groups were found to be statistically significant (see Table 4.2) at the $p < .0001$ level ($F=70.125$, $df\ 4,831$). A complete ANOVA table is presented in Table B3. The Verbal-Comprehension scores differentiate the learning disabled group from the EMI and other group but not from the EI or non-impaired group. The most powerful discriminator between the learning disabled and non-impaired groups is the Attention-Concentration factor. Within the learning disabled group, the largest discrepancy is found between the Attention-Concentration factor and the

Spatial factor.

Hypothesis 4a: There is no significant relationship between the factors of group (learning disabled - non-impaired) and socioeconomic status in the identification of children by an Educational Placement and Planning Committee.

This hypothesis was not rejected ($\chi^2=0.0358$; $df=1$; $p<0.8498$). This indicated an absence of SES bias in the identification of children by an Educational Placement and Planning Committee (see Table 4.3).

Hypothesis 4b: There is no significant relationship between the factors of group (learning disabled - educable mentally impaired) and socioeconomic status in the identification of children by an Educational Placement and Planning Committee.

This hypothesis was not rejected (Fisher Exact; $df=1$; $p<0.4370$). Again, this indicated an absence of SES bias in the identification of children (see Table 4.3). Since cell sizes were small, the relationship was examined again, except that the discrepancy criterion was not applied to the EMI group and the IQ criterion was not applied to the LD group. In this instance, a significant relationship was found ($\chi^2=4.731$; $df=1$; $p<0.0296$). Caution should be exercised in interpreting this finding, however, since the two groups may not be matched.

Hypothesis 4c: There is no significant relationship between the opinion of the school psychologist and the opinion of the learning disability consultant in the placement of children as learning disabled.

A highly significant relationship (see Table 4.4) was found between the opinion of the school psychologist and that of the learning disability consultant ($\chi^2=80.995$; $df=4$; $p<.0001$); therefore, the hypothesis was rejected. A

Table 4.3 - Frequency and percentages for relationship between group placement and socioeconomic status.

SES	Group Placement ^a	
	Learning Disabled	Non-Impaired
Middle	39(81.3)	9(19.8)
Low	19(82.6)	4(17.4)

SES	Group Placement ^b	
	Learning Disabled	Mentally-Impaired
Middle	1(14.3)	6(85.7)
Low	2(33.3)	4(66.7)

SES	Group Placement ^c	
	Learning Disabled	Mentally-Impaired
Middle	39(55.7)	31(44.3)
Low	19(34.5)	36(65.5)

^aPercentage of Discrepancy held constant.

^bPercentage of Discrepancy and F.S.IQ held constant.

^cPercentage of Discrepancy and F.S.IQ not held constant.

Table 4.4 - Frequency and percentage for relationship between opinion of school psychologist and consultant as to whether a child should be placed as learning disabled.

Consultant Opinion	Opinion of School Psychologist		
	Yes	No	Uncertain
Yes	183(64.0)	5(1.7)	36(12.6)
No	8 (2.8)	8(2.8)	11 (3.8)
Uncertain	15 (5.2)	0(0.0)	20 (7.0)

Consultant Opinion	Opinion of School Psychologist	
	Yes	No
Yes	200(34.4)	7 (1.2)
No	10 (1.7)	365(62.7)

similar relationship was found for the entire population ($\chi^2=506.4060$; $df=1$; $p<.0001$). It was concluded that the two professionals are in almost perfect agreement as to the placement of children as learning disabled.

Hypothesis 5: There is no significant contribution made to a formula which discriminates learning disabled children from other children by the factors of percentage of discrepancy, Attention-Concentration, Spatial, Verbal-Comprehension and Full Scale IQ scores, sex, age and socioeconomic status.

A series of four Discriminant Analyses were used to test the hypothesis. The first analysis was conducted with all five groups and the 60% discrepancy criterion. In the second analysis two groups (emotionally impaired and otherwise impaired) were dropped since they could not be

discriminated from the other three groups and the proposed discrepancy replaced the 60% discrepancy. The third and fourth analyses were conducted in order to examine the relative power of Full Scale IQ and the three WISC factors. The analyses revealed that these factors do contribute significantly to a formula which discriminates the learning disabled group from other groups (see Table 4.5); therefore, the hypothesis was not rejected. The complete DISCRIMINANT Tables are presented in Table B4.

The first Discriminant Analysis demonstrated significant mean differences (see Table B7) for each variable entered with the exception of Spatial score and age. Inspecting the exact F ratios (Table B4) in order of effectiveness, four of the variables (Full Scale IQ, Discrepancy, Attention and SES) were significant at the $p < .0001$ level, one (Comprehension) was significant at the $p < 0.002$ level and one (sex) was significant at the $p < .027$ level. These six variables combined to produce four separate Discriminant Functions (see Table B5 and B6). Applications of these formulas to the five sample groups, which assigned subjects on the probability of membership, resulted in 129, or 65.5%, correct classification of the 197 learning disabled children. The effective assignment for the EMI group was 63, or 66.3%, and for the non-impaired group was 122, or 64.6%. However, correct assignment for the EI group was 6, or 13.0% and for the other group was 2, or 4.0%. Additionally, overlap in the distribution of subjects was found.

Table 4.5 - Prediction Results - Frequency and percentage of cases identified and mis-classified by Discriminant Analyses.

1. First Discriminant Analysis

<u>Actual Group</u>	<u>No. of Cases</u>	<u>Predicted Group Membership</u>				
		<u>LD</u>	<u>EMI</u>	<u>EI</u>	<u>Other</u>	<u>None</u>
LD	197	129 65.5	21 10.7	0 0.0	2 1.0	45 22.8
EMI	95	22 23.2	63 66.3	0 0.0	1 1.1	9 9.5
EI	46	15 32.6	6 13.0	6 13.0	0 0.0	24 52.2
Other	50	15 30.0	2 4.0	2 4.0	2 4.0	25 50.0
None	189	52 27.5	5 2.6	5 2.6	1 0.5	122 64.6

Percentage of cases correctly classified: 55.81%

Prior probabilities

LD - .341 EMI - .164 EI - .079 Other - .086 None - .327

Table 4.5 (cont'd.)

2. Second Discriminant Analysis

<u>Actual Group</u>	<u>No. of Cases</u>	<u>LD</u>	<u>Predicted Group Membership</u>	
			<u>EMI</u>	<u>None</u>
LD	197	133 67.5	18 9.1	46 23.4
EMI	95	19 20.0	64 67.4	12 12.6
None	189	53 28.0	8 4.2	128 67.7

Percentage of cases correctly classified: 67.57%

Prior probabilities

LD - .409 EMI - .197 None - .392

The Second Discriminant Analysis was the most effective in discriminating between the learning disabled, mentally impaired and the non-impaired groups. The variables are ordered according to their sequence of entry into the discriminant equation. The Full Scale IQ, new discrepancy and Attention scores were the most powerful and were significant at the $p < .0001$ level. Inspecting the Exact F ratios (Table B4), the proposed discrepancy was more effective in discriminating groups than the 60% discrepancy used in the first Discriminant Analysis ($F=22.227$, $df\ 2,571$). Each of the other variables entered (except Spatial) contributed to the equation. SES was significant at the $p < .007$ level, Comprehension at the $p < .005$ level, Age at the $p < .002$ level and Sex at the $p < .014$ level. Only the Spatial factor was not entered since it did not approach a level of significance.

Application of these formulas to the LD, EMI and non-impaired sample profiles, which assigned pupils on the basis of the probability of membership, resulted in 133, or 67.5% correct classification of the learning disabled group. For the educable mentally impaired and non-impaired groups, the correct classification was 64, or 67.4% and 128, or 67.7%, respectively. The subjects have been plotted along the two Discriminant Functions; this plot is presented graphically in Figure B1.

The third and fourth Discriminant Analyses (see Table 4.6) represent an attempt to further evaluate the contributions made to the equation by the variables of F.S.IQ,

Table 4.6 - Prediction Results - Third and Fourth Discriminant Analyses.

3. Third Discriminant Analysis

<u>Actual Group</u>	<u>No. of Cases</u>	<u>LD</u>	<u>Predicted EMI</u>	<u>Group Membership None</u>
		129	23	45
LD	197	65.5	11.7	22.8
		16	65	14
EMI	95	16.8	68.4	14.7
		47	12	130
None	189	24.9	6.3	68.8

Percentage of cases correctly classified: 67.36%

Prior probabilities

LD - .409 EMI - .197 None - .392

4. Fourth Discriminant Analysis

<u>Actual Group</u>	<u>No. of Cases</u>	<u>LD</u>	<u>Predicted EMI</u>	<u>Group Membership None</u>
		137	19	57
LD	213	64.3	8.9	26.8
		18	70	11
EMI	99	18.2	70.7	11.1
		58	8	147
None	213	27.2	3.8	69.0

Percentage of cases correctly classified: 67.43%

Prior probabilities

LD - .405 EMI - .188 None - .405

Attention-Concentration, Verbal-Comprehension and Spatial scores. Further computations disclosed that the classification based on Full Scale IQ and the other four variables (discrepancy, age, SES, sex) was almost as accurate as classification based upon each of these variables plus the three factors of Attention, Verbal and Spatial scores. Plots of these analyses are presented graphically in Figures B2 and B3. It was concluded that most of the discriminant power assigned to these three factors is lost when Full Scale IQ is included in the formula.

Supplementary Analysis

To further examine the effectiveness of the discrepancy formulas, they were applied to the educable mentally impaired, emotionally impaired, otherwise impaired and non-impaired samples. Frequency distributions for each group by age range, F.S.IQ and sex are presented in Table 4.7. For the EMI group, a significant relationship was found between percentage of discrepancy and age range ($\chi^2=0.0034$; $df=1$; $p<0.0465$). A complete Chi Square table is presented in Table B2. The percentage of EMI children identified increases at each age range with the exception of the highest age range where this percentage decreases. No significant relationships were found for either the emotionally impaired or otherwise impaired groups. For the non-impaired group, a significant relationship was found between discrepancy and age range ($\chi^2=4.992$; $df=1$; $p<0.025$). For the non-impaired

Table 4.7 - Frequency and percentage of EMI, EI, other and non-impaired children identified by proposed criteria.

GROUP	EMI	EI	OTHER	NON-IMPAIRED
Age Range				
4.6- 8.11	2 (7.6)	3 (15.7)	1 (7.7)	23 (19.5)
9.0-11.11	4 (10.5)	3 (15.0)	2 (8.3)	16 (16.5)
12.0-14.11	6 (13.6)	2 (11.1)	0 (0.0)	6 (12.5)
15.0-18.6	3 (3.0)	1 (10.0)	0 (0.0)	0 (0.0)
Total	13 (9.2)	9 (13.4)	3 (4.9)	45 (15.3)
F.S.IQ				
0 - 89	12 (9.0)	4 (11.1)	1 (2.0)	9 (6.8)
90 - above	1 (11.1)	5 (16.1)	2 (18.1)	36 (22.3)
Total	13 (9.2)	9 (13.4)	3 (4.9)	45 (15.3)
Sex				
Male	11 (12.5)	7 (14.3)	3 (6.4)	39 (17.6)
Female	2 (3.8)	2 (11.1)	0 (0.0)	6 (8.3)
Total	13 (9.2)	9 (13.4)	3 (4.9)	45 (15.3)

group the relationship between discrepancy and F.S.IQ was significant ($X^2=13.3135$; $df=1$; $p<0.0003$) as it was for sex ($X^2=3.623$; $df=1$; $p<0.0570$). While the discrepancy formula does identify a larger percentage of learning disabled than non-impaired children at all levels, the percentage of children incorrectly identified warrants caution in applying the formula.

To further understand the differences between groups on the Wechsler scores, comparisons were made on each of the separate subtests as well as Verbal, Performance and Full Scale IQ. Group mean scores are presented in Table 4.8. Applying a 95% confidence interval for each group revealed that Wechsler subtests of Information, Coding and Arithmetic

Table 4.8 - Comparison of Wechsler score across five groups and Learning Disabled and Non-Impaired group differences.

	Verbal IQ	Perf. IQ	F.S. IQ	Pict. Comp.	Pict. Arr.	Obj. Ass.	Comp.	Block Des.	Voc.	Simil.	Info.	Cdg.	Arith.
Learning Disabled	86.5	91.8	88.5	9.5	9.4	9.4	8.7	8.6	8.4	7.9	7.6	7.2	7.0
Non-Impaired	91.5	95.3	92.5	9.9	9.5	9.6	9.1	9.1	8.7	8.3	8.1	8.3	8.2
Educable Mentally Impaired	68.5	73.9	68.5	6.9	5.7	6.2	5.3	5.6	4.4	4.7	4.7	5.1	4.9
Emotionally Impaired	87.5	92.8	89.5	9.5	9.5	10.0	8.3	8.7	8.2	8.3	8.0	7.4	8.0
Otherwise Impaired	79.5	85.9	80.5	8.5	8.4	8.8	7.4	7.7	7.1	6.6	6.5	7.1	6.9
LD-Non-Impaired Difference	5.0*	3.5*	4.0*	0.4	0.1	0.2	0.4	0.4	0.3	0.4	0.5*	1.1*	1.2*

*p < .05

were the subtests which significantly discriminated the learning disabled from the non-impaired group. The learning disabled and non-impaired groups were also found to be significantly different in Verbal, Performance and Full Scale IQ. In all cases, the learning disabled group scored below the non-impaired group.

To further analyze the usefulness of the discrepancy formulas, each achievement subtest was analyzed separately with both the 60% and the new discrepancy formulas. A complete ANOVA table is presented in Table B1.

Inspection of the group means presented in Table 4.9 and multiple range tests for the 0.05 level, revealed that the most powerful subtest in discriminating between the learning disabled and non-impaired groups was Word Recognition. The next powerful was the Spelling subtest, followed by Arithmetic. Differences in Reading scores were the least powerful and did not significantly discriminate between the two groups.

Finally, to determine the magnitude of the relationship between IQ and achievement scores for this population, correlation coefficients between Verbal IQ/Full Scale IQ and WRAT subtests were established. These results are presented in Table 4.10.

Summary

This chapter presented the results of the study for each of the test hypotheses and supplementary analyses.

Table 4.9 - Mean grade level above 60% and Proposed Discrepancy Criteria for Word Recognition, Spelling, Arithmetic and Reading subtests across groups.

	60% Word Recog.	New Word Recog.	60% Spell	New Spell	60% Arith.	New Arith.	60% Read	New Read	60% Max.	New Max.
Learning Disabled	1.00	0.87	0.83	0.72	1.35	1.23	1.24	1.09	0.42	0.28
Non-Impaired	1.99	1.78	1.49	1.28	1.71	1.49	1.46	1.21	0.86	0.89
Educable Mentally Impaired	1.45	1.50	1.11	1.21	1.61	1.65	1.18	1.17	0.92	0.97
Emotionally Impaired	2.15	2.04	1.85	1.76	1.81	1.68	1.93	1.89	1.21	1.08
Otherwise Impaired	1.82	1.79	1.54	1.57	1.86	1.83	2.27	2.39	1.13	1.10
LD-Non Impaired Difference	0.99*	-0.91*	-0.66*	-0.56*	-0.36*	-0.26	-0.22	-0.12	-0.44	-0.61

*Mean difference between learning disabled and non-impaired groups on each of the subtests ($p < .05$).

Table 4.10 - Correlation Coefficients between Verbal IQ/Full Scale IQ and WRAT subtest of Word Recognition, Spelling and Arithmetic for each of the five groups.

GROUP	LD		EMI		EI		OTHER		NON-IMPAIRED	
Intelligence Scale	VIQ	FSIQ	VIQ	FSIQ	VIQ	FSIQ	VIQ	FSIQ	VIQ	FSIQ
<u>WRAT</u> <u>SUBTEST</u>										
Word Recognition	.002 .485	.175 .002	.414 .001	.148 .032	-.027 .406	-.209 .026	.070 .281	.305 .002	.227 .001	.290 .001
Spelling	-.065 .163	.204 .001	.394 .001	.144 .061	-.154 .104	-.115 .165	.120 .177	.237 .025	.163 .005	.218 .001
Arithmetic	.094 .058	.297 .001	.340 .001	.211 .005	-.124 .138	-.094 .187	.087 .231	.361 .001	.133 .014	.326 .001

Overall, the results indicated that there exist significant differences between the learning disabled group and the other groups analyzed. However, the degree of overlap on each characteristic measured is sufficient to warrant substantial caution to those involved in identification of children as learning disabled. A summary of the significant findings is included in Table 4.11.

Presented in Chapter V is a discussion of the results of this study. Chapter VI includes a summary of these results, implications for school psychologists and others in the field of special education, suggestions for further research and a summary of the research.

Table 4.11 - Summary of major findings.

Hypothesis	Effect	Scale	p < Sig. level
1a	Group differences	60% Discrepancy	< .0001
1b	Group differences	Proposed Discrepancy	< .0001
2b	Relationship between F.S.IQ and Discrepancy for LD	F.S.IQ and Proposed Discrepancy	< .0001
2c	Relationship between Sex and Discrepancy for LD	Sex and Proposed Discrepancy	< .023
3a	Group differences on Attention-Concentration	Coding + Arithmetic	< .0001
3b	Group differences on Verbal-Comprehension	Vocabulary + Similarities + Comprehension	< .0001
4c	Relationship between opinion of psychologist and consultant	Placement of child	< .0001
5	Group differences	F.S.IQ Discrepancy Attention Comprehension Age SES Sex	< .0001 < .0001 < .0001 < .005 < .002 < .007 < .014

Table 4.11 (cont'd.)

Supplementary Analysis	Effect	Scale	p < Sig. level
For Non-Impaired Group	Relationship between Age and Discrepancy	Age and Discrepancy	< .0255
	Relationship between F.S.IQ and Discrepancy	F.S.IQ and Discrepancy	< .0003
	Relationship between Sex and Discrepancy	Sex and Discrepancy	< .0570
For Learning Disabled and Non-Impaired	Wechsler subtest differences	Information	< .05
		Coding	< .05
		Arithmetic	< .05
	Wechsler IQ differences	Verbal IQ	< .05
		Performance IQ	< .05
		F.S.IQ	< .05
	Achievement test differences	Word Recognition	< .05
		Spelling	< .05
		Arithmetic	< .05

CHAPTER V

DISCUSSION OF RESULTS

Presented in this chapter is a discussion of the results of the study. Included here are considerations related to intellectual characteristics, discrepancy, misclassification, profile analysis, sex differences, chronological age, socioeconomic status and the placement process.

Intellectual Characteristics

The factor which contributed most significantly to discrimination between groups was Full Scale IQ. With regard to intelligence, mentally impaired children have, by definition, lower IQ's than the learning disabled or non-impaired children. Some research reviewed in Chapter II indicates that the learning disabled, as a group, are reported to be scoring lower than expected on intelligence tests. Kirk and Elkins (1975), in their extensive study, report a mean F.S.IQ of 93. Others have not found this to be the case. Ackerman (1975) reports a mean F.S.IQ of 108.5, and Sobotka (1977) reports 102.5. The findings of this study more closely approach the results of Kirk and Elkins (1975), as the mean F.S.IQ was 88.5. While not low enough to be considered retarded, the distribution of intelligence reflects a

skewness which places the majority of these children below the national mean. An inspection of the literature demonstrates that learning disabled children have been reported to have lower intelligence levels than comparison groups with some consistency (Bryan and Bryan, 1976).

A number of explanations may account for these IQ differences. Kirk and Elkins (1975) report that approximately 35% of the children in their research had IQ's below 90. The results of the present study demonstrate this percentage to be 58%. The authors maintain that previously, many of these children would have been classified as mentally retarded. They propose that since the American Association of Mental Deficiency has changed its criterion for mental retardation from one standard deviation below normal (or an IQ of 84 or below) to two standard deviations (or an IQ of 68 or below), it would appear that many of these slow learning children are now being classified as learning disabled. Additionally, the authors believe that in some projects it was obvious that they were not dealing with specific learning disabilities, but rather with general learning problems. They see these children as representing (a) slow learners or (b) children from disadvantaged environments who have had unequal opportunities to learn. This position has had substantial support (Kendor, 1972; Hallahan and Kauffman, 1977).

Ames (1977), reflecting a popular opinion (Shepard, 1975; Donofrio, 1977) in referring to what she calls the Law of Parsimony, insists that all too often children

classified as learning disabled are simply overplaced. Addressing the population with F.S.IQ's from 89 to 90 she writes:

In most school systems, these students also fail. Too intelligent for a class of retarded children, they are still not able to keep up with the regular class. They suffer and struggle, flounder and fail. If one is available, they end up in a learning disability class (p. 7).

There are those who reject this proposition, however. Cruickshank (1977) writes that the reality of the situation is that learning disabilities is a matter relating to children of any intellectual level. He rejects the notion that those below an F.S.IQ of 80 should be excluded from the learning disabled category. To do this would be seen as arbitrary and "serve to deprive thousands of mentally handicapped children the appropriate understanding and programming and, indeed, in many instances...result in the worst type of discrimination" (p. 60).

Approaching the issue differently, the precision of determining intelligence and not the measured IQ of the child has been criticized. The major concerns about using IQ as a criterion in evaluating and classifying the learning disabled have been summarized by Danielson and Bauer (1978):

- (1) IQ is not an index of "ability" or "potential".
- (2) Since intelligence as operationally defined in most tests is an aggregate of many discrete abilities, and tests vary in their composition of these abilities, estimates of ability may vary from test to test.
- (3) Intelligence as a predictor of achievement will vary from one area to another.

- (4) The very fact that a child is learning disabled may preclude the valid measurement of intelligence.
- (5) The fact that a classification procedure relies upon IQ invites cultural discrimination.
- (6) Children with high IQ's are less likely to be initially referred for evaluation.

The last point may help to explain the results of this study. While 56.6% of the learning disabled children had F.S.IQ's below 90, only 21 (6.6%) had IQ's of 110 or better. It may be that a large number of children with higher IQ's are not being referred or served because they are achieving some marginal success which those of lower intelligence levels fail to reach.

A final point that deserves consideration here is the differences between WISC and WISC-R scores. Swerdlik (1975) reported the mean Full Scale IQ score differences across all ages and races of 5.5 points. In all cases, the WISC yielded higher scores. WISC/WISC-R differences increased as the ability of the students decreased. Perhaps the lower IQ's found in the present study are, in part, a function of the instrument (WISC-R) employed.

Discrepancy Between Actual And Expected Achievement

One way to determine if differences between the slow learners and the learning disabled exist, would be to identify a cluster or clusters of characteristics upon which the groups are quantitatively different. One such characteristic has long been thought to be a severe discrepancy between

actual achievement and expected achievement. Results of this study demonstrate that this procedure, while having some limitations, is helpful in differential diagnosis. When a criterion calling for a 60% discrepancy is applied across all age levels, 25.9% of the learning disabled children under consideration are identified. When the proposed Michigan criteria are applied to the same population, the success rate jumps to 37.8%. This rate of identification varies, however, according to the age range, sex and IQ levels. The new formula appears most successful at the 12.0-14.11 age range, correctly identifying 48.4% and least successful at the 15.0-18.5 range, identifying only 25.7% of the children. The percentage identified at the 4.6-8.11 range is 34.4% and at the 9.0-11.11 range is 38.9%. The variation by sex was substantial as evidenced by the fact that 41.1% of the males were identified but only 25.4% of the females. In terms of IQ, those with an IQ at 90 or above were identified 57.4% of the time; this success rate dropped to 23.9% when the IQ was below 90.

Explanations as to the failure of discrepancy formulas to work more effectively are varied but have been consistently registered (Sulzbacher and Kenowitz, 1977; Lloyd et al., 1977). The overwhelming opposition to the 50% criterion originally proposed by the federal government, led to the elimination of any quantitative guidelines with the publication on December 29, 1977, of the final learning disability regulations.

As the discrepancy formula includes the child's measured IQ, it is subject to all of the same criticisms directed at the concept of IQ. Gearhart (1977) sums up this criticism in asking: "If we cannot determine intellectual potential, how can we determine degree of discrepancy?" (1977, p. 12). Sulzbacher and Kenowitz (1977) raise two other questions concerning the use of the discrepancy:

Is a 50% discrepancy in math as disabling as a 50% discrepancy in spelling? Is a 50% discrepancy for a third grader as deserving of remediation as a 50% discrepancy in a tenth-grade student? (p. 68)

Criticism has also been directed at attempting to measure achievement at the pre-school level. The formula seems to yield unreasonable values for children younger than five years of age since the expected discrepancy is so large. This problem becomes more pronounced the lower the age (Danielson, 1978). Determining achievement in the early grades is a problem since the tests lack a sufficient floor. In this case, the child might not be identified as having a severe discrepancy despite the fact that he is truly disabled. Also, it is important to note that a child would have been required to exhibit a severe discrepancy in only one of the eight achievement areas to qualify as learning disabled. Therefore, the probability of a child exhibiting a severe discrepancy due to chance alone could be considerable.

While all of these criticisms may be correct, they are based upon the validity of the identification procedure. This process is founded upon such assumptions as specific

etiology, common signs and a known outcome, but these are often not the case. Frequently the process suffers from unreliable judgments and in fact, the final judgment may say as much about those making the decision as the child himself. Clarizio (1976) outlines four factors that contribute to the low reliability associated with diagnostic inquiry:

1. Human error - a source of error centers around the personal characteristics of the individual making the decisions. Differences in expectations, behavioral analysis and interpretation, as well as theoretical biases, can all affect diagnosis. Additionally, loose reasoning and inaccurate observation may confound the process.
2. Individual characteristics of the child - many characteristics of the child may contribute to favorable or unfavorable judgments made about him despite the fact that they have no direct bearing upon the decision to be made. These characteristics may include socioeconomic status, race, manner of speaking or attitude towards being tested.
3. Faulty logic underlying the category system - disagreement exists about the definitions upon which diagnosis is made. Furthermore, it is commonly assumed that the categories are mutually exclusive. Yet most individuals placed into such a category do not exhibit all the characteristics attributed to it.
4. Judgement context - low agreement in the placement process is a function of an interaction between situation, the diagnostician and the child. Often diagnoses are made in an isolated setting that is not representative of the setting in which the problem is occurring.

Actually, considering the difficulties related to diagnosis, the discrepancy formula can be judged as functioning with surprising effectiveness. Indeed, the formula might be even more effective if the diagnostic process were more reliable and valid. And considering the absence of more

effective alternatives in the field today, the discrepancy formula appears to have substantial utility for those charged with the identification of handicapped children.

Results of this study suggest that the proposed discrepancy formula varies across age range in identifying children placed as learning disabled in Michigan. The proposed formula is most effective at the 12-14.11 age range where it identifies 48.4% of the students. It appears that a criterion requiring a 60% discrepancy at this age range is realistic. The formula is somewhat less effective at the 9.0-11 and 4.6-8.11 age ranges, identifying 38.9% and 34.1% of the children respectively. However, this is a considerable improvement (25%) over the original formula which called for a 60% discrepancy at these age ranges. Obviously a 60% discrepancy is too great to typically expect at such an early age. One needs to be aware, however, of the fact that by adjusting the criterion from 60% to 40%, the probability of identifying more children who are not truly "handicapped" is increased. The cost of such a procedure must be carefully considered. Additionally, a larger percentage of children might be identified at the earlier age ranges except for the problem of an insufficient floor on achievement tests. This, however, is a function of the test at this age and not the formula per se. Finally, the formula identified the lowest percentage (25.7%) of children at the 15-18.6 age range. Since the 60% criterion was 28.1% more effective than the proposed criteria, the most obvious conclusion is that a

70% discrepancy criterion is simply too rigorous to expect at this age range; a 60% criterion would seem more realistic. It is also plausible that children with a severe discrepancy may have dropped out of school at such a late age or perhaps are being served in some other manner. Finally, it may be that adults are more reluctant to make a placement as "handicapped" at these age ranges. The services received may not be seen as "worth" the label involved in such a placement.

Across IQ levels the proposed formula identifies a greater percentage of children with IQ's above 90 (57.4%) than below 90 (23.9%). By definition, IQ is a part of the formula. Consequently, expected achievement increases with IQ level. The identification of those with higher IQ's who were also underachieving would thus be facilitated. This would be especially true if IQ was a less effective predictor of achievement for this group than for the population in general. Correlation coefficients between IQ and achievement tests (see Table 4.10) would lend support to this proposition. It may also be that those with IQ's above 90 are more clearly learning disabled (as currently defined in the field) than those with lower IQ's who may be experiencing more generalized learning problems. Additionally, these results could be a function of a reluctance on the part of E.P.P.C.'s to place children of average or above intelligence as learning disabled unless a severe discrepancy is apparent. Perhaps those with lower IQ's experiencing school

failure are being referred without such a discrepancy since this category will get them services they would otherwise not be able to receive.

Finally, the proposed discrepancy formula identifies substantially more males (41.1%) than females (25.4%). Brenton and Gilmore (1976) had similar findings, identifying 44% of the males but only 30% of the females in their study. In the absence of any apparent evidence, there is no reason to assume that the formula itself is discriminatory or in noncompliance with PL 94-142. The most plausible explanation here is that these findings are a result of the placement process and possible cultural biases and expectations. It is conceivable that females are expected to exhibit less underachievement than males. Consequently, when a female demonstrates some underachievement, although not severe, she will more readily be referred and placed as learning disabled than a male. Another factor may be related to social skills. Females may more typically exhibit those social characteristics (neat, well behaved) demanded by schools. Adults would tend to be more reluctant to make a referral for the female, perceiving these other characteristics as compensating for underachievement. Additionally, many of these females may be misclassified. In an attempt to meet the needs of all students, school systems may be erroneously identifying more females as learning disabled despite the fact that they do not demonstrate as severe a discrepancy as males. Finally, the most parsimonious explanation is that underachievement,

in school related tasks, is more prevalent among males than among females. In such a case, this difference in the general population would be reflected in a group of children referred because of school difficulty.

In effect, the formula does vary in effectiveness across age level, IQ range and sex. However, there appears no evidence of the formula being discriminatory in and of itself. Considering the variety of factors involved in the placement process, the formula can be perceived as fulfilling its function most adequately. In effect, the procedure identifies a percentage of children at the lower end of the achievement curve. Because the children who are lowest on this criteria are identified as learning disabled, it obviously identifies the most severely handicapped only if one agrees that the procedure reflects appropriate criteria. If one accepts the proposition that the learning disabled child is one who exhibits a severe discrepancy between expected and actual achievement, with expected age being a function of age and IQ, then the procedure, while not perfect, holds some promise. However, what is excluded here (and which may explain why more children are not identified) is the concept of process disorder.

Educators have long been interested in "process", but this term, too, has taken on a variety of meanings. Oftentimes, we read or hear of processes necessary for achievement in areas such as arithmetic or social studies or of the processes involved in thinking. More recently,

professionals have become interested in processes involved in school learning, such as auditory, tactile, visual and motoric, often called modalities. Lerner (1976) writes that regardless of one's definition, a process can be impaired in at least three ways:

1. Loss of an established process.
2. Inhibition of the development of such a process.
3. Interference with the function of such a process.

Although not revealed in the data analyzed, it may be that substantial consideration is given to process difficulties at placement committees. This would go far in explaining that while the school psychologist and the learning disability consultant were in near perfect agreement as to placement, the quantitative distinctions between groups were not found to be as perfect. This finding may be explained in part by recent work (Yoshida et al., 1977; Fenton et al, in press) which indicates that not all committee members participate equally in placement decisions. These decisions are often made by one or perhaps two individuals. And those involved in the final decision may be those least responsible for implementation of programs, such as instructional personnel.

But as process disorder is difficult to measure, so is motivation. Algozzine and Sutherland (1977) propose a new direction and address those that are not learning disabled but "learning disinterested" (p. 96). They use the term, not in the perjorative, but rather the descriptive sense. In the present study, part of the failure of the formula to

identify all the learning disabled could be explained by motivational factors.

The results of this study reflect the criticisms of any definition, as well as the shortcomings of any discrepancy formula. However, in addressing the IQ-discrepancy formula, Ringelheim (1978) states that:

...You must look at the 1,000 comments on the proposed regulations. I think one could characterize them as kill, kill. Don't tell us what alternatives there are but only what is wrong. We put out a formula - everybody jumped on the formula and said that it in no way could be acceptable (p. 66).

Ringleheim (1978) goes on to say that if a different position was put forth, that this position, too, would be criticized as untenable.

Misclassification and Overlap of Characteristics

A related area examined in this study is the overlap in characteristics between the different groups. If the proposed Michigan guideline (where the discrepancy varies across age ranges) was applied, a percentage of children classified as non-impaired would have been classified as learning disabled (19.5%, 16.5%, 12.5% and 0.0% at each successive age range). In terms of F.S.IQ, 6.8% of the low IQ group and 22.3% of the high IQ group of non-impaired would meet the criteria. Of non-impaired males, 17.6% would have been identified, while 8.3% of the non-impaired females would also meet the criteria. Overall, the discrepancy formula identifies 15.3% of the non-impaired, 9.2% of the

EMI, 7.4% of the EI and 4.9% of the otherwise impaired. Danielson (1978) found a range from 8 to 12% of misidentification in his study.

What needs to be given careful consideration here are the consequences of misidentification. Any attempt to reduce type II errors (misidentification of non-impaired children) will increase type I errors (those learning disabled who will not be identified). The choice of a cutoff point is always a balance between these two errors, and this has to be recognized as part of the problem of any screening effort. In recent years the dangers of misidentification have been well documented (Hobbs, 1975; Goldman and Hartig, 1976). Included in these dangers are the prejudicing of teacher expectations, the self-fulfilling prophecy and the lowering of the child's expectations, to name but a few (Ysseldyke and Foster, 1978). On the other hand, it may be that some of the dangers of misidentification have been overstated (McCarthy and Paraskevopoulos, 1969). Furthermore, the extent of the danger of misclassification will be related to the reversibility of the decision. Finally, one must realize that while reducing the number of false positives to near zero is perhaps possible, these would also substantially reduce the number of disabled children in need of services that would not get it. This procedure would be fraught with inadequacies.

Clearly, there is little doubt that learning disabilities, mild emotional disturbance and mild mental retardation

have a great deal in common. This also seems to be true of children initially referred for evaluation but later found to be non-impaired. The degree to which these groups could be differentiated on certain select variables was a central purpose of this study. While no single criterion was remarkably effective, a combination of characteristics did improve the differential diagnosis. The Discriminant Analysis effectively identified 67.5%, 67.4% and 67.7% of the learning disabled, EMI and non-impaired children, respectively (see Table 5.1) While this still leaves overlap, it is substantially more effective than relying on the discrepancy formula alone.

Overall, the results of the analysis of the formula suggest that the procedure may have utility. There appears to be some problem at the younger and older ends of the age range, as well as for females. Additionally, the formula may be judged by some to yield prevalence figures for slow learners that are unacceptable, although this could also be a function of the initial referral process. Finally, overlap in characteristics is sufficient to warrant caution in the use of any formula.

The procedure is confounded by the need for numerous value decisions. When we are forced to make black and white decisions in grey areas, the decision easily becomes arbitrary (Danielson, 1978). But, while much seems inadequate about the procedure, it may be that no better system is in use today. A failure to provide leadership has its problems

Table 5.1 - Frequency of Learning Disabled and Non-Impaired Children correctly identified and mis-classified by second Discriminant Analysis.

		Current Classification		
		LD	Non-Impaired	
Discriminant Analysis	LD	133	53	186
	Non-Impaired	46	128	174
		179	181	360

Correct Identification = $\frac{261}{360} = 72.5\%$

False Positives = $\frac{53}{186} = 28.5\%$
 (Those labeled as LD who are non-impaired)

The analysis identified 186 children and was wrong on 53 of these.

False Negatives = $\frac{46}{179} = 25.6\%$
 (Those labeled as non-impaired who, in fact, are LD)

Of the 179 children who are LD, 46 are missed by the analysis.

* 18 cases currently LD were labeled EMI.

Chart taken from Gallagher and Bradley in NSEE yearbook (1972).

as well. Without specific guidelines practitioners will still need to make decisions. In this case, educators might use criteria which are less valid than the proposed discrepancy formula. Perhaps a formula-based procedure would best be seen as one aspect of a more comprehensive identification and placement process.

Profile Analysis

Group profiles were analyzed according to Bannatyne's (1968) suggested recategorization. The learning disabled group did exhibit a "pattern" reported by many previous researchers (Keogh and Hall, 1974; Rugel, 1974; Smith et al., 1977). This pattern demonstrates highest scores on Spatial subtests, next highest scores on Verbal-Comprehension subtests and lowest scores on subtests called Attention-Concentration. Analysis of individual Wechsler subtests revealed that the learning disabled as a group scored lowest on subtests of Arithmetic, Coding and Information, with group scores of 7.0, 7.2 and 7.6, respectively. They scored highest on subtests of Picture Completion, Picture Arrangement and Object Assembly, with scores of 9.5, 9.4 and 9.4, respectively. These results are similar to those reported in earlier studies (Keogh et al., 1973; Vance and Gaynor, 1976; Smith et al., 1977). The one difference was that scores on Picture Arrangement were higher than expected.

These results may be taken as additional support that the learning disabled demonstrate varying degrees of

competence in certain psychological processes. Specifically, this group is alleged to be strongest in areas that do not involve sequencing and require the ability to manipulate objects in multidimensional space, either directly or symbolically. Their verbal competence as measured by performance on language tasks is less established.

There does appear to be growing evidence that learning disabled children may have language disorders which have been underestimated and understudied. These disorders might be related to a wide variety of problems including reading and attentional difficulties. Beyond language disorders it has also been suggested that learning disabled children may be suffering from delayed language development (Bryan and Bryan, 1974). It is possible that the material is not learned in the first place because of inattention. Relative to their own scores, they are weakest in the Attention-Concentration category which requires short-term memory storage of sequences of auditory and visual stimuli (Smith et al., 1977).

The pattern proposed by Bannatyne (1968) appears to have been replicated. However, the three variables added little discriminate power statistically in differentiating between the learning disabled and non-impaired group. In fact, when all three factors were not included in the Discriminate Analysis, very little power was lost. One logical explanation is that this was not truly a "normal" group. The group classified as non-impaired was initially referred

for evaluation and, thus, may share many of the same characteristics that are apparent in those classified as learning disabled. This would tend to aggravate the problem of overlap that exists between any two populations. The Digit Span was not given. This subtest is offered as an alternate on the Wechsler scales. Consequently, it need not be given by practitioners in order to achieve a complete (5 subtests) Verbal score. Typically, it would only be administered if one of the other subtests was found to be invalid due to error in administration. Perhaps practitioners need to be encouraged to make greater use of this subtest.

The results of this study are similar to those found by Huelzman (1970). His findings led him to conclude that low Information, Arithmetic and Coding subtest scores were characteristic of the group of children classified as learning disabled. However, he states that conclusions about individual underachievers cannot be made from these group findings.

Apparently, the degree to which the Wechsler pattern (Verbal-Spatial-Attention) differentiates groups is insufficient to base classification solely on them. Bryan (1976) drew a similar conclusion and asserted that errors in classification of individual children are likely to be frequent. Again, a problem here is the low reliability of difference scores between subtests. Piatrowski and Grubb (1976) examined the significance of subtest score scatter on the WISC-R and suggest that 3 to 5 point (differences) are necessary

at the .05 level and 4 to 6 point (differences) are necessary at the .01 level. They suggest that caution be exercised concerning the interpretation of statistically significant differences. While emphasizing that profile or pattern analysis rather than random comparison of pairs of subtests adds more credibility to the use of subtest scores, they warn that it is imperative that even WISC-R subtest patterns reflect clear differences and not simply measurement error. The results of this study substantiate their caution. Subtests lack the reliability necessary to draw more specific conclusions. This conclusion is further reinforced by the work of Kaufman (1976) who found that the WISC-R profiles of normal children exhibit much scatter, probably more than most test users realize. Kaufman (1976) lends some insight into the use (or misuse) of WISC-R profiles in writing that:

...when a child has an unusual amount of scatter in his WISC-R profile, there may be diagnostic and remedial implications. When there is some scatter (e.g., one or more deviant test scores), but not an abnormal amount, then the focus should be primarily -- perhaps solely -- on gaining a better understanding of the child's abilities and/or on planning for his remediation. What must be remembered, in the final analysis, is that the normal child -- just like the exceptional child -- does not have a flat WISC-R profile, and will often evidence relative strengths and weaknesses when his test scores are subjected to empirical analysis (p. 40).

Results of this study do suggest the children identified as learning disabled are characterized by the same pattern of abilities that Bannatyne (1968, 1971) found for children with genetic dyslexia and Rugel (1974) reported for disabled readers in general. Evidence that these children are

characterized by a unique pattern on the Wechsler scales continues to mount (Keogh and Hall, 1974; Evans and Smith, 1977).

What may be most important is the utility of these findings. The hope is that the suggested recategorization would serve as Bannatyne (1974) suggests: "As a practical diagnostic tool which reorganizes the subtest scores into a more useful and statistically valid format than Wechsler's own grouping of Verbal and Performance" (p. 273). It may be important to know that at least some learning disabled children possess high visual-spatial skills, moderate verbal-conceptual skills and low attention skills.

Evans and Smith (1977) suggest that profile analysis has both diagnostic and interpretive, as well as a prescriptive, utility. A low Attention-Concentration score, Bannatyne (who calls it sequential) suggests, represents a deficit in auditory closure and sequencing. This auditory memory deficit purportedly is crucial to the reading process. Of course, as initial learning is not controlled for, a depressed score could represent low motivation. Kaufman (1976) prefers to call the factor Freedom from Distractibility and believes that useful results related to memory, numerical skills and distractibility may be found by profile analysis. Kaufman (1975) gives an example of this possible utility in writing that:

A low score on Digit Span, coupled with low scores on Arithmetic and Coding (along with average or higher scores on most other tests) would suggest that the individual is highly distractible; however,

a low score on Digit Span, but not on Arithmetic and Coding would justify the specific interpretation of possible deficiency in immediate auditory memory and/or possible anxiety (p. 145).

The prescriptive utility of the WISC-R in educational programming is still in the early stages of exploration (Evans and Smith, 1977). However, the area seems to be growing. "Academic Therapy" published an entire series beginning in the spring of 1976 entitled Prescription from WISC Patterns. In this series, Wills and Banas (1976) urged the reader "Not to discard the value of such intelligence tests as the WISC but to discard the use of intelligence quotient (IQ) figures in favor of knowledgeable analysis of subtest patterns in identifying weak and strong learning areas" (p. 241). The present study provides support for regrouping the WISC into Spatial, Conceptual and Sequential categories. These categories appear to provide valuable information about three important areas of intellectual functioning: visuospatial ability, language ability and memory. Not all disabled readers will be highest in Spatial subtests and lowest in Memory subtests. Some may be lowest in Spatial subtests whereas others may show no differences at all. However, should a definitive pattern of strengths and deficits emerge, this should provide useful diagnostic information in terms of planning a remedial program.

Attention-Concentration

The Attention-Concentration factor was of particular interest in this study, and results suggest that the

population of learning disabled children score lowest on this factor. An analysis of individual profiles would be helpful to practitioners in differentiation between the learning disabled and the educable mentally impaired. Similar results have been reported by others (Keogh et al., 1973; Keogh and Hall, 1974). In the case where a child had an IQ between 80 and 90, it could be used in distinguishing between a learning disability and more generalized learning difficulties.

However, examination of individual subtests, as well as the inclusion of the Attention-Concentration factor in the Discriminant Analyses, revealed this factor to have less discriminating power than had previously been reported (Ackerman et al., 1971). This failure to discriminate more effectively may be, in part, explained by those same considerations presented in the discussion of the three factors as proposed by Bannatyne (1968). The difficulties that were discussed earlier as to overlap of characteristics between groups are also relevant here. Additional problems are related to definition, subtest validity and the heterogeneity of populations of children.

The difficulty in the area of Attention and learning disabled children reflects confusion as to an exact meaning for the term "attention". While some (Dykman et al., 1971) use definitions such as alertness and stimulus selection, others (Bryan, 1974) prefer terms such as task and non-task oriented behavior. Harris (1976) asserts that "There is no

consensus as to a formal definition for the term 'attention' and some investigators questions whether the word is formally definable at all" (p. 48).

The validity itself of an Attention-Concentration factor is in question as well. That is, whether this portion of the Wechsler scale measures what some purport that it measures appears uncertain. Indeed, the factor has had a variety of labels, such as Sequential, Freedom from Distractibility and Attention-Concentration. Bannatyne (1968) admits that the subtests involved measure a variety of abilities. For example, he reports that the Coding subtest measures the ability to: memorize symbols, understand that it is possible to memorize symbols, memorize arbitrary associations, recognize small designs and sustain concentration; it is also seen as a measure of eye-motor coordination. Rugel (1974) found Digit Span and Coding not to load on a single factor. He believes that these subtests involve auditory and short-term memory. Bryan and Bryan (1975) report that Arithmetic and Digit Span show the least correlation with Verbal IQ and that research suggests that subtests may be tapping mathematical skills. They feel that the reliability of the Digit Span subtest is so low that inferences as to individual characteristics are not justifiable. Kaufman (1975) has questioned the factor as well, insisting that while it may measure memory, it is also a measure of numerical ability. Sattler (1974) reports a variety of abilities measured by each of the subtests comprising the Attention-

Concentration factor. Coding is reported as a measure of visual-motor coordination, mental speed and coordination; Digit Span allegedly measures attention, short-term memory and auditory recall; Arithmetic is a measure of reasoning, numerical accuracy and prior learning. With such a range of abilities measured, conclusions as to the Attention of individuals as reported by the Wechsler may be questionable. Put differently, if the individual was deficient in attention, one wonders if it would be reflected in subtest scores.

Ross (1976) sees the problem as additionally confounded since the relationship of attention to learning, even if definable and measurable, is not clear. He writes that:

Attention is a necessary but not sufficient condition for learning. That is to say that learning does not take place unless the individual is attending to the material to be learned, but when learning takes place, processes other than attention must be involved...it is impossible to say whether a failure to learn was due to a failure to attend (p. 43).

Furthermore, it may be that attention, or the lack of it, is not a unitary trait but rather, a situational variable. Bryan (1974), for example, found that learning disabled children did attend more in a setting in which they received more teacher attention, a greater proportion of positive and a small proportion of negative reinforcement from the teacher.

Finally, it may be that the school-verified learning disabled children represent a group too heterogeneous to expect one characteristic to be typical of all or even most of them. Mercer (1975) suggests that it is necessary to

consider each child's unique strengths and weaknesses and to manipulate the appropriate variables accordingly in order to increase the success of the children.

Sex Differences

Additional findings of this study are that the learning disabled group present a sex ratio where boys outnumber girls 3.4 to 1, are more typically younger with a mean age of 10.8 years and have a mean grade level of 5.1. The number and percentage of males and females at each successive age range is as follows: M=96 (70.1%) - F=41 (29.9%), M=84 (77.1%) - F=25 (22.9%), M=72 (87.8%) - F=10 (12.2%) and M=36 (78.3%) - F=10 (21.7%).

Sex differences have long been reported in populations of school-verified learning disabled children (Myers and Hammill, 1976; Lerner, 1976). Bannatyne (1974) reports that the result of his work demonstrated a ratio of approximately 4:1 favoring males. The results of this study fall between this figure and the 3:1 ratio favoring males reported by Kirk and Elkins (1975). Efforts to explain this overrepresentation of males have considered sex differences in such areas as physiology, aggressiveness, cognitive thinking and language facility (Bannatyne, 1974).

It is impossible to present all of the possible explanations in this discussion. However, there appears strong evidence that the greater incidence of reported school problems in boys than in girls is due in part to sex differences

in behavior. Caplan and Kinsbourne (1974) found that boys who fail in school tend to react aggressively and extra punitively, whereas girls who fail in school tend to behave in more socially acceptable ways. They suggest that because teachers consider aggression the most disturbing kind of behavior, they would find boys more noticeable. The implication is that the males would be more likely to be referred for evaluation and would have a greater opportunity to receive special attention.

Others, such as Ames (1977) and Donofrio (1977), suggest that a number of factors are involved in producing a child with learning difficulties, one of the most important being the sex of the child. Suggested here is a "most favored group" which has a January to June birthdate, early maturation, bright intellect, verbal facility and femaleness (the male is 6 months behind the female in general development upon entry into school). The factors producing the "unfavored group" include July to December birthdates, late maturation, verbal difficulty, an 80 to 90 IQ and maleness. Donofrio (1977) suggests grade repetition, not as a punishment for failure, but rather as an alternative to future failure. Kaplan (1977) asserts that a societal bias exists against boys in that their learning is of greater concern based on sex role perception. If behavior is not what is "expected", they (males) will more likely be referred for special help.

As schools are largely institutions that make

substantial language demands, the possibility exists that boys are overrepresented due to sex differences in language facility. Faust (1970) describes how these differences have been noted for decades. Girls, she describes as vocalizing more as infants and maintaining an advantage in nearly every phase of language development including articulation, word usage, length and complexity and grammatical correctness of sentences well into school years.

Chronological Age

The learning disabled children in this study were found to be younger (mean age = 10.8 years) and in the lower grade levels (mean grade = 5.1). They were older than those children reported by Kirk and Elkins (1971) who had a mean age of 8.4 years, but the figures still reflect that the bulk of these children are referred and placed in the earlier years. The number of children at each successive age range is 85 (30.6%), 90 (32.4%), 64 (23.0%) and 39 (14.0%).

Chronological age is a factor which may serve as a parameter in defining learning disabilities. The emphasis on both early identification and programming (Keogh, 1970) has established chronological age as crucial to a functional definition (Mercer et al., 1976). Practitioners may perceive that those identified earlier may be more readily served. Similarly, these same practitioners may be more reluctant to make a learning disability classification at upper age ranges since the results of programming may be perceived as less

effective at this level. No doubt concerns as to the dangers of "labeling" are also reflected in the lower prevalence rates at the upper age levels. These last two considerations may well interact. That is, as practitioners become more pessimistic as to substantial success at the upper age levels, the concept of classification takes on more of the characteristics attributed to a label. Indeed, the children and parents themselves may be resisting the placement at the upper grades. Along these same lines, the underrepresentation of older children may be a function of a higher school drop-out rate, possibly related to school difficulty at this level. Finally, if one assumes that early programming for learning disabled children is effective, it follows that many of these same children would no longer be learning disabled in the later grades.

Socioeconomic Status

Results of this study suggest that differences in socioeconomic status (SES) exist between the five groups analyzed. However, the data does not explain the reason for these differences. Consequently, any interpretation of the results must, by necessity, be descriptive rather than explanatory.

Of the total number of children initially referred for evaluation, 48.3% were seen by the school psychologist as middle or upper middle SES, 27% were seen as lower SES and 24.7% were not assigned to an SES category. By group, the percentages of low SES children identified were: learning disabled (29.3%), educable mentally impaired (57%),

emotionally impaired (54%), otherwise impaired (36.7%) and non-impaired (27.0%). These findings support the contention of previous researchers (Kealy and McLeod, 1976; Franks, 1977) that low SES children are overrepresented in classes for the mentally impaired, while middle SES children are more likely to be found in classes for the learning disabled or non-impaired. Children of low SES have long been found to experience particular difficulties in the schools (Grotberg, 1970). These same children have been found to score lower on standardized measures of intelligence than middle SES children (Telegdy, 1973).

At issue here, however, is whether an SES bias exists in the placement process. Results of this study found no evidence of such a bias. When criteria for eligibility for the learning disabled group and the educable mentally impaired group were held constant, no significant trends indicating an SES bias were found. The same is true for differences between classes for the learning disabled and the non-impaired. No trend indicating a placement bias was found in either direction.

The failure to find any SES bias may indicate the professionals making placements are quite sensitive to any possible placement bias. In light of substantial litigation (Hobsen v. Hansen, 1967; Spangler, 1970; Diana v. State Board of Education, 1970; Larry P. v. Riles, 1971), as well as legislation (PL 93-380), this would not be surprising. Placement committees may be making a concerted effort to

avoid any SES bias in their procedures. Obviously, this would be the most optimistic position. Myers et al. (1978) examined files in 12 representative districts which permitted a comparison of educable mentally impaired placement and those later decertified. No evidence was found to support allegations of racial or SES bias in the placement process. To the contrary, considerable trepidation was noted in those school personnel responsible for EMR assignment about any further placement of minority children. The authors concluded that the work of school psychologists in the EMR placement was professionally competent, given the guidelines in effect at that time.

The lack of any placement bias could also be a function of data collection. Since the assignment to SES was made by the school psychologist with no specific (or known) guidelines, one might expect a degree of subjectivity or human error to enter into the procedure. In 24.7% of the cases, the SES of the child was not reported. Whether this was due to clerical error or a more conscious effort on the part of the individual practitioners to not make such a report, cannot be determined. There is, however, no evidence that any such bias is present.

The results of this study may be a function of the initial referral as much as the placement process. Kealy and McLeod (1976) have suggested that middle-class children are more likely than those of lower SES status, to be initially referred for help. If this is the case, it would explain

the disproportionate number of middle SES children found to be learning disabled or non-impaired. Interestingly, the data suggests a differential rate of referring may be related to the epidemiological characteristics of the school district. While 53.3% of children referred in urban districts were placed as learning disabled, the percentage dropped to 33.3% and 30.2% for suburban and rural districts, respectively. Concomitantly, 5.5% of the urban referrals were placed in educable mentally impaired classes while this rate jumps to 18.0% and 18.1% for suburban and rural districts, respectively. The trend of urban districts to make a greater percentage of learning disability referrals and a lesser percentage of educable mentally impaired referrals is obvious. Any additional conclusion here would be speculative. It must be remembered that when criteria for eligibility were held constant, no evidence toward an SES bias was found.

Another plausible explanation is that behavioral traits were not reported. A substantial part of any class placement should be accounted for by this behavioral analysis which is unavailable. Rubin et al. (1973) found significant differences in behavior with those from lower SES being defined as exhibiting less acceptable behavior. Perhaps the disproportionate figures found in this study reflect differences in functional behavior as well. This explanation makes the most sense and helps to bring the findings in perspective.

Summary

This chapter presented a discussion of the results of this study. A summary of these results and a conclusion are presented in the next chapter.

CHAPTER VI

SUMMARY AND CONCLUSIONS

Presented in this chapter is a summary of the results of this study. In addition, conclusions based on the results, implications for practitioners and recommendations for further research are set forth.

Summary

The importance of early and accurate identification of children with learning disabilities has been strongly emphasized for several years (Kirk and Bateman, 1962; Bannatyne, 1968; Hammill, 1976). At the same time, the controversies surrounding attempts to define learning disabilities are equally apparent (Bryan and Bryan, 1976; Sulzbacher and Kenowitz, 1977). While the field of learning disabilities is relatively young, there has been a rapid growth in the number of children being classified and served. However, persons faced with the responsibility of evaluating children to determine whether they have a specific learning disability do not have a clear concept of the term (Myers and Hammill, 1976; Hallahan and Kauffman, 1977). The matter of definition has become more pressing with the establishment of PL 94-142, the Education for All Handicapped Children Act of 1975.

Professionals involved in the field have been charged with identifying those children with specific learning disabilities, yet there remains a persistent lack of a clear and workable definition.

The essential purpose of this study was to define a learning disabled population in the State of Michigan in relation to certain important variables. In conducting this study, an examination of the state of the art, as it is practiced in the identification of these children, was also undertaken. Specifically, an attempt was made to develop a formula which would provide maximum discrimination between children classified as learning disabled in the State of Michigan and four other populations (educable mentally impaired, emotionally impaired, otherwise-impaired and non-impaired). Also investigated was the degree of overlap in characteristics between populations and the intellectual characteristics of the learning disabled children. The study addressed the effectiveness of a formula (in identification of children placed as learning disabled) which is designed to measure discrepancy between expected achievement and actual achievement as measured by individually administered tests. The utility of the recategorization of the Wechsler scales as suggested by Bannatyne (1968) was also examined. Finally, the extent to which age, sex, socioeconomic status and professional opinions are relevant to the placement process was investigated. It was hoped that a description of children placed as learning disabled could be

developed which would lend precision to current concepts and be helpful to practitioners.

Previous studies in this area have often led to rather inconclusive and contradictory findings. Certain trends, however, do seem to have emerged and suggest further investigation. Recent findings indicate that children identified as learning disabled achieve a Full Scale IQ lower than control groups (Kirk and Elkins, 1975) and exhibit a discrepancy between Verbal and Performance scores on individual measures of intelligence (Ackerman et al., 1971). There exists evidence that the learning disabled exhibit a unique pattern on the Wechsler scales (Bannatyne, 1968). The existence of a severe discrepancy between expected and actual achievement, a lack of attention in school performance and overrepresentation of males in classification have also been frequently cited (Keogh and Hall, 1974; Rugel, 1974). Finally, the claim exists that a socioeconomic status bias exists in the placement process (Dunn, 1968; Franks, 1977).

Earlier investigations have often presented findings based upon limited samples. The present study employed a larger, less restricted sample of children drawn from 45 school districts throughout the State of Michigan. Rural as well as urban areas are represented. The study included four comparative groups in order to provide more meaningful results. It employed a statistical design which allows for the simultaneous analysis of a variety of variables. No comparative study was found to have employed such a

technique in this manner. Additionally, it addresses two important issues in the field of learning disabilities, socioeconomic status and overlap of group characteristics.

In the present study, the characteristics of 1,129 children in grades 1 through 12, drawn from 45 Michigan school districts and representing four handicapped categories as well as one non-impaired category, were analyzed. The population of central interest was those children classified as learning disabled.

Results

The data from this study can be summarized as follows:

1. The proposed Michigan discrepancy formula is more effective than the 60% formula in identifying learning disabled children. The former effectively identified 37.8% of the study sample while the latter identified 25.9%.
2. The effectiveness of the discrepancy formula varies according to age range. The percentage of learning disabled children meeting the criteria at each age range is as follows: 34.4% (4.6-8.11 years), 38.9% (9.0-11.11 years), 48.4% (12.0-14.11 years) and 25.7% (15.0-18.6 years).
3. The discrepancy formula identifies a greater percentage of learning disabled children in the upper Full Scale IQ range (90 and above) than the lower range (0-89). The identification rates are 57.4% and 23.9%, respectively.
4. The discrepancy formula identifies a greater percentage of males than females in the learning disabled group. While 41% of the males met the discrepancy, only 25.4% of the females met it.
5. The discrepancy formula fails to identify 62.2% of the learning disabled children. Additionally, the formula identifies 9.2%, 13.4%, 4.9% and 15.3% of the EMI, EI, otherwise-impaired and non-impaired children, respectively.

6. For the learning disabled sample, the within group pattern on the Wechsler scales was Spatial ($\bar{x}=9.15$), Verbal-Comprehension ($\bar{x}=8.33$) and Attention-Concentration ($\bar{x}=7.13$). The largest discrepancy was found between Spatial and Attention scores ($\bar{x}=2.02$).
7. The cognitive pattern found for the learning disabled group on the three Wechsler factors was also found for the EI, otherwise-impaired and non-impaired samples. It was not found for the EMI sample.
8. A significant difference was found between the learning disabled sample and non-impaired sample on the Attention-Concentration factor. Verbal-Comprehension and Spatial scores were not significantly different between these two groups.
9. No significant relationship was found between group (LD, EMI, non-impaired) and socioeconomic status in the placement process when subjects had similar F.S.IQ's and discrepancies between expected and actual achievement.
10. The school psychologist and the learning disability consultant were in agreement 97.1% of the time as to whether a child should be classified as learning disabled.
11. A Discriminant Function was developed which can significantly discriminate between the learning disabled, educable mentally impaired and non-impaired groups. It is not effective with the emotionally impaired and otherwise-impaired group.
12. The Discriminant Function correctly predicted placement 67.5%, 67.4% and 67.7% of the time for the LD, EMI and non-impaired groups, respectively.
13. The most powerful factors in discriminating between the three samples are in order of significance: F.S.IQ, percentage of discrepancy, Attention score, sex, Verbal-Comprehension score, SES and age. The Spatial score did not contribute significantly to the function.
14. Within the learning disabled group, lowest mean scores were achieved on the Wechsler scales of Arithmetic, Coding and Information. Additionally, these subtests were the most powerful in discriminating the learning disabled from the non-impaired group.
15. The intellectual characteristics of the learning disabled group are as follows: Verbal IQ - $\bar{x}=86.5$, Performance IQ - $\bar{x}=91.8$, Full Scale IQ - $\bar{x}=88.5$. In each case, these scores are significantly below those of the non-impaired group.

16. Standardized achievement subtests most effective in discriminating the learning disabled from the non-impaired sample were in order of importance: Word Recognition, Spelling and Arithmetic. Reading Scores did not discriminate between the two groups.
17. The learning disabled children in this study were found to have a mean age of 10.8 years and a mean grade of 5.1. The number and percentage at each successive age range are 85 (30.6%), 90 (32.4%), 64 (23.0%) and 39 (14.0%).
18. There was a greater prevalence of males than females in the learning disabled group. The sex ratio was 3.4 to 1, males to females.
19. It remains necessary for practitioners to exercise caution in identifying children as learning disabled. No single test pattern or formula exists which effectively identifies all such children.

Conclusions

The results of this study strongly suggest that no one characteristic or even cluster of characteristics differentiate the learning disabled children from other groups. This has long been found to be the case and a number of explanations for this have been presented. What needs to be emphasized, however, is that the degree of differentiation may be increased or decreased as a function of the variables considered. When the percentage of discrepancy alone was considered, 37.8% of the learning disabled children were effectively identified. However, when a cluster of variables, including F.S.IQ, sex, age and subtest patterns were combined, the effective rate of identification rose to 67.5% (2 out of 3). The implication here is that practitioners need to consider a variety of characteristics in speaking of the learning disabled and be careful not to be too

simplistic in descriptions and definitions.

A final consideration has to do with both the placement process and the definition employed. The findings say perhaps as much about these two factors as they do about the characteristics of the children that have been referred and placed. Hammill (1976) addressed the latter issue in writing that:

In any particular state, the nature of the students diagnosed as having a learning disability is actually a function of the regulation used to identify them rather than the definition used to describe them (p. 30).

The results of this study are, at least in part, a function of the regulations used by practitioners and the placement process in the State of Michigan. As the regulations employed at the time of this study had no quantitative criteria, it is not surprising that the findings reflect a certain lack of consensus. And the Michigan criteria are subject to all of the difficulties involved in identification which have been previously addressed in this paper.

The findings reflect, too, the practices of those making decisions in the field as well. In effect, what has been described is the state of the art as it was practiced at the time of the data collection within the State of Michigan. This, however, is important. Practitioners need to look at themselves, as well as the child. They need to consider who they are placing or not placing and attempt to determine why and how these decisions are made, as well as what the net effect of these decisions will be. In

considering the field of learning disabilities as it is today, Ringelheim (1978) suggests that:

What we have come up with is essentially what we consider to be the state of the art. A lot of people are going to argue that we've said nothing. Maybe we'll have to come out and say, "By the way, that's the state of the art." This is why I am saying our position at this point is basically to remain as professionally viable as possible - within the context that we have now come to the conclusion that there is no conclusion (p. 17).

Implications and Recommendations for Practitioners

1. The results of this study suggest that the number of children identified as learning disabled is a function of the definition employed. In applying two different discrepancy formulas considered by the State of Michigan, different numbers of children would be considered eligible for programming.

In no instance did the discrepancy formula identify all learning disabled children. Considerable numbers of children appeared to be programmed as learning disabled who did not meet the criteria while others who did meet the criteria were found in each of the other three handicapped categories or the non-impaired category. If these criteria (or similar ones) are employed in many states, as is the case in New York, the use of the discrepancy formula will decrease the number of children who would be eligible for programs for the learning disabled.

Additionally, the percentage of children identified as learning disabled will not only decrease but will be an

uneven reduction in numbers varying across age range, sex and F.S.IQ. Practitioners should be cognizant of the fact that the proposed discrepancy formula may identify a greater percentage of children from the younger and middle age ranges to the exclusion of children 15 years or older. The formula will also identify a greater number of children with F.S.IQ's between 90 and 109, as compared to those with a lower IQ than this. It also appears that males will more often be identified than females. While it may not be reasonable to expect any criteria to work equally well for all, the schools are expected to do a reasonable job of identifying and serving children at all levels. Practitioners need to be aware that such a procedure may decrease the number of false positives at the cost of increasing the number of false negatives in the identification process.

The percentage of children identified by the discrepancy formula will also vary according to the achievement subtest used. Results of this study suggest that the most severe discrepancy is likely to be found when the word recognition subtest is used, followed in degree by the spelling and arithmetic subtests. Any psycho-educational evaluation should be carefully planned and as comprehensive as possible. If the WRAT or PIAT are given, the administration of all subtests would help to avoid misclassification.

To prevent an unreasonable reduction in services to those who deserve them, as well as any unintentional bias in the identification process, school psychologists and other

practitioners need to be particularly alert in using criteria other than, or perhaps in addition to, the discrepancy formula. However, this should always occur and children should never be placed solely on the basis of a discrepancy score.

2. Much attention has been paid recently to the subtest patterns exhibited by learning disabled children on the Wechsler scales. These results confirm that, as a group, school-verified learning disabled children do demonstrate a profile with Spatial scores being highest, followed by Verbal-Comprehension scores and with lowest scores on the Attention-Concentration factor. However, the same pattern also appears in children placed as emotionally impaired, otherwise-impaired and non-impaired. Only those found to be educable mentally impaired had a different subtest pattern.

In terms of identification, the use of profile analysis based upon these three factors would be helpful to practitioners in differentiating between learning disabled and educable mentally impaired children. Additionally, in the case where a child has an IQ between 80 and 90, it could be useful in distinguishing between a child with a specific learning disability and one with more generalized learning difficulties. Practitioners need to use caution in this profile analysis, however, as results from this study represent group differences and say little of individual differences.

While subtest analysis may be of use to school

psychologists in differential diagnosis, its greater contribution is likely to be in the area of programming and remediation. Analysis of individual strengths and weakness and cognitive style is currently under investigation (Wills and Banas, 1977) and appears to hold some promise.

3. The mean Full Scale IQ for learning disabled children was approximately one standard deviation below the national mean. A majority of these children scored below 90 on the Wechsler scales and less than 4 percent had a F.S.IQ of 115 or above. It is entirely possible that a large percentage of children with Full Scale IQ's lower than the general population are being initially referred to placement committees and are being subsequently placed as learning disabled. Practitioners need to remain aware that those with average and above average IQ's are also eligible for special services if found to be learning disabled.

Another possibility is that children other than the learning disabled, such as the "slow learner", are being misclassified. This is a much debated issue (Shepard, 1975; Ames, 1977) and one that is not settled by results from this study. However, examination of the IQ scores does indicate this to be the case. While these "slow learners" could no doubt benefit from such programming, this was not the intention of those involved in establishing learning disability programs. Practitioners need to look at a variety of variables in making a placement. While F.S.IQ is one such variable, it is certainly not enough. Attention needs to be paid

to achievement, process and even motivation in a careful psycho-educational evaluation.

4. The probability of misclassification is decreased as the variables taken into consideration become more comprehensive. This study demonstrated that a cluster of variables could increase the accuracy of identification to 67 percent. As previously discussed, this figure may be seen as surprisingly accurate in light of the difficulties involved in any identification and placement process. The findings of this study could be used by those who provide leadership in the field. The variables in order of effectiveness here are: F.S.IQ, percentage of discrepancy, Attention score, sex, Verbal-Comprehension factor, socioeconomic status and age. If the school psychologist could add additional relevant variables, the probability of misclassification could be reduced even further. A measure of process, examination of subtest scatter and a comprehensive case history would all add to the effectiveness of the identification procedure.

5. No one characteristic was found to exclusively define those classified as learning disabled. Overlap in characteristics between groups was found to exist. Professionals charged with identifying the learning disabled will find no simple answers. It is entirely possible to find an educable mentally impaired or non-impaired child to exhibit those traits often associated with the learning disabled. Conversely, a child with a severe perceptual or language

difficulty will not always manifest the expected characteristics. It remains necessary for the practitioner to evaluate each child individually and to be sensitive to recent findings in the field.

6. Further, children in classes for the learning disabled are more often perceived as being from middle socioeconomic backgrounds while those in classes for the educable mentally impaired are perceived as being from lower socioeconomic backgrounds. It should be emphasized, however, that no evidence of an SES bias in the placement process was found in this study. The issue of SES bias in the placement process is controversial. From a review of the issues presented in Chapter II, it is obvious that there are differing opinions. Even if it is accepted that no such bias does exist at this time, those in the field must remain vigilant to any potential bias in future decision making.

7. Professionals need to examine their own placement decisions. While the school psychologist and the learning disabilities consultant were in almost perfect agreement as to placement, the reason for this is not at all clear. It may be that placement decisions are being made by only one professional. In this case placement committees need to be careful to include all relevant parties in placement decisions. Additionally, the results indicate that some children are more likely to be referred for services. This is particularly true for younger children, males and those with Full Scale IQ's below the national average. It may well be

that these are the students most in need of special services. However, substantial numbers of other children, equally deserving and equally in need of special services, may not be initially referred for any number of reasons. As the placement process is a function of the referral procedure, practitioners need to monitor the referring process and modify it where necessary in order to maximize their effectiveness.

8. Those charged with the identification and placement of handicapped children need to be cognizant of the difficulties involved in such a process. Misclassifications here may be related to human error (expectations, interpretation, theoretical biases), the child's characteristics (SES, race, attitude towards testing), the category system (differing definitions) and judgment context (interaction between situation, diagnostician and child). Professionals should work to minimize the errors related to each of these factors.

9. Based upon the results of the present study a suggested definition has been developed. This definition is presented in Appendix A.

Recommendations for Further Research

On the basis of the findings of this study, the following recommendations for further research are set forth:

1. Several of the possible explanations for the differential success rate of the discrepancy formula might be investigated. The research might attempt to assess their

contribution to the effectiveness of such a formula.

a. A more detailed investigation might be undertaken to determine the characteristics of the child placed as learning disabled who does not meet the criteria. Also, it could determine the characteristics of children who do meet the criteria but are placed in other categories. If unique characteristics do exist, they could be of practical importance to professionals in the field.

b. An explanation as to why the formula works more effectively for some, such as younger children, males and those with F.S.IQ's between 90 and 110, should be sought. Whether these differential rates are a function of the child's characteristics or the procedure employed (or some other variable) seems an important question.

c. A more detailed study examining the effectiveness of programming for children at different achievement levels should be conducted. This might include studying two groups being served, one which meets the discrepancy formula and one which does not. If programming was found to be effective for only one group, this would have important implications.

2. A more detailed investigation of the on task behavior of learning disabled children, similar to the Bryan (1974) study, should be conducted. This study might employ behavioral analysis of task oriented behavior and compare these results to the Wechsler factor of Attention-Concentration which purports to measure the same.

3. An investigation might be undertaken to determine if the WISC-R is as valid a measure of intelligence for the learning disabled as it is for the general population. It would be interesting to compare the WISC-R and several other measures of intelligence for the same pool of subjects.

4. Smith et al. (1977) reported that a number of children placed as learning disabled would be better placed as educable mentally impaired or as slow learners. Research might undertake to determine if justification exists for such a proposition.

5. Further investigation is needed to determine how useful to programming the recategorizing of the Wechsler scales would be. This might include comparing two groups of learning disabled children receiving the same remediation but exhibiting different test profiles. It may be that this recategorization specifies particular cognitive styles which demand unique instruction.

6. Longitudinal follow-up studies in the area of learning disabilities are lacking. Research here might attempt to determine which subgroups benefit most from intervention and which subgroups improve without specific intervention procedures.

7. Additional studies directed at examining both the placement process and the initial referral process should be conducted. Practitioners need to know how and why they are making essential decisions. This research might examine different referral procedures employed by a variety of

districts and attempt to investigate the effect of modifying these procedures.

8. Research might be directed to the area of prelabeling in the referral and placement process. It would be interesting to know what percentage of children are determined to be learning disabled before the placement committee meets and to determine exactly how this is done. The subsequent effects (if any) of labeling a child learning disabled might also be investigated.

9. A more detailed study examining the reliability of the difference scores used in a discrepancy formula could be conducted. This research might attempt to determine the differences in rate of placement if individual tests were readministered.

10. An investigation could be undertaken to determine any relationship between professional training or other characteristics of practitioners and decision making.

11. Further investigation needs to be undertaken in the area of behavioral analysis. While standardized tests may be helpful, practitioners need workable behavioral scales to help both in identification and in subsequent follow-up of learning disabled children.

12. Additional research is needed in the area of the social characteristics of children classified as learning disabled. It might be of interest to examine if peer ratings could be helpful to the identification process.

Chapter Summary

Presented in this chapter has been a summary of the results of this study. In addition, conclusions, implications for practitioners and recommendations for further research were set forth.

APPENDICES

APPENDIX A

LETTER TO PARTICIPANTS AND PILOT PROJECT DRAFT

APPENDIX A

PILOT PROJECT DRAFT: LEARNING DISABLED

Criteria for determination of eligibility

A comprehensive evaluation by a school psychologist and other pertinent information should be available to determine if a student, being considered for placement in special education as learning disabled, meets all of the following criteria:

(a) Present achievement in one or more of the basic skill areas is approximately 40% or less of expected achievement.

(b) Pattern of strengths and weaknesses as evidenced by intra-individual variability on individually administered educational and psychological tests of approximately a 1.5 standard deviation difference between two or more subtest scores and the student's mean score on that test.

(c) Manifestation of learning disorders which may be characteristic of central nervous system dysfunction as reflected by such diagnostic labels as minimal brain dysfunction, dyslexia or aphasia.

(d) Inability to profit from regular education alternatives without special education support.

(e) Unsatisfactory performance not found to be based on social, economic or cultural background.

PILOT PROJECT DRAFT

15

JOHN W. PORTER
Superintendent of
Public Instruction

STATE OF MICHIGAN
DEPARTMENT OF EDUCATION

Lansing, Michigan 48902

September 10, 1975

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MEMORANDUM

TO: Special Educators
FROM: Murray O. Batten, ⁷¹⁶Director, Special Education Services
SUBJECT: LEARNING DISABLED

The enclosed information pertains to a project initiated by the Michigan Department of Education, Special Education Services, for the 1975-76 school year. The purpose of this project is an attempt to evaluate an operationalized definition of learning disabilities that will lend itself to a more consistent identification of learning disabled students who require special education programs and/or services.

The enclosed criteria for evaluation of learning disabilities do not, in our opinion, conflict in any way with the current rule 340.1713 Learning Disabled Defined.

I wish to express my gratitude to the following people who assisted this office in developing these criteria: Dr. Harvey Clarizio, Professor of Educational Psychology, Michigan State University; Dr. Gerald Fuller, Professor of Psychology, Central Michigan University; Mr. Fred Louke, School Psychologist, Ottawa Intermediate School District; Dr. William Rico, School Psychologist, Ingham Intermediate School District; Dr. Gene Scholten, School Psychologist, Holland Public Schools, Dr. John Wissink, Assistant Professor of Learning Disabilities, Grand Valley State Colleges.

Districts that wish to pilot these criteria during the 1975-76 school year, should notify Dr. M. Diane Hodson of this office. If you have any specific questions pertaining to the criteria to be used in this pilot project draft, contact either Dr. Hodson or Dr. John H. Braccio at the following phone number: 517--373-0923.

MJB:jhb:av

Enclosure



Learning Disabled, Defined

(1) "Learning Disabled" means a person identified by an educational planning and placement committee, based upon an in-class observation and an individual, comprehensive psychological evaluation administered by a school psychologist and an individual educational evaluation administered by a teacher consultant of the learning disabled and other pertinent information, as meeting all of the following criteria:

(A) A severe discrepancy between present achievement and expected achievement in one or more of the following basic skill areas: expressive language, oral or written; receptive language; reading, including spelling; and mathematics.

While no quantitative discrepancy is mandated, the following criteria are presented as a guideline:

(I) A severe discrepancy is indicated as follows: for ages up to 8-11, present achievement is approximately 60% or less of expected achievement; for ages 9-0 to 11-11, present achievement is approximately 50% or less of expected achievement; for ages 12-0 and above, present achievement is approximately 40% or less of expected achievement.

(II) Expected achievement shall be determined by the following method: $CA \left(\frac{IQ}{300} + .17 \right) - 2.5$, where CA = chronological age, IQ = Full Scale IQ and the other numbers are constant.

(2) Patterns of strengths and weaknesses as evidenced by intra-individual variability on individually administered educational and psychological tests. While no quantitative

discrepancy is mandated, the following criterion is presented as a guideline:

(A) Variability of approximately 1.5 standard deviation difference between two or more subtest scores and the student's mean score on that test.

(3) Documented evidence from the student's general education teachers that viable general education alternatives have been developed and applied, and found to be ineffective; except for students not currently enrolled in a school program.

(4) Learning impaired shall be inclusive of persons who have been diagnosed as having a condition or disorder characteristic of central nervous system dysfunction, such as minimal brain dysfunction, dyslexia or aphasia, if the persons thus diagnosed meet the requirements of subrule (1).

(5) Learning impaired shall be exclusive of persons whose severe discrepancy between present achievement and expected achievement is primarily the result of:

(A) Mental, emotional, hearing, visual, physical or other health impairments.

(B) Environmental, cultural or economic disadvantage.

(6) The qualitative criteria presented in Sections I and II are guidelines. In using such criteria, professionals are reminded of the following:

(A) Discrepancy formulas have been found to identify proportionately larger numbers of males, children with higher IQ's and in the early and middle grades. All identification

procedures should comply with current legislation on non-discriminatory assessment and placement.

(B) Subtest variability exists within all populations and is not exclusive to those found to be learning disabled.

(C) The socioeconomic status of a child, in and of itself, is not sufficient to exclude the child from the learning disabled category.

APPENDIX B

ANOVA, CHI SQUARE AND DISCRIMINANT TABLES AND PLOTS

APPENDIX B

ANOVA TABLES

Table B1 - ANOVA Table for group differences in percentage of discrepancy between expected and actual achievement.

Effects	df	MS	F	p
<u>Between Subjects</u>				
60% Word Recognition	4	40.6728	17.766	0.0000
ERROR	803	2.2894		
60% Spelling	4	20.3221	12.668	-0.0000
ERROR	696	1.6042		
60% Arithmetic	4	6.5544	6.143	0.0001
ERROR	802	1.0670		
60% Reading	4	3.4023	1.788	0.1353
ERROR	125	1.9024		
Proposed Word Recognition	4	37.0960	13.616	0.0000
ERROR	803	2.7244		
Proposed Spelling	4	19.5562	10.095	0.0000
ERROR	696	1.9373		
Proposed Arithmetic	4	7.5350	5.738	0.0001
ERROR	802	1.3132		
Proposed Reading	4	5.1467	2.426	0.0514
ERROR	125	2.1217		
60% Discrepancy	4	21.6343	25.169	0.0000
ERROR	836	0.8596		
Proposed Discrepancy	4	22.1245	21.936	0.0000
ERROR	836	1.0086		

CHI SQUARE TABLES

Table B2 - Chi Square Table for relationship between discrepancy and F.S.IQ, Age and Sex for each group.

Source	df	χ^2	p
Learning Disabled			
F.S.IQ	1	32.1273	0.0000
Age Range	1	0.2886	0.5911
Sex	1	5.1324	0.0235
Educable Mentally Impaired			
F.S.IQ	1	0.0411	0.8393
Age Range	1	0.0034	0.0465
Sex	1	3.0095	0.0828
Emotionally Impaired			
F.S.IQ	1		0.4029*
Age Range	1		0.4312*
Sex	1		0.5453*
Other			
F.S.IQ	1		0.0810*
Age Range	1		0.2159*
Sex	1		0.4505*
Non-Impaired			
F.S.IQ	1	13.3135	0.0003
Age Range	1	4.992	0.0255
Sex	1	3.639	0.0570

*Fishers Exact Test

Table B3 - ANOVA Table for Wechsler factors.

Effects	df	ms	Multi-variate F	p
<u>Between Subjects</u>				
Spatial	4	275.4175	51.292	.0001
ERROR	776	5.3696		
Verbal	4	395.4997	70.125	.0001
ERROR	831	5.6399		
Attention	4	284.3787	62.312	.0001
ERROR	920	4.5638		

DISCRIMINANT TABLES

Table B4 - Summary Table for Discriminant Analyses.

Variable	Step	df	U-stat. ^a	Exact F ^b	p ^c
Full Scale IQ	1	1,572	0.675	68.783	.0001
Discrepancy	2	2,571	0.584	22.227	.0001
Attention	3	3,570	0.561	5.710	.0001
SES	4	4,569	0.542	5.019	.0001
Comprehension	5	5,568	0.529	3.622	.002
Sex	6	6,567	0.521	2.097	.027
Age	7	7,566	0.516	1.438	.116
Spatial	8	8,565	0.511	1.319	.177
Full Scale IQ	1	1,478	0.646	130.960	.0001
Discrepancy	2	2,477	0.562	35.384	.0001
Attention	3	3,476	0.547	6.486	.0001
Comprehension	4	4,475	0.537	4.605	.005
Age	5	5,474	0.527	4.345	.002
SES	6	6,473	0.520	3.101	.007
Sex	7	7,472	0.515	2.584	.014
Comprehension	1	1,478	0.737	84.962	.0001
Attention	2	2,477	0.655	29.756	.0001
Discrepancy	3	3,476	0.592	25.557	.0001
Spatial	4	4,475	0.566	10.830	.0001
Age	5	5,474	0.558	3.395	.011
SES	6	6,473	0.550	3.335	.006
Sex	7	7,472	0.546	1.991	.045
Full Scale IQ	1	1,522	0.664	143.932	.0001
Discrepancy	2	2,521	0.561	38.569	.0001
Age	3	3,520	0.546	7.243	.0001
SES	4	4,519	0.540	2.813	.013
Sex	5	5,518	0.535	2.453	.019

^aWilkes Lambda denotes contribution made by each successive variable entered.

^bDenotes degree to which each variable will add to discrimination between groups if entered.

^cSignificance level of each variable entered.

Table B5 - Summary Table for Discriminant functions.

Discriminant Analysis	Discriminant Function ^a	Eigenvalue ^b	Relative ^c Percentage	Function ^d Derived	U-Stat. ^e	χ^2	df	p
1	1	0.5459	68.21	0	0.5114	381.962	32	0.0001
	2	0.2057	25.71	1	0.7905	133.884	21	0.0001
	3	0.0318	3.98	2	0.9531	27.347	12	0.007
	4	0.0167	2.10	3	0.9835	9.476	5	0.092
2	1	0.6462	78.29	0	0.5151	315.142	14	0.0001
	2	0.1792	21.71	1	0.8480	78.306	6	0.0001
3	1	0.5546	75.72	0	0.5461	287.359	14	0.0001
	2	0.1778	24.28	1	0.8490	77.756	6	0.0001
4	1	0.6279	80.98	0	0.5353	324.981	10	0.0001
	2	0.1475	19.02	1	0.8714	71.560	4	0.0001

^aNumber of Discriminant Functions used in each analysis.

^bDenotes relative ability of each Function to separate groups (higher values represent greater power).

^cRelative percentage of each Function in discriminating between groups.

^dNumber of Functions which significantly contribute to discrimination between groups.

^eDenotes decreasing contribution made by each successive Function (higher values represent decreased power).

Table B6 - Summary Table for Unstandardized Discriminant Function Coefficients.

Discriminant Analysis	Variable	Func. 1	Func. 2	Func. 3	Func. 4
1	Sex	-0.2898	0.1865	0.1473	1.0516
	SES	-0.2193	-0.4124	-1.8091	0.0460
	Age	-0.0358	-0.0214	-0.0477	-0.1729
	F.S.IQ	0.0467	0.0131	-0.0048	0.1127
	Spatial	0.0354	-0.0857	-0.1633	-0.2056
	Attention	0.0760	-0.2066	0.2777	-0.3092
	Comprehen.	0.0117	0.1684	-0.2035	-0.3449
	Discrepancy	0.1978	-0.8557	-0.1942	0.1568
	Constant	-3.834	1.5037	6.1598	-2.6552
2	F.S.IQ	0.0583	-0.0189		
	Discrepancy	0.2736	-0.9002		
	Attention	0.0666	-0.1589		
	Comprehen.	-0.0317	0.2456		
	Sex	-0.3087	0.0053		
	SES	-0.2828	-0.1678		
	Age	-0.0549	0.0774		
	Constant	-3.7390	0.8611		
3	Discrepancy	0.2023	-0.8987		
	Attention	0.1605	-0.1905		
	Comprehen.	0.1242	0.1985		
	Spatial	0.1350	-0.0560		
	Sex	-0.2946	0.0032		
	SES	-0.3273	-0.1512		
	Age	-0.0466	0.0778		
	Constant	-1.7481	0.3515		
4	Discrepancy	0.2638	-1.0617		
	F.S.IQ	0.0624	-0.0029		
	Sex	-0.2879	0.0485		
	SES	-0.2511	-0.2110		
	Age	-0.0593	0.1087		
	Constant	-3.9237	0.1638		

NOTE: Discriminant scores for individual cases may be computed by multiplying the raw values of the associated variables by these coefficients and summing them together. They are added to the constant to adjust for the grand means.

Table B7 - Group means for first and second Discriminant Analyses.

	LD	EMI	EI	Other	None	Total
Sex	1.2132	1.3895	1.2174	1.2000	1.2275	1.2461
SES	2.2893	2.5474	2.5435	2.3600	2.2434	2.3432
Age	10.8115	12.2713	10.7576	11.4638	10.0959	10.8697
F.S.IQ	87.5584	67.8737	88.7609	81.3400	92.1111	85.3657
Spatial	9.0305	6.3263	9.3623	8.4133	9.5785	8.7377
Attention	6.9213	4.9895	7.6304	7.4000	8.2460	7.1352
Comprehension	8.2014	4.8070	8.1449	7.1000	8.5432	7.6545
Discrepancy	0.3898	0.9027	1.3619	1.1899	1.0910	0.8508

	LD	EMI	None	Total
F.S.IQ	87.5584	67.8737	92.1111	85.4595
Discrepancy	0.2095	0.9632	0.8112	0.5948
Attention	6.9213	4.9895	8.2460	7.0603
Comprehension	8.2014	4.8070	8.5432	7.6653
Spatial	9.0305	6.3263	9.5785	8.7117
Sex	1.2132	1.3895	1.2275	1.2536
SES	2.2893	2.5474	2.2434	2.3222
Age	10.8115	12.2713	10.0959	10.8186

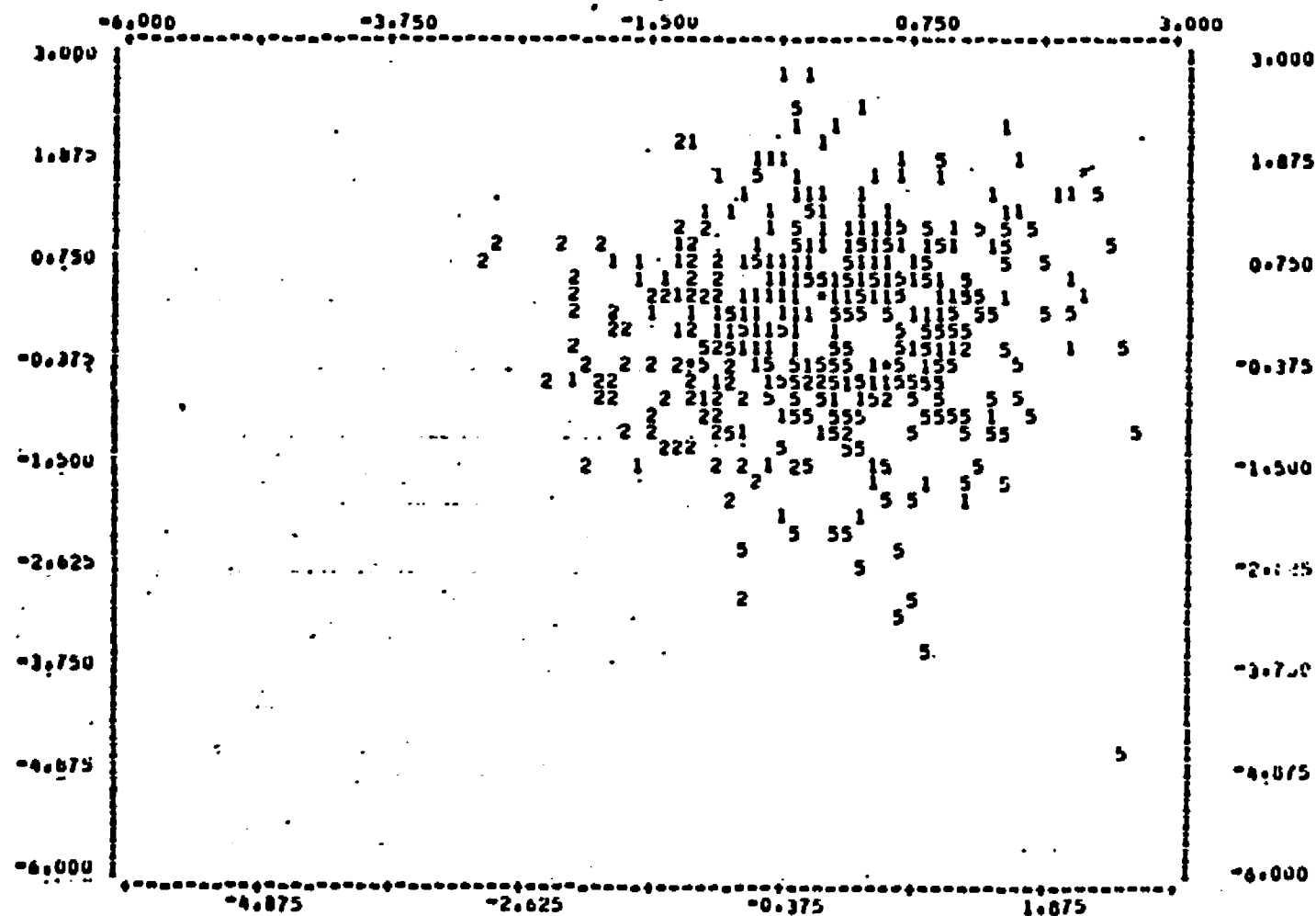


Figure B1 - Plot of cases for Second Discriminant Analysis.

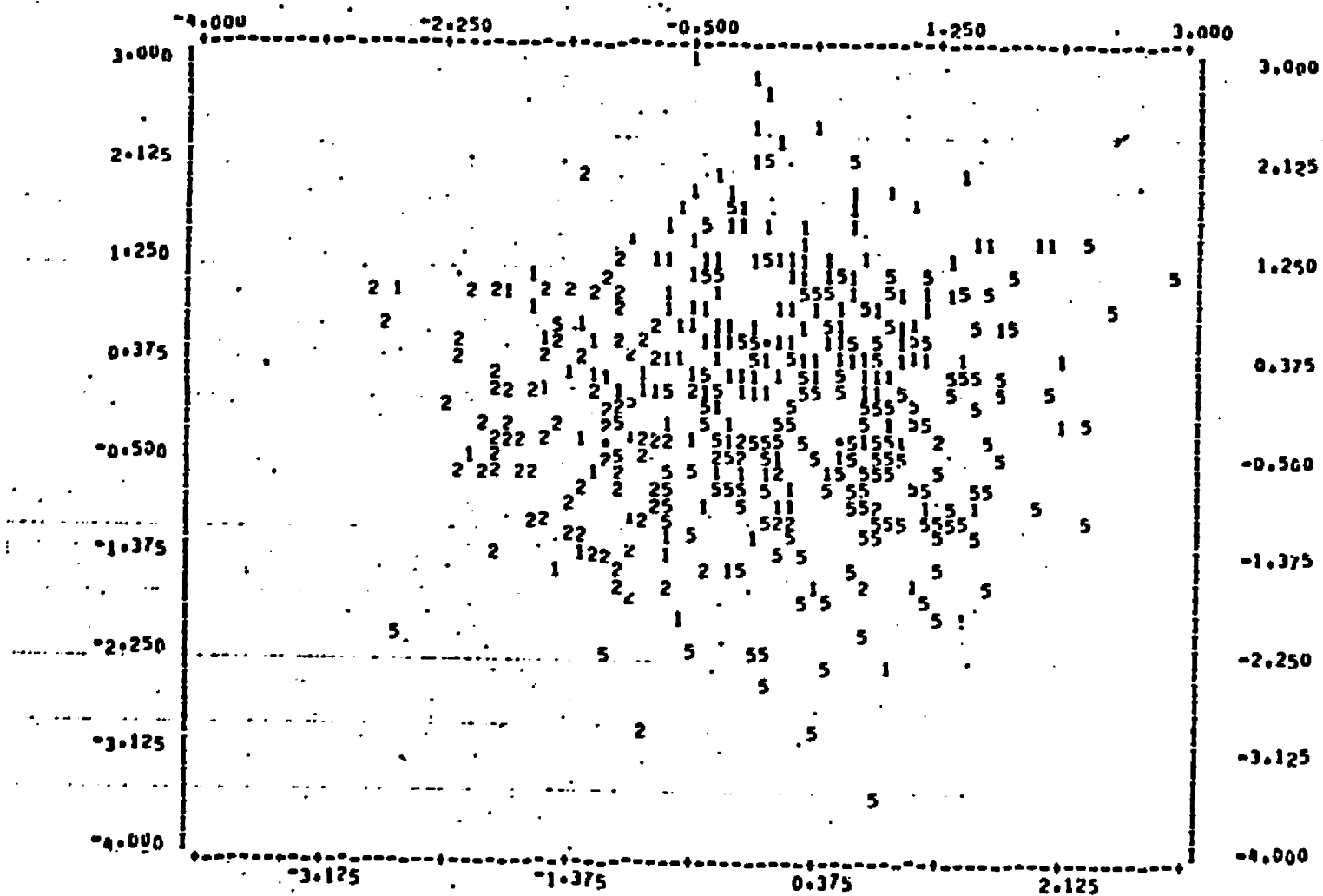


Figure B2 - Plot of cases for Third Discriminant Analysis.

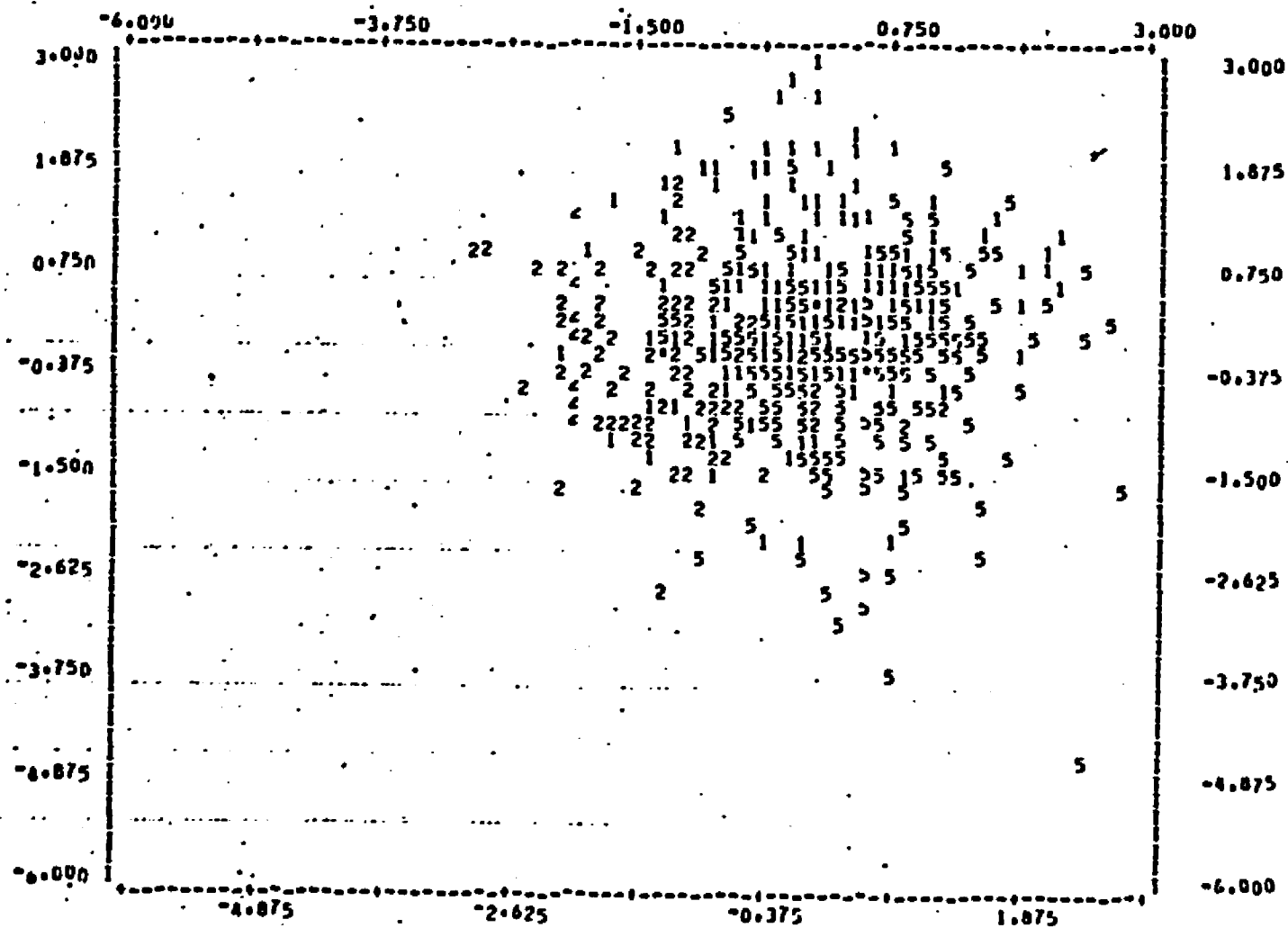


Figure B3 - Plot of cases for Fourth Discriminant Analysis.

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