WISC pattern analysis : a comparison of techniques for the diagnosis of minimal brain dysfunction in school children
by Dwight James Leonard

Abstract:
Eight different WISC scoring methods used for diagnosing minimal brain dysfunction (MBD) were mathematically formalized. Discriminant analysis was used for testing the 24 MBD equations in the comparison of 76 children diagnosed as MBD against 37 children diagnosed emotionally disturbed. Using all 24 MBD scores, a definite distinction was made between clinically diagnosed MBD groups and emotionally disturbed groups at a significant level of $p<.005$ for an F There were 18 wrong diagnoses (15.9%) made in 113 cases :05,24,88,=2.9 Of the individual methods, only those of Money (1962) or Bannatyne (1971) were able to significantly distinguish the MBD from the emotionally disturbed groups ($p<.005$; with 32 and 36 wrong diagnoses, respectively). The methods of Clements and Peters' (1962) and McGlannan (1968) were predictive of emotional disturbance instead of for MBD.

It was concluded that the WISC can be used to distinguish between children with MBD and those with emotional disturbance. However, the diagnostic use of the WISC must take into consideration that MBD is not a single syndrome and, therefore, different scoring methods must be computed. It was felt that the results of the present study can be useful in an educational testing situation given the availability of desk mini-computers.

WISC PATTERN ANALYSIS: A COMPARISON OF TECHNIQUES FOR THE
DIAGNOSIS OF MINIMAL BRAIN DYSFUNCTION IN
SCHOOL AGE CHILDREN

by

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ABSTRACT

Eight different WISC scoring methods used for diagnosing minimal brain dysfunction (MBD) were mathematically formalized. Discriminant analysis was used for testing the 24 MBD equations in the comparison of 76 children diagnosed as MBD against 37 children diagnosed emotionally disturbed. Using all 24 MBD scores, a definite distinction was made between clinically diagnosed MBD groups and emotionally disturbed groups at a significant level of $p < .005$ for an $F_{.05,24,88,} = 2.9$. There were 18 wrong diagnoses (15.9%) made in 113 cases.

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Chapter 1

Introduction

The diagnosis of Minimal Brain Dysfunction (MBD) in children is an important issue for education because such diagnoses may show that the child who does not perform well in the classroom may not be stubborn, retarded, unmotivated or emotionally disturbed, but may in fact be neurologically handicapped. For example, the child who seems quite normal at recess may be handicapped in the classroom by dyslexia, or "word blindness," and therefore unable to read at his age level. When a teacher tries to cope with a child who apparently cannot read, he or she needs to know whether the child is mentally retarded, emotionally disturbed, or has a neurological handicap which appears as a learning disability or behavior disorder. The teacher is vitally interested in having an accurate diagnosis of the problem in order that appropriate remedial procedures may be taken. The parents too are vitally interested in their childrens learning problems, while the children themselves must suffer their failures without knowing the cause. It is for these reasons that the diagnosis or identification of MBD (minimal brain dysfunction) is vital.

The diagnosis of MBD is generally made in a team approach where a psychologist, social worker, neurologist or psychiatrist, educator, and others pool their information and attempt to establish mental retardation, emotional disturbance, or MBD. The child who is referred

to this team is usually having academic problems and/or emotional

problems associated with school failure and social failure. An accurate

diagnosis results in proper treatment; e.g. the identification of MBD

associated with dyslexia would suggest that such treatment be educa-

tional remediation rather than psychotherapy or placement in special

education classes. The diagnosis can often be made by the psychologist

on the team because it is through his tests that emotional disturbance,

mental retardation or MBD can be differentially established although

the final diagnosis is always made through the efforts of the entire

team. Thus, the use of psychological tests is quite important in

diagnosis, and specifically, the intelligence test is relied upon for

diagnosis of mental retardation and MBD.

In the past there has been much debate among psychologists as

to the validity of test interpretation and especially that done from

a pattern of test scores such as the subscores from the WISC (Wechsler

Intelligence Scale for Children). Proponents of diagnostic psycho-

logical testing (Wechsler, 1958) state that complex performance tests

such as those contained in the WISC are more sensitive as indicators

of impaired cerebral functioning than simple neurological tests.

Critics of diagnostic psychological testing note the conflicting

results produced by different examiners, the lack of supporting neuro-

logical criteria, and the failure of many studies to find a significant

correlation between neurologically established brain damage and

psychological test diagnosis of brain damage (Yates, 1954). It is for these reasons that this study has been undertaken. More experimental results are needed to evaluate the contribution of diagnostic psychological testing in this area; and especially the use of diagnostic patterns on the Weschler Intelligence Scale for Children (WISC).

The Problem: How to Differentiate Between MBD and Emotional Disorder

This study offers a statistical evaluation of eight different methods of scoring WISC patterns in order to determine their ability to distinguish between a group of children diagnosed MBD and a group of children diagnosed as having emotional problems. The population studied was a group of 246 school children who were diagnosed at the Butte Mental Hygiene Clinic, Butte, Montana, from 1970 through 1972. The ages of the children was between 5 and 16 in keeping with age limitations of the WISC. The final clinical diagnosis was used in order to classify the children into either MBD or emotional problem groups.

Diagnosis by Pattern and Scatter Analysis

The Wechsler Intelligence Scale for Children (WISC) offers various scoring patterns possibly reflecting the presence of MBD.

The test consists of 12 subtests, each sampling aptitude in different areas of intellectual functioning (Wechsler, 1949).

The test was designed statistically so that the average child can be expected to earn a score of 10 points on each of the 12 subtests. Expected, or average, performance then on each of the tests yields a "flat" profile; i.e. most children will not deviate significantly from a scaled score of 10, with a standard deviation of 3 on each of the tests.

The psychologist, when confronted with a subtest pattern exceeding the above "normal" limits of variability on the test, is obliged to explain or account for the unexpected variability. He will ask himself, is this child emotionally disturbed, anxiety ridden, neurologically impaired (brain-damaged), or culturally deprived.

It is suggested here that certain patterns of subtest scatter are related to a sometimes elusive syndrome, a type of "organicity," which has been described in the literature as MBD.

Specific WISC Scoring Methods for Diagnosing MBD

The scoring patterns employed in this study are those proposed by Money (1962), Bannatyne (1971), Wechsler (1958), McGlannan (1968), Clements and Peters (1962), Reitan (1962), Wills and Banas (1971), and an experimental pattern proposed by the author of this study. Some of the scoring methods such as those of Money (1962) and Bannatyne (1971) were originally proposed for learning disabilities but were used in this study to diagnose MBD. On the assumption that a learning

disability sometimes implies MBD, McGlannan's (1968) scoring for

dyslexia, and Wills and Banas (1971) three patterns for learning

disabilities were used for diagnosis of MBD. Clements (1962), Reitan,

(1962) and Wechsler (1958) have all proposed specific methods of

scoring the WISC subtests in order to establish a MBD diagnosis. This

author will also present a scoring pattern.

Studies of brain damage in adults were conducted by Halstead

(1947). His studies yielded the most comprehensive test battery avail-

able for the assessment of brain-damaged patients. The tests were

validated by Reitan who also extended them downward for use with

adolescents and younger children (Reed, Reitan and Klove, 1965).

However the emphasis in these studies was on a test _battery_ and use of

the subtests of the WISC was only a supplementary source of data.

These studies did point out different syndromes and symptom patterns

of brain damage. The studies sometimes were able to localize actual

damaged portion of the brain (later verified on neurological tests)

(Russell, Neuringer, and Goldstein, 1970).

Reitan's Patterns

Using the Wechsler-Bellevue I, Reitan and his colleagues have

suggested that there are two major relationships between IQ test scores

and brain damage: when the left side of the head sustains damage, the

Verbal IQ is lower than the Performance IQ; when the damage is to the

right side of the head, the Performance IQ will be lower than the

Verbal IQ. They have cited evidence that these relationships exist and thus there are actually two different patterns of brain damage (Reitan, 1955). There is some question whether these results are found on the WISC (Matarazzo, 1972, p. 394).

Wechsler's Brain Damage Profile

Wechsler suggested that various patterns of scores on the Wechsler Adult Intelligence Scale (WAIS) reflect brain damage in adults (Wechsler, 1958). Although these patterns were derived from the WAIS, they have been generalized to the WISC.

Wechsler felt that the profile in Table 1 was not diagnostic of any one brain damage syndrome such as brain tumor or chronic alcoholism, but illustrated the disorganization of intellectual processes observed in most brain damage cases, irrespective of type. He suggests that "the most general symptoms of organic brain cases are disturbances in the visual-motor spheres, a loss of shift, memory defects, and a falling off of capacities involving organization and synthetic ability" (Wechsler, 1958, p. 174).

Perhaps the greatest influence Wechsler has had on profile and pattern analysis was the use of a number of sub-scales which are converted to standard scaled scores. It was then easy to compare the childs functioning in various test areas with the norm, and against each other. Figure 1 has an example of the WISC profile of a child who was clinically diagnosed as MBD compared with Wechsler's suggested

profile for brain damage. In this case the correlation between the Verbal areas is good, but the performance areas are negatively correlated. Although the profile is useful in diagnosing brain syndromes, the individual differences are varied and cannot be expected to fit any one profile exactly.

Table 1

An Adaptation of Wechsler's Brain Damage Profile

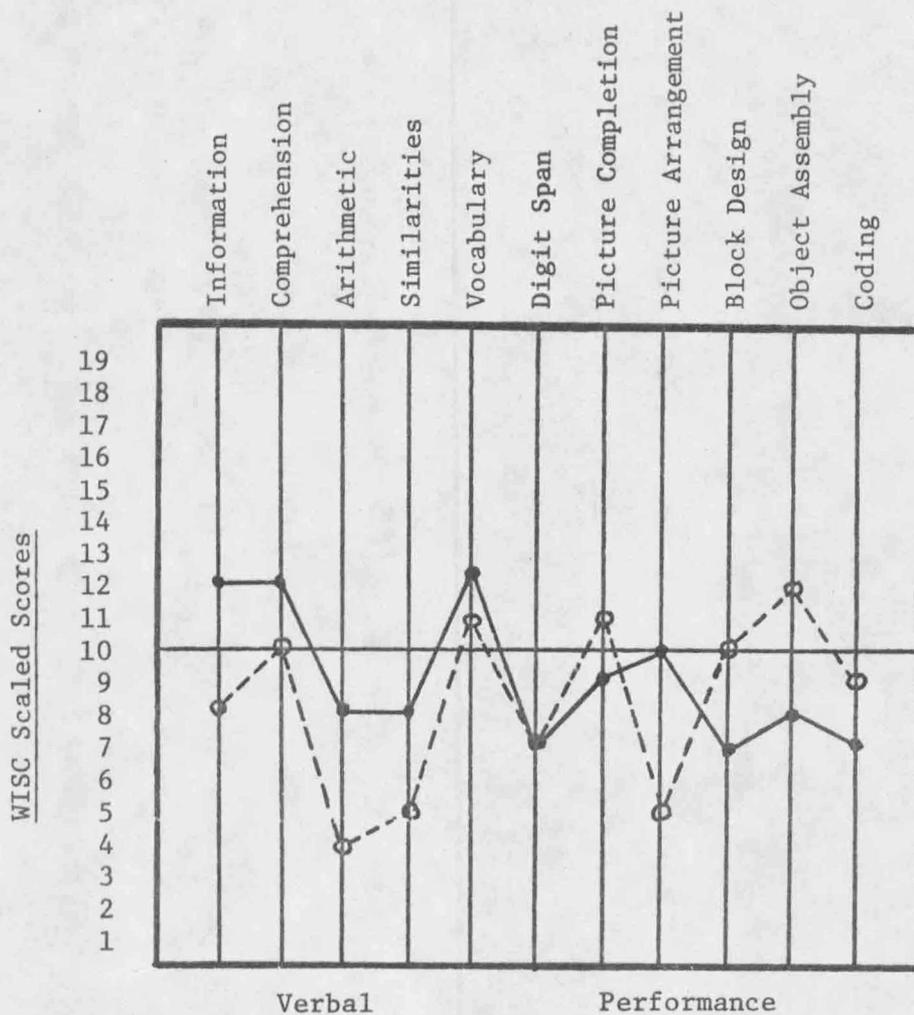| WISC Subtest	Scaled Score
Information	12
Comprehension	12
Arithmetic	8
Similarities	8
Vocabulary	13
Digit Span	7
Picture Completion	9
Picture Arrangement	10
Block Design	7
Object Assembly	8
Coding	7

(adapted from Wechsler, 1958, p. 171)

Figure 1. An example of Wechsler's brain damage (●———●) with the profile (○— — —○) of one child's case #4673 who was clinically diagnosed MBD.

Clements and Peters Three Patterns

Clements and Peters (1962) have developed the most comprehensive

patterns indicative of three different MBD syndromes. However, there is

little corroborating experimental evidence to establish the validity of

these measures.

Clements and Peters (1962) specifically suggest the following

patterns:

WISC Pattern A
1. Scatter in either or both verbal and performance scales.
2. Low scores (relative to the others) most frequently in Arithmetic, Block Design, Object Assembly, Digit Span, Coding and Mazes.
3. Final verbal and performance IQ scores often nearly equal. (Note internal inconsistency.) —Not uncommon to find Comprehension 5 to 10 points higher than Arithmetic. —Not uncommon to find Picture Completion 5 to 10 points higher than Block Design.

WISC Pattern B
1. Verbal IQ 15 to 40 points higher than performance IQ. (In this instance the achievement on the verbal tasks is sufficiently high to obscure or to compensate for a drop in Arithmetic. If the Arithmetic score is excluded, the difference is more pronounced, this test being another type of symbol process.)
2. Trouble with most of the performance scale items, particularly with pure visual–motor tasks which include Block Design, Object Assembly, Coding, and Mazes; less difficulty with Picture Arrangement and Picture Completion. (Often the performance IQ falls within the mentally deficient range, while the verbal IQ falls within or above the normal range.)

WISC Pattern C
1. Least frequent pattern.
2. Performance IQ 10 to 30 points higher than verbal IQ (This child, generally considered to have dyslexia, has difficulty in expressing himself verbally. He must actively search for the words necessary to express his usually concrete solution to a "thought" problem. On the other hand, he is quite proficient at the subtests which constitute the performance scale.) (Clements and Peters, 1962)

McGlannan's Dyslexia Profiles

McGlannan (1968) suggested two profiles that identify dyslexia. The patterns for specific dyslexia and complex dyslexia in Table 2 involve only four WISC subtests.

Table 2

McGlannan's Two Dyslexia Profiles

WISC Subtests	Specific Dyslexia	Complex Dyslexia
Similarities	15	6
Digit Span	8	8
Block Design	11	11
Coding	6	8

Money's Factor Analytically Derived Patterns

Money (1962) suggests that pattern scoring can be calculated from subtests using the results of Cohen's factor analytic studies (Cohen, 1959). He proposed the categories in Table 3.

Table 3

Money's Pattern for Learning Disabilities

Patterns	WISC/Subtests	
Perceptual Organization	1.	Block Design
	2.	Object Assembly
Verbal Comprehension	1.	Information
	2.	Comprehension
Freedom from Distractibility	1.	Arithmetic
	2.	Digit Span