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ABSTRACT

A group of 34 subjects each with a reading deficiency of 1 year or more were studied on the following variables: visual perception, arithmetic, memory, auditory perception, and laterality. The age range was from 8 to 13 years, with a mean grade deficiency of 1.93 years. Using the Minnesota Percepto-Diagnostic test as the diagnostic instrument, the subjects were assigned to one of three reading categories: primary retardation, secondary retardation, or retardation due to brain injury. The study was divided into two problems. The first compared the three reading categories on each variable by analysis of variance and by t tests. Auditory recall and consistency of direction in drawn figure placement were associated with brain injury. The second problem compared the three reading categories with normative populations on each of the variables by means of t tests. The primary group was not significantly different from the normative populations on any of the variables. Difficulty with arithmetic was found to be associated with secondary reading retardation, and poor auditory recall was associated with brain injury. A continuum of organicity underlying all three diagnostic categories was suggested. References are included. (Author/WB)

PSYCHOLOGICAL CORRELATES OF READING DEFICIENCY: ETIOLOGICAL AND NORMATIVE COMPARISONS

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A group of 34 Ss each with reading deficiency of one year or more were studied on the following selected variables: visual perception, arithmetic, memory, auditory perception, and laterality. The age range was from 8 to 13 years with a mean grade deficiency of 1.93 years. Using the Minnesota Percepto-Diagnostic test as the diagnostic instrument, the Ss were assigned to one of 3 reading categories: primary reading retardation, secondary reading retardation, or reading retardation due to brain injury. The study was divided into two problems. The first compared the 3 reading categories on each variable by analysis of variance and t tests. Auditory recall was associated with brain injury ($p < .001$). Consistency of direction in drawn figure placement, a variable related to laterality, rotation, and directionality, were also associated with brain injury, suggesting that these children are less able to benefit in reading by conventional left-to-right orientation. The second problem compared the 3 reading categories with normative populations on ~~each~~ of the selected variables by means of t tests. The primary group was not significantly different from the normative populations on any of the variables. Difficulty in arithmetic was found to be associated with secondary reading retardation ($p < .01$), and poor auditory recall was associated with brain injury ($p < 001$). A continuum of organicity underlying all 3 diagnostic categories was suggested.

PSYCHOLOGICAL CORRELATES OF READING DEFICIENCY: ETIOLOGICAL AND NORMATIVE COMPARISONS

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In American society learning and language disorders are often devastating to the personality. Reading disability is perhaps the most frequent of these problems. It has been estimated that 20% to 30% of today's school population is retarded in reading (Money, 1962). Completed in July of 1968, the present study was undertaken to investigate the relationship between diagnostic categories of reading retardation and certain psychological variables.

The variables selected were those found salient in the literature: visual perception, auditory perception, memory, arithmetic ability, and laterality.

The study dealt with two separate problems. The purpose of the first was to compare etiological reading retardation categories on each variable. It was hypothesized that there were no significant differences between the three diagnostic categories on any of the selected variables. The purpose of the second problem was to compare the etiological groups with a normative population on each variable. It was hypothesized that there were no significant differences between

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the etiological groups and normative populations on any of the selected variables.

Method

Subjects and Criteria

Ranging in age from 8 to 13 years, the subjects had been referred by classroom teachers to a summer school reading clinic, a part of the public school program in Mt. Pleasant, Michigan. No child had been retained in his former grade; no subject was mentally retarded. Of those tested, 34 met the criteria for reading deficiency which was defined as any extent of retardation score in excess of one year. Using a procedure devised by Harris (1947), the reading expectancy score was determined by subtracting five years from the MA. The difference between the reading expectancy score and the child's actual reading achievement score yielded the extent of retardation score. The mean extent of retardation score in the 34 subjects was 1.93 years.

Etiological Categories

Subjects who met the criteria were then classified into one of the three diagnostic categories suggested and defined by Rabinovitch (1962). (a) Primary reading retardation includes those whose capacity to learn to read is impaired, but brain damage is not seen in the case history or upon neurological examination. The ability to deal with letters and

words as symbols is defective. Ability to integrate the meaningfulness of written material is diminished. The problem appears to reflect a basic disturbed pattern of neurological organization. The cause is biological or endogenous. (b) Secondary reading retardation includes those whose capacity to learn to read is intact but is not utilized sufficiently for the child to achieve a reading level appropriate to his intelligence. The cause is exogenous. The child has a normal reading potential which has been impaired by negativism, anxiety, depression, emotional blocking, psychosis, limited schooling opportunity, or other external influences. (c) Brain injury with reading retardation (organic) includes those whose capacity to learn to read is impaired by brain damage seen in neurological deficits. Usually the case history reveals the cause of the brain injury, for example prenatal toxicity, birth trauma or anoxia, encephalitis, and head injury.

Diagnostic Instrument

The subjects were classified into the etiological categories by means of the Minnesota Percepto-Diagnostic Test (MPD) by Fuller and Laird (1963). In administering the MPD the examiner simply instructs the child to copy each figure on six stimulus cards which are placed before him one at a time. The cards present a figure-ground problem. Bender figures A and B each appear in three different orientations:

vertically on diamond card, horizontally on diamond card and vertically on oblong card. The test measures perceptual stability in terms of degrees that the figures are perceived as rotated from their original axis. The tendency to rotate is greatest among organics. Least rotation is seen in both the normal subjects and in primary reading retardation groups.

When the 34 subjects were divided into etiological categories, there were nine in the primary and nine in the secondary categories and there were 16 in the brain injury group.

Test Battery

The test battery used to measure the variables consisted of the following: (a) Laterality Subtest of the Hawthorne Center Concepts-Symbolization Test (Lat), which is unpublished, was used to assess laterality. (b) Wepman's (1960) Auditory Discrimination Test (ADT) was given to identify auditory discrimination deficits. (c) The Arithmetic Subtest of the Wechsler (1949) (Arith) measured arithmetic and memory on the auditory perceptual level. (d) The Digit Span Subtest of the Wechsler (DS) measured immediate recall on an auditory perceptual level. (e) The Block Design Subtest of the Wechsler (BD) was given to assess the ability to organize and execute on an abstract visual perceptual level. (f) Grahar and Kendall's (1960) Memory-For-Designs Test (MFD) measured immediate recall on a visual perceptual level.

Both the diagnostic test and the battery of tests which measured variables were given on a one-to-one basis at the school during regular hours by a team of examiners from the Central Michigan University Psycho-Education Clinic.

After the study was well under way, it became apparent that some of the test material yielded data which merited further examination. The placement of figures on the page in the MPD and the MFD was seen as being possibly related to reading deficiency. In these tests the subjects are not instructed as to placement. This phase of the study, which was dubbed Directional Consistency (Dir Con), had to do with the way the hand seems to "want" to go before it is conditioned by the teaching of conventional ways. This consistency manifests itself in the order in which figures are placed on paper if the subject has not been instructed as to placement. It is an entirely different thing from mirror writing, rotation, or reversals in the order of letters.

Scoring for Directional Consistency on both the MPD and the MFD was accomplished by observing how well the directional progression of the drawn figures seemed to serve reading needs. That is, the top score of 10 was given if the child had begun conventionally at top-left of the page and had progressed from left-to-right or from top-down. A score of one was given if progression was contrary to good reading habits, that is, if it were from right-to-left or from bottom-up. Scores between one and 10 were assigned according to the

strength of these tendencies. These two tests were treated statistically along with the variables selected originally.

Statistical Analysis

To test the first hypothesis, that is, to compare the etiological groups on each variable, an analysis of variance on raw scores was used. For further breakdown of the significant variables, t tests were used to determine between which diagnostic groups the difference existed.

For the second hypothesis, t tests compared standard scores in each diagnostic category with the population norms for each test (or subtest) as they are given in the test manuals. The list of variables was necessarily shortened to include only those for which data on normative populations was available (i. e., ADT was omitted).

Results and Discussion

Etiological Comparisons

When the first hypothesis was tested by comparing the three etiological categories with each of the selected variables (See Table 1 for characteristics of the three groups), a significant difference between the three diagnostic categories was seen for Digit Span which measured

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Insert Table 1 about here

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immediate recall on an auditory perceptual level (See Table 2).

TABLE 1

Means and Standard Deviations of three Ethiological Groups
(Raw Scores)

Variables	Primary		Secondary		Organic	
	M	SD	M	SD	M	SD
Read Def	2.12	0.65	2.27	0.90	1.65	0.52
Lat	14.56	5.66	16.22	5.14	16.34	4.84
ADT	6.67	6.86	3.33	2.29	4.75	4.33
Arith	8.00	1.73	7.89	1.36	7.31	1.20
Vis Math	4.89	1.45	5.56	1.74	4.38	1.36
DS	9.33	1.41	8.44	1.24	8.00	9.67
BD	18.11	9.65	21.44	10.57	15.00	10.55
MFD	-0.72	1.82	0.28	3.47	0.63	2.59
MPD	29.78	5.59	47.89	1.39	72.94	1.54
Dir Con (MPD	9.67	0.71	8.00	3.97	6.75	3.71
Dir Con (MFD)	8.56	3.00	6.78	4.38	4.88	3.79

Both Directional Consistency tests showed a marked tendency, though not statistically significant, toward difference (See Tables 3 and 4).

Insert Table 2 about here

Insert Table 3 about here

Insert Table 4 about here

When the t tests determined between which etiological groups the difference existed, there was a sharp difference between the primary and organic groups on Digit Span (See Table 5). Since the sensitivity of Digit Span to brain injury

Insert Table 5 about here

is well known, this was interpreted as evidence of the ability of the diagnostic instrument to differentiate the primary and organic groups. The t tests also showed that the two Directional Consistency tests were related to reading retardation in the organic groups, suggesting that brain injured children work against themselves in the placement of figures on paper. A new area for investigation arises in the question, what is the relationship between ability to read and the order of figure placement?

Placement of figures on the Bender Gestalt has been

TABLE 2

Summary of Analysis of Variance
for Digit Span

Source	df	MS	F
Between-groups	2	5.12	3.76*
Within-groups	31	1.36	
Total	33		

*p <.01.

TABLE 3

Summary of Analysis of Variance
for Directional Consistency (MPD)

Source	df	MS	F
Between-groups	2	2.46	2.27*
Within-groups	31	1.09	
Total	33		

*p < .10.

TABLE 4

Summary of Analysis of Variance
for Directional Consistency (MFD)

Source	df	MS	F
Between-groups	2	4.01	2.82*
Within-groups	31	1.42	
Total	33		

*p <.10.

TABLE 5

t Tests for Between-Groups Differences on Four Variables

Groups Compared	DS	Dir Con MPD	Dir Con MFD	MPD
Primary & Secondary	1.42	1.24	1.00	-3.62**
Secondary & Organic	1.00	.79	1.14	-4.03**
Primary & Organic	2.80**	2.31*	2.50*	-8.04**

*p < .01.
**p < .001.

TABLE 6

t Test Comparisons between Standard Scores of Primary Reading Retardation Group and Normative Populations

Variable	Primary		Normative		t
	M	SD	M	SD	
Lat	8.33	5.22	10	3	-1.63
Arith	8.89	2.67	10	3	-1.11
DS	10.00	2.29	10	3	0.00
BD	10.11	2.52	10	3	0.11
MFD	- 0.72	0.18	- 0.05	3.08	-0.65

used clinically in personality description and diagnosis (Halprin, 1951). The relationship seen in the present study between organicity and figure placement suggests that this clinical use should be reevaluated. Further, the relationship may shed light on the fact that some researchers (Hermann, 1959; Vernon, 1957) have found a distrubance of directional function among poor readers, and others (Coleman & Deutsch, 1964) have not. That is to say, the differences in these findings may be explained by the numbers of organics within the groups of subjects studied.

An examination of the between-group differences in Digit Span and Directional Consistency on the MPD (Table 5) showed a close relationship between the primary and secondary groups and a closer one between the secondary and organic groups. A continuum is suggested. Since these two variables have been shown to be sensitive to organicity, a continuum of neurological causes manifesting themselves in different ways may be an underlying factor in reading retardation. For example, in the primary group the defect in ability to deal with symbols may be a manifestation of organicity. In the secondary group, the organicity may cause behavior defects such as hyperactivity and perseveration which interfere directly with learning. Or the behavior may elicit responses from significant others, that, in turn, cause the subject psychological problems such as anxiety or depression which interfere with learning. If these assumptions concerning

secondary reading retardation are correct, the child would not have a normal reading potential, nor would the causative factors of poor reading be exogenous. Though testing may indeed suggest that the capacity to learn to read is intact, the fact that it is not sufficiently utilized would have an endogenous, not exogenous etiology.

That a continuum of organicity underlies all three etiological categories is an assumption that merits further study, especially in the light of the epidemiological studies of Pasamanic and Knoblock (1961) which give evidence that "there exists a continuum of reproductive insult.....resulting in a continuum of reproductive causalty extending from death through varying degrees of neuropsychiatric disability (p. 91)."

Normative Comparisons

When the second hypothesis was tested by comparing each of the diagnostic groups with a normative population,

Insert Table 6 about here

the primary group was found to be not significantly different from the normative populations on any variable (See Table 6). This was expected because the propensity of the selected variables are sensitive to visual or auditory perceptual problems, and primary reading retardation does not seem to show perceptual weakness (Fuller, 1964).

The secondary reading group showed a difference from the normative population on arithmetic (See Table 7). This seems

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Insert Table 7 about here

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logical since subjects of the secondary group would likely be burdened with anxiety, emotional blocking or negativism which would prevent them from the concentration necessary to manipulate the complex thought patterns. Cultural disadvantage or rebellion against authority are also suggested as causes of both the arithmetic deficiency and the reading retardation.

The brain injury group differed from the normative group on Digit Span (See Table 8). As in the first part of

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Insert Table 8 about here

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the study, this was viewed as evidence of the ability of the diagnostic instrument to identify the organic groups.

TABLE 7

t Test Comparisons between Standard Scores of Secondary Reading Retardation Group and Normative Populations

Variable	Secondary M	Secondary SD	Normative M	Normative SD	t
Lat	9.22	4.92	10	3	-0.78
Arith	8.00	2.18	10	3	-2.00*
DS	8.22	2.16	10	3	-1.78
BD	10.11	2.61	10	3	0.11
MFD	0.28	3.47	- 0.05	3.08	0.32

*p<.01.

TABLE 8

t Test Comparisons between Standard Scores of Brain Injury with Reading Retardation and Normative Populations

Variable	Organic M	Organic SD	Normative M	Normative SD	t
Lat	10.44	3.39	10	3	0.58
Arith	8.81	2.56	10	3	-1.58
DS	7.94	1.98	10	3	-2.75*
BD	9.56	3.20	10	3	-0.58
MFD	0.63	2.59	- 0.05	3.08	0.88

*p < .001.

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