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Ninety-nine third grade children were administered the Slosson Intelligence Test and the Slosson Oral Reading Test. Fifteen percent of those children with the largest discrepancies between the z-score for reading achievement and the z-score for I.Q. were designated as the reading disabled group. Control children matched for sex, I.Q. score, and race were selected from the remaining students. Both groups of children were given the WISC and VMI. Results of univariate analyses revealed significantly better scores for the control group on the Information, Arithmetic, and Picture Arrangement subtests.

Teachers of the reading disabled and control children completed a checklist of behavioral and academic problems and deficits for each child. Univariate analyses revealed that reading disabled children were reported to have more problems related to academic performance. Teachers reported reading disabled children to have more difficulties with reading, writing and arithmetic, telling time, retaining information, substituting words, reading slowly, learning the sounds of letters, and letter reversals.

The results of the present study suggest that reading disabled children have specific deficiencies in cognitive functioning and classroom academic behaviors. No differences were found between the groups for the VMI or non-academic behavior problems.

WISC, VMI, AND BEHAVIORAL CHARACTERISTICS OF READING DISABLED CHILDREN IDENTIFIED BY THE Z-SCORE METHOD

by

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

INTRODUCTION

Specific reading disability is usually defined as a failure to read at an adequate level of expectancy in spite of proper instruction, normal intelligence, adequate motivation, and freedom from sensory, motor, and neurological deficits (Eisenberg, 1966). A child who scores in the average or above average range on an intelligence test but whose reading achievement is below average, then, would be described as being reading disabled. Intelligence test scores are considered to be the best available standard of expected rate of learning because items on intelligence tests represent a broad spectrum of learned behaviors. Thus, the rate of learning to read, measured by an achievement test which samples a smaller, finite class of behaviors, may be compared with the overall rate of learning reflected by an intelligence test score.

Estimates of the extent of reading disorders in the school population have ranged from ten to thirty percent. In a study by Eisenberg (1966), 12,000 children from a large eastern city were tested using the Stanford group reading test. His results indicated that twenty-eight percent of sixth grade children were reading as much as two or more grades below their expected grade level.

An important fact in the study of learning disabilities, especially in the area of reading, is that the earlier the diagnosis the better the prognosis for the individual. As a child gets older

his chances for educational recovery are decreased (Tarnopol, 1969). The child who has not mastered first grade reading skills before he is promoted to the second grade has a poor chance of ever achieving at his grade level because he lacks the basic skills which are the foundation for future learning. He may also have developed poor reading habits, deficits in other academic behaviors for which reading is necessary, and behavioral problems. These deleterious consequences emphasize the necessity for identifying children with reading disabilities early in their educational training.

The standard evaluation by psychologists, in a clinical setting, usually includes the following measures: Wechsler Intelligence Scale for Children (WISC), Bender Visual-Motor Gestalt Test, Draw-a-Person, Gray Oral Reading Test, and the Wide Range Achievement Test (Tarnopol, 1969). It is not financially feasible, however, for school systems to provide such extensive diagnostic batteries for the purpose of screening. It is therefore necessary to develop a more economical approach in terms of both time and money.

Review of Research on the WISC

Research has shown that pattern analysis of subtest scores on the WISC indicates that there may be discriminable patterns for poor readers. Studies reported in the present paper represent the most well designed and least confounded of those in the literature. With a population of children taken from six primary schools, grades one through six, Lyle and Goyen (1969) studied the results of the WISC given to 54 below average male readers of normal intelligence and a control group of 54 students matched on age, sex, and I.Q.

scores, who were reading adequately. The reading disabled group showed significantly poorer performances on Information, Arithmetic, and Coding subtests and significantly better performances on Comprehension, Picture Arrangement, and Block Design subtests. Hirst (1960), using a clinical sample of children, found that the reading disabled group generally scored high on Picture Arrangement, Picture Completion, and Block Design while scoring low on Digit Span, Arithmetic, and Coding. The conclusion that low performances on Information, Arithmetic, and Coding subtests are characteristic of groups of disabled readers was also supported by Huelsman (1970). He emphasized that if a WISC subtest pattern did exist for disabled readers the value "would lie in the assistance it would give diagnosticians in identifying clues to instructional methods and objectives, and in promoting preventive methods" (p. 535).

Neville (1961) studied a group of 53 male disabled readers from a clinical population with I.Q. scores above 89 and who were reading at a level two years below their mental age. He also used a control group matched for grade, sex, and I.Q. score. His findings not only revealed the characteristic low scores on Information, Arithmetic, and Digit Span, and high scores on Picture Arrangement and Block Design, but also showed Verbal I.Q. scores to be significantly lower than the Performance I.Q. scores for the disabled readers. The predominance of higher Performance I.Q. scores for children with reading disabilities has been supported by other researchers (Spache,

1957; McLean, 1964; Huelsman, 1970; Rourke, Young, and Flewelling, 1970; and Ackerman, Peters, and Dykman, 1971).

Although these studies are relatively consistent, Huelsman (1970), in his extensive review of the literature, found a lack of consistancy in the published research. He postulated that this finding could be due to the disagreement in defining reading disabilities, statistical procedures, sex differences in patterning, different selection procedures, the use of clinical populations of varying socio-economic levels, and different age ranges of the subjects.

A more recent study by Carlson (1973) suggests that the WISC subtest pattern for the disabled readers may be a by-product of flaws in experimental design, particularly the lack of objective methods for selecting reading disabled subjects. In a research study which eliminated the known design flaws of previous studies Carlson did not find WISC subtest patterns which discriminated disabled readers from their controls. One potential problem with Carlson's study did arise in that the population from which he selected his reading disabled subjects was above average in intelligence. In part, the present study sought to replicate Carlson's study with a population whose mean I.Q. score was closer to that of the national norm.

Research on Visual-Motor Coordination

The area of visual-motor coordination has been of great concern to researchers in the field of reading disabilities. Deficits in this area are highly correlated with reading disabilities as shown

in studies by Silver (1961) and Spraings (1969). More than 90 percent of the cases demonstrated visual-motor deficits on the Bender-Gestalt Test (BGT). Bender (1971) suggested that reading disabilities are due to developmental lag which can be discovered through the use of the BGT. Ackerman et al., (1971), in their study on BGT findings concluded that 67% of the learning disabled children as compared with 44% of the control children made more errors than the mean for normative children of the same age. More importantly, they found that 68% of the severe reading disability cases and 60% of the mild reading disabled children had poor BGT scores.

Norfleet (1973) investigated the BGT as a predictor of reading achievement when given to groups of children at the end of the first grade. The use of cut-off scores enabled the investigator to predict the reading achievement of groups who scored in the extreme ranges on the BGT, especially the reading level of those children with good BGT scores. The prediction of poor readers was not as accurate.

Research specifically on the Developmental Test of Visual-Motor Integration (Beery and Buktenica, 1967) is lacking because of its recent publication. Although this test is similar to the BGT, it has several advantages that would encourage its use. The procedure for administration is more highly structured and more objective; it is better standardized, has more recent norms, has a greater number of examples for scoring, and the steps between age levels are smaller. Results from BGT studies can be used as a springboard for further research regarding the correlation between reading disabilities and visual-motor integration.

Methods of RD Identification

In conducting research in the area of reading disabilities it is essential to have an operational definition of the problem. Past research has suggested that the characteristics of children with reading disabilities identified in a population may depend on the criteria used in their identification. Several methods have been used to identify children with reading disabilities.

One of the easiest and most popular methods is the "years below grade level" formula. In this approach an arbitrary number of years below the child's grade level is designated as the criterion for the child to be considered reading disabled. This formula lacks the precision necessary in identifying children with reading disabilities. It cannot be used with children in the early school years when identification is most important, and it tends to increase the number of cases identified as reading disabled as the grade of the child advances. General intellectual functioning is not taken into account, therefore enhancing the difficulties of discriminating between the disabled reader and the slow learner. The picture portrayed of "disability" is difficult to distinguish from variation normally observed in human ability (Ullman, 1969). Ullman suggests that a more conservative method be used to identify the significant disability cases.

Several approaches are based on a discrepancy between reading achievement and the expected reading level based on an I.Q. score. Virtually all investigators eliminate children with I.Q. scores below 90 from consideration in the diagnosis of reading disabilities,

although, theoretically, reading disabilities could occur in slow learners and retarded children.

Johnson and Myklebust (1967) criticize the common practice of using one or more years below the level of expectancy as a criteria for identifying reading disabilities. They suggest that there are serious limitations since one year below the expected level at age seven is not comparable to one year below expectancy at age fifteen. They suggest the use of a Learning Quotient, that is, the ratio of achievement to mental age. This technique reflects the amount of learning achieved related to the intellectual potential for learning. This method may be criticized for identifying too many high I.Q. children as reading disabled by assuming that instruction in reading should have been initiated prior to the first grade.

The Mental Grade Method (Bond and Tinker, 1967) requires the assumption that each child enters the first grade at age 6.2 years. The standard age in the grade is multiplied by the child's I.Q. score and 6.2 is subtracted from that product. One year is then added to the remainder, and the final number is the child's mental age.

One final technique developed by Erickson (1974) is the Z-score Discrepancy Model. Although this model for screening reading disabled children has not been thoroughtly investigated, the advantages inherent in this statistical procedure suggests that it may be superior when dealing with school populations where there is large variability in educational facilities, type of school, or norm expectancies. To determine the standard-score discrepancy, the I.Q.

score and reading achievement scores are calculated through the use of standardized tests. The mean and standard deviation are determined for both sets of scores, thus allowing for the conversion of individual test results into z-scores. For those instances in which the z-score for reading achievement is the lower of the two scores, children with the largest discrepancies are identified as reading disabled. Children are rank ordered on the basis of the size of the difference between the z-score for reading achievement and the z-score for I.Q.

An advantage of the use of standard scores to determine discrepancies is that this method has the possibility of establishing norms for various types of educational facilities. The degree of reading retardation seems, in part, to depend on the socio-economic level of the school population. Eisenberg (1966) studied the percentage of children who were more than one year retarded in reading from various school settings. He found that the metropolitan schools had failure rates 2/3 higher than the commuter county schools, 3 times higher than the suburban schools, and 50 times higher than the private schools. If the average expectancy levels for children are lower in poor urban and rural schools than in private and suburban schools, it would seem logical that norms regarding expected discrepancy levels would be necessary to aid in the identification of children with reading disabilities.

In situations where a full clinical diagnosis and evaluation are not feasible due to lack of finances and qualified personnel, an "in school" identification and diagnostic procedure is essential. The

standard score discrepancy model allows for screening of large groups of children directly in the school setting, the results of which have more external validity to classroom situations. Movement from the clinic with its referral population and into the school is an important, long-awaited step in this field of research. Huelsman (1970) criticizes the use of clinical populations for reading disability research. The subjects vary from clinic to clinic depending on fees and socio-economic level. He has also suggested that cultural differences could influence the findings.

Behavioral Correlates of RD Children

Another area of interest in the present study involves teachers' assessment of the reading disabled child. Along with poor reading ability, specific disruptive classroom behaviors and behavioral problems have been associated with disabled readers. Bond and Tinker (1967) report a higher incidence of behavior problems for disabled readers when compared with normal readers. For example, hyperactivity and short attention span are often observed. Bryan and Wheeler (1972) found a significant difference in the amount of time spent on non-task-oriented and task-oriented activity for average achievers and the learning disabled. Meyers (1969) suggests that there is an increase in inattentiveness and inappropriate talking out in classes. Other categories of behavioral problems include aggression, inappropriate classroom behaviors, perseveration, and negative self verbalizations (Ross, 1967). The ability of the teacher to assess the discrepant

behaviors of reading disabled children could easily facilitate the identification of these children.

Statement of Purpose

The purpose of the present study was to determine if the WISC subtest scores and the VMI age equivalent can significantly discriminate reading disabled children from normal readers when subjects are chosen from a school population using the z-score discrepancy method for the identification of reading disabled children. When methodological flaws encountered in previous research are controlled for, specifically the sampling procedure used for selecting disabled readers and their controls, a clearer interpretation of the value of the WISC and VMI as assessment tools for disabled readers can be made.

Another concern of the present study was to determine whether reading disabled children may be discriminated from normal children on the basis of teachers' ratings of behavioral and academic problems.

METHOD

Subjects

Fifty-five male and forty-four female third grade students with an average age of 9.3 years served as subjects in the present study. They were recruited from two Caswell County schools in North Carolina. Those students who had failed one or more grades were eliminated from the investigation. Of the students selected for the reading disabled (RD) and control groups, twenty were males and ten were females.

Materials

The following tests were administered to all subjects: Slosson Intelligence Test (SIT, 1963) and the Slosson Oral Reading Test (SORT, 1963). The Wechsler Intelligence Scale for Children (WISC, 1949) and the Developmental Test for Visual-Motor Integration (VMI, 1967) were administered to thirty of the subjects. All tests were individually administered in small, isolated rooms.

A behavioral problem checklist for learning disabled children, developed by the Guilford County Public School System (1971) was given to the teachers of the thirty subjects (See Appendix A).

Procedure

The SIT and SORT were administered individually to all ninety-nine subjects. The mean and standard deviation of the I.Q. scores and the reading achievement scores were calculated for the entire group of

subjects. Each score (I.Q. and reading) was converted into z-scores thereby enabling a discrepancy measure to be obtained by subtracting the reading z-score from the I.Q. z-score. The discrepancy scores were rank ordered from the largest negative score (reading z-score below I.Q. z-score) to the largest positive score (reading z-score above I.Q. z-score). Fifteen percent of the children with the largest negative discrepancies, yet with I.Q. scores of a normal level or above (93-130), were selected as the reading disabled (RD) group. The control children were selected from the remaining subjects and matched with each RD subject for sex, race, and I.Q. score (Table 1). Students in the RD and control groups were given the WISC and VMI inidvidually. The examiners were graduate students who successfully completed a course in Behavioral Assessment and were experienced in administering the WISC and VMI. They had no knowledge of any child's academic achievement or of the group placement of the children.

The teachers for all thirty children were given a checklist of behavioral and academic problems and deficits associated with learning disability children. At this time the teachers were naive regarding the children's test scores, group placement, and the nature of the study. They were given one checklist for each child and were told that the checklists would provide the investigator with important information regarding the behaviors exhibited by these children in the classroom. They were asked to score each behavior for each child on a one to five scale (1 = does not apply, 5 = very applicable).

TABLE 1

I.Q. SCORE, SEX, RACE AND Z-SCORE DISCREPANCY FOR READING DISABLED AND MATCHED CONTROL SUBJECTS

RD Group				Control Group			
I.Q.	Sex	Race	z-score Discrepancy	I.Q.	Sex	Race	z-score Discrepancy
97	M	B	-1.2	93	M	B	+ .2
112	M	W	-1.3	105	M	W	+ .7
96	M	W	-1.2	99	M	W	+ .2
109	M	W	-1.4	107	M	W	+ .2
96	F	W	-1.0	101	F	W	+1.0
122	M	W	-1.5	120	M	W	- .8
95	M	B	-1.2	96	M	B	- .3
100	F	B	-1.2	101	F	B	- .6
96	M	B	-1.0	93	M	B	- .1
107	F	W	-1.3	107	F	W	- .7
115	M	W	-1.4	107	M	W	+1.8
130	M	W	-2.1	128	M	W	+ .7
95	M	B	-1.1	100	M	B	- .6
110	F	B	-1.6	104	F	B	- .8
100	F	W	-1.9	100	F	W	+ .1

RESULTS

The mean I.Q. score for the ninety-nine children given the Slosson Intelligence Test was 95 with a standard deviation of 13.3. The mean grade placement for the Slosson Oral Reading Test was 3.8 with a standard deviation of 1.3. The mean Slosson I.Q. scores for the 15% of the subject population selected as reading disabled and the control group were 104 and 105, respectively.

A profile of the mean WISC subtest scores for the reading disabled and control groups is shown in Figure 1. The largest differences found between the two groups on the mean scores were for Information, Arithmetic, and Picture Arrangement. The means and standard deviations for the WISC Verbal Scale, Performance Scale, and Full Scale I.Q. scores, WISC subtest scaled scores, and VMI age equivalents (in months) for the experimental and control groups can be found in Table 2. Although there was a 6.6 point difference between the two groups on the Full Scale I.Q. score, a t-test for matched pairs revealed that this difference was not significant.

Since many dependent variables were examined, a multivariate analysis of variance (MANOVA) was performed on the data. A MANOVA was calculated for the ten WISC subtests and the VMI age equivalents. The results of this analysis yielded no significant differences between the two groups ($F=1.36$, $df=11, 18$). Univariate analyses of variance were calculated for each individual subtest and the VMI age equivalent

I = Information
C = Comprehension
A = Arithmetic
S = Similarities
V = Vocabulary
PC= Picture Completion
PA= Picture Arrangement
BD= Block Design
OA= Object Assembly
Co= Coding

Control group

Reading disabled group

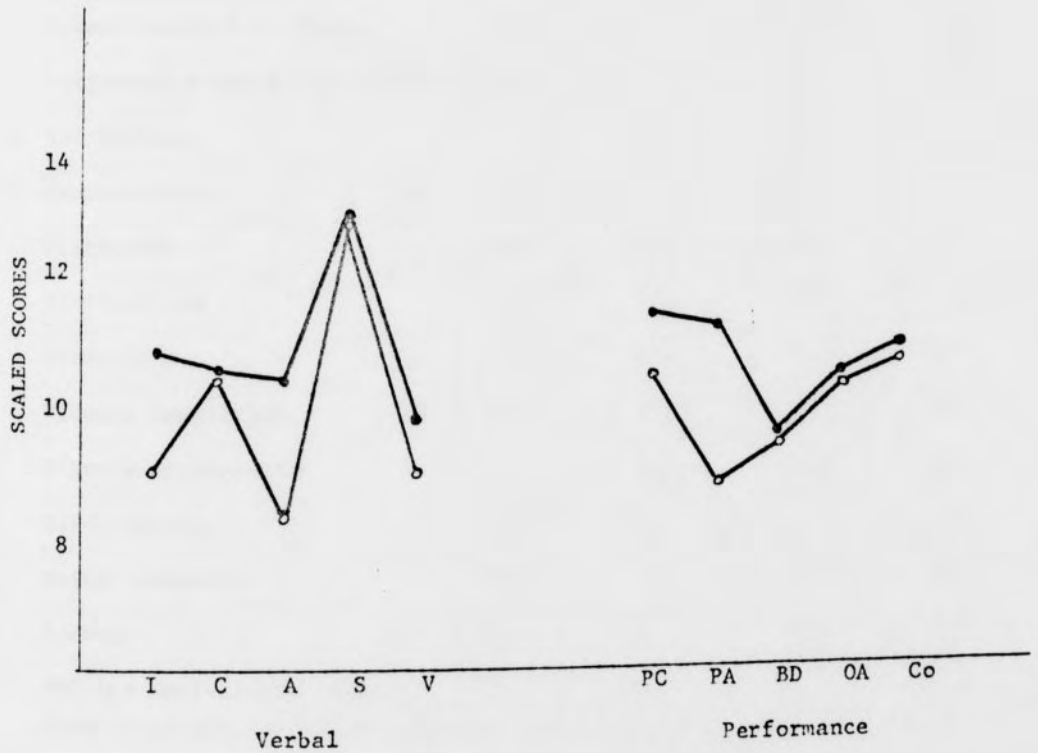

Fig. 1. Mean WISC Verbal and Performance Subtest Scaled Scores for Reading Disabled and Control Groups.

TABLE 2

MEANS AND STANDARD DEVIATIONS OF WISC FULL SCALE I.Q., VERBAL SCALE I.Q., PERFORMANCE SCALE I.Q., SUBTEST SCALED SCORES AND VMI AGE EQUIVALENTS FOR READING DISABLED AND CONTROL GROUPS

	Reading Disabled Group		Control Group	
	Mean	Standard Deviation	Mean	Standard Deviation
Full Scale I.Q. Score	99.7	9.1	106.3	11.4
Verbal Scale I.Q. Score	99.8	7.6	106.5	9.9
Performance Scale I.Q. Score	99.8	11.5	105.3	12.5
Information	9.0	2.0	11.0	2.1
Comprehension	10.5	3.5	10.6	2.5
Arithmetic	8.3	2.6	10.5	2.7
Similarities	13.0	2.0	13.0	1.6
Vocabulary	9.1	1.7	9.9	2.7
Picture Completion	10.6	2.9	11.5	2.4
Picture Arrangement	8.8	2.4	11.3	2.7
Block Design	9.4	2.1	9.5	2.9
Object Assembly	10.3	2.2	10.5	2.2
Coding	10.7	1.8	10.9	3.5
VMI Age Equivalents (months)	91.0	18.3	99.3	20.2

score. Three out of the eleven analyses revealed that the control group performed significantly better than the RD group (magnitudes of effect are reported in terms of utility indices (UI)): Information Subtest ($F=6.7$, $df=1, 28$, $p<.05$, $UI=.16$), the Arithmetic subtest ($F=4.8$, $df=1, 28$, $p<.05$, $UI=.11$), and the Picture Arrangement subtest ($F=7.5$, $df=1, 28$, $p<.05$, $UI=.17$). The results for the WISC subtests and the VMI age equivalent are shown in Table 3.

The means and standard deviations for the sixteen teacher behavior rating variables are presented in Table 4. The largest mean differences between the two groups are apparent for the teachers' ratings of difficulty with reading, writing, and arithmetic, problems with letter reversals, reads slowly, substitutes words that distort meaning, trouble telling time, trouble learning the sounds of letters, and problem retaining information. A multivariate analysis of variance was calculated and the results indicated a trend toward significance ($F=2.32$, $df=16, 28$, $p<.10$). Univariate analyses of variance were also performed for each separate variable. The results of these analyses can be found in Table 5. Seven of the univariate analyses resulted in significantly higher scores (more problems) for the RD group: difficulty with reading, writing, and arithmetic ($F=10.2$, $df=1, 28$, $p<.01$, $UI=.23$), reads slowly ($F=9.14$, $df=1, 28$, $p<.01$, $UI=.21$), substitutes words that distort meaning ($F=19.4$, $df=1, 28$, $p<.01$, $UI=.38$), trouble telling time ($F=8.45$, $df=1, 28$, $p<.01$, $UI=.19$), trouble learning the sounds of letters ($F=12.8$, $df=1, 28$, $p<.01$, $UI=.24$), problems retaining information ($F=4.69$, $df=1,28$, $p<.05$, $UI=.10$), and letter reversals ($F=4.73$, $df=1, 28$, $p<.01$, $UI=.11$).

TABLE 3

UNIVARIATE ANALYSES OF VARIANCE FOR WISC SUBTESTS AND VMI AGE EQUIVALENT

Variable	Source of Variance	MS	df	F
Information	groups	30.0	1	6.7*
	error	4.43	28	
Comprehension	groups	.03	1	.01 NS
	error	5.26	28	
Arithmetic	groups	36.3	1	4.78*
	error	7.59	28	
Similarities	groups	.03	1	.01 NS
	error	2.6	28	
Vocabulary	groups	5.63	1	.94 NS
	error	5.99	28	
Picture Completion	groups	2.7	1	.34 NS
	error	8.0	28	
Picture Arrangement	groups	58.8	1	7.53*
	error	7.8	28	
Block Design	groups	.3	1	.04 NS
	error	6.87	28	
Object Assembly	groups	.83	1	.16 NS
	error	5.02	28	
Coding	groups	1.63	1	.19 NS
	error	8.4	28	
VMI age equivalent	groups	676.2	1	2.1 NS
	error	320.1	28	

* = $p < .05$

TABLE 4

MEANS AND STANDARD DEVIATIONS OF
TEACHER BEHAVIOR RATINGS

	Reading Disabled Group		Control Group	
Variable	Mean	Standard Deviation	Mean	Standard Deviation
Hyperactivity	1.9	1.2	1.7	.4
Slow to finish work	2.2	1.5	1.9	.5
Short attention span	1.7	1.1	1.5	.4
Difficulty with reading, writing and arithmetic	2.7	1.5	1.3	.3
Speech or hearing problem	1.4	1.0	1.1	.3
Does not listen to directions	2.1	1.4	1.5	.4
Letter reversal	1.8	1.4	1.0	0
Reads slowly	2.2	1.3	1.0	.3
Substitutes words	2.9	1.2	1.2	.3
L-R mistakes	1.3	.8	1.0	0
Trouble telling time	2.1	.7	1.3	.3
Seems bright but does poorly	2.1	1.2	1.9	.5
Trouble learning sounds of letters	2.5	.9	1.3	.3
Poor drawings	1.7	.8	1.3	.3
Problem retaining information	2.7	1.5	1.6	.4
Immature	1.5	1.0	1.7	.5

TABLE 5

UNIVARIATE ANALYSES OF VARIANCE FOR
TEACHER BEHAVIOR RATINGS

Variable	Source of Variance	MS	df	F
Hyperactive	groups	.30	1	.17 NS
	error	1.75	28	
Slow to finish work	groups	.83	1	.42 NS
	error	2.0	28	
Short attention span	groups	.30	1	.24 NS
	error	1.23	28	
Difficulty with reading, writing and arithmetic	groups	14.7	1	10.2 **
	error	1.43	28	
Speech or hearing problem	groups	.53	1	.77 NS
	error	.69	28	
Does not listen to directions	groups	3.3	1	2.63 NS
	error	1.26	28	
Letter reversal	groups	4.8	1	4.73 **
	error	1.0	28	
Reads slowly	groups	8.53	1	9.14 **
	error	.93	28	
Substitutes words	groups	20.83	1	19.36 **
	error	1.07	28	
L-R mistakes	groups	.83	1	2.5 NS
	error	.33	28	
Trouble telling time	groups	5.63	1	8.45 **
	error	.67	28	
Seems bright but does poorly	groups	.30	1	.22
	error	1.31	28	
Trouble learning sounds of letters	groups	9.63	1	12.8 **
	error	.75	28	

Poor drawings	groups	.83	1	.76
	error	1.1	28	
Problem retaining information	groups	8.53	1	4.60 *
	error	1.82	28	
Immature	groups	.30	1	.19
	error	1.59	28	

* = $p < .05$
** = $p < .01$

DISCUSSION

The z-score method for selection of RD children resulted in a sample with a mean I.Q. score that was nine points higher than the mean I.Q. score for the entire sample. This finding indicates that the higher I.Q. children in this population were less likely to have comparably high reading achievement scores. One possible factor contributing to this finding may be the schools' focusing special resources on children whose I.Q. score and achievement score are low (e.g., the slow learner or retarded pupils).

The data from the present study suggests that using the Slosson tests and the z-score method for identification results in discriminable WISC patterns which are similar to those found by previous investigators. The univariate analyses of variance revealed relatively poor performance of reading disabled children on the Information and Arithmetic subtests. The magnitudes of effect suggested a somewhat strong and reliable difference. However, in the present study RD children performed significantly lower on the Picture Arrangement subtest in contrast to previous studies in which RD children performed higher (Hirst, 1960; Neville, 1961). The reasons for the discrepancy among the results are not readily apparent from a closer comparison of the present study with previous studies.

The mean WISC I.Q. score for the RD group was four points lower than the mean Slosson I.Q. score. This difference suggests that the Slosson may be an over-estimate of the WISC I.Q. score for

RD children, since the scores of the control group appeared to be more consistent. The standardization data for the WISC showed that the correlations of the Information, Arithmetic, and Picture Arrangement subtests with WISC Full Scale I.Q. ranged from .70 to .82 (Wechsler, 1949). These high correlations suggest that differences in performance on the three subtests may be due to the differences in I.Q. scores. The mean I.Q. score for the RD group was 6.6 points lower than the mean score for the control group. This difference is large enough to account for differences in individual subtest scaled scores. Future investigations matching both groups on WISC I.Q. scores may not reveal these differences.

Significant differences between the two groups were not found for the VMI age equivalents with the univariate analysis of variance. Past research (Silver, 1961; Spraings, 1969; Ackerman et al., 1971) using the BGT report a high percentage of reading disabled children having poor performances on the test. The mean scores obtained for the VMI in the present study, for both groups, were approximately one year below the mean chronological ages. This large discrepancy between VMI age equivalents and chronological age suggests that the VMI scores are not highly correlated with I.Q. scores since the mean I.Q. scores were in the normal range. Overall, the scores on the VMI were low, yet these low scores did not effect the lack of significance between the RD and control groups. This findings suggests that the VMI would not be a reliable test for differentiating problem readers from normal readers. Perhaps further research in various school settings employing a larger sample would shed light on this finding.

The results of the behavior ratings suggest that the teachers sampled in the present study were able to discriminate the children in the two groups on the basis of academic behaviors but not on the basis of the behavior problems usually associated with disabled readers. Significant discriminations were revealed for problems dealing with retaining information, learning the sounds of letters, trouble telling time, substituting words that distort meaning, reading slowly, letter reversals, and trouble with reading, writing, and arithmetic. The utility indices suggested that these differences were substantial. However, differences were not found for variables covering general classroom behaviors such as short attention span, hyperactivity, slow to finish work, and does not listen to directions.

It is not clear whether or not the deficits in academic behaviors are a direct cause or consequence of reading disabilities. The behavior rating scale used in the present study was not detailed enough to warrant a clear interpretation of the results. Further research using a more specific rating scale, perhaps including on-task and off-task activities, aggressive behaviors, and other inappropriate behaviors would provide for a clearer analysis of behavior problems. In addition, reliability measures taken by unobtrusive observers would further increase the validity of the investigation and the results.

The findings of the present study suggest that reading disabled children have specific characteristics in cognitive and academic behavioral areas, but not in the area of visual-motor

integration, when compared with normal readers with similar I.Q. scores. Further research involving a larger sample of disabled readers, carefully matched on WISC Full Scale I.Q. scores is necessary to substantiate these results. A possible limitation of the present study was the use of a 15% cutoff to determine disabled readers, that is, selecting 15% of the children with the largest discrepancies between reading achievement and I.Q. score. Perhaps the selection of children with more extreme discrepancies (5-10% cutoff) would have revealed more differences in non-academic behaviors.

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APPENDIX A

BEHAVIORAL RATING SCALE FOR LEARNING DISABLED CHILDREN

Name of Student_____

Name of Teacher_____

does not apply 1 2 3 4 very applicable 5

1 2 3 4 5 1. Hyperactive (can not sit still in class, out of seat, shakes or swings legs, fidgety).

1 2 3 4 5 2. Slow to finish work (does not apply self, daydreams alot, sometimes falls asleep).

1 2 3 4 5 3. Disorder of attention (short attention span, distractibility, cannot concentrate with the slightest disturbance from other students moving around or talking quietly).

1 2 3 4 5 4. Considerable difficulty with reading, arithmetic, writing, and spelling.

1 2 3 4 5 5. Slight speech or hearing problem.

1 2 3 4 5 6. Does not seem to listen to daily classroom instructions or directions (often asks to have them repeated).

1 2 3 4 5 7. Reverses and/or rotates letters, numbers, and words (writes "b" for "d", "saw" for "was", "2" for "7", "16" for "91") far more frequently than other classmates.

1 2 3 4 5 8. Reads silently or aloud far more slowly than classmates; often loses place.

1 2 3 4 5 9. Substitutes words which distort meaning ("when" for "where").

1 2 3 4 5 10. Mistakes left from right (ex. confuses left-hand with right-hand side of paper).

1 2 3 4 5 11. Has trouble telling time.

1 2 3 4 5 12. Seems very bright in many ways but still does poorly in school work.

1 2 3 4 5 13. Unable to learn the sounds of letters or phonemes.

1 2 3 4 5 14. Poor drawing of people as compared with classmates.

1 2 3 4 5 15. Seems unable to retain information from one day to the next.

1 2 3 4 5 16. Seems quite immature (does not act his/her age).