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Patricia Twohig

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A STUDY OF PERCEPTUAL-MOTOR SKILLS
OF SUPERIOR AND RETARDED READERS
IN THE PRIMARY GRADES

by

Patricia M. Twohig

A DISSERTATION
SUBMITTED IN PARTIAL FULFILLMENT OF THE
REQUIREMENTS FOR THE DEGREE OF
MASTER OF ARTS IN EDUCATION (READING SPECIALIST)
AT THE CARDINAL STRITCH COLLEGE

Milwaukee, Wisconsin

1967

This dissertation has been
approved for the Graduate Committee
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Date May 13, 1967

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TABLE OF CONTENTS

	Page
ACKNOWLEDGMENTS	ii
LIST OF TABLES	v
LIST OF FIGURES	vi
Chapter	
I. THE PROBLEM	1
Introduction	1
Statement of the Problem	2
Scope and Limitations	3
II. REVIEW OF THE RELATED LITERATURE	5
Research Findings	6
III. THE PROCEDURE	14
Administration of Tests	15
Equating the Groups	16
Perceptual-Motor Testing	18
Vision Screening	19
Treatment of Data	20
IV. PRESENTATION AND INTERPRETATION OF RESULTS	21
Analysis of Data on Total of Both Subtests	21
Analysis of Data for Girls' Scores	23
Analysis of Data for Boys' Scores	25
Summary of Comparative Study of Groups	27
Survey of Vision Screening	28
Individual Scores of the Pairs	29
V. SUMMARY AND CONCLUSIONS	34
Summary	34
Findings	35
Conclusions and Implications	36
Suggestions for Further Research	37

	Page
BIBLIOGRAPHY	38
APPENDIX	42

LIST OF TABLES

Table	Page
1. Mean Chronological Ages, Mental Ages, and Intelligence Quotients of Equated Groups	17
2. Comparison of the Developmental Drawing and Rhythmic Writing Scores of Superior and Retarded Readers	22
3. Comparison of the Developmental Drawing and Rhythmic Writing Scores of Girls	24
4. Comparison of the Developmental Drawing and Rhythmic Writing Scores of Boys	26

LIST OF FIGURES

Figure		Page
1.	Individual Scores of the Pairs on Tests of Developmental Drawing and Rhythmic Writing . . .	30
2.	Individual Scores of the Pairs on a Test of Developmental Drawing	32
3.	Individual Scores of the Pairs on a Test of Rhythmic Writing	33

CHAPTER I

THE PROBLEM

Introduction

Modern society has become a very complex structure. As a result of this the demands made on members of society have increased greatly. In order to function successfully in this environment, an adult member must attain an adequate level of literacy.

Of all the many skills that a person learns and uses during his lifetime the ability to read proficiently is probably the most useful, because of its applicability to the diverse experiences that one encounters in everyday life.¹

Thus, a child entering school today has as a major objective successful attainment of reading skill.

While many children are successful in learning to read proficiently, nevertheless, there are always those few who are not successful. There are many reasons for failure in learning to read, for reading is a complex process.²

¹Gertrude Hildreth, Teaching Reading: A Guide to Basic Principles and Modern Practices (New York: Holt, Rinehart and Winston, 1965), p. 3.

²Marion Monroe, Children Who Cannot Read (Chicago: University of Chicago Press, 1936), p. 79.

. . . Some children have inferior learning capacity, poor memory and attention spans, defective vision or hearing, weak language and experiential backgrounds, neurological or physiological handicaps, and emotional or social immaturities. Some have narrow recognition spans, inadequate recognition skills, and insufficient knowledge of phonics. Some lack interest in reading. And, some have received inadequate instruction in important phases of effective reading.³

These are the children who do not catch up later, but rather, they continue to fall further behind their classmates until they are no longer able to function adequately in a normal classroom situation.

An awareness of the problems experienced by the child who fails in learning to read has encouraged this writer's interest in learning more about the various factors which contribute to success in reading. Since reading is a perceptual process, the importance of the development of adequate visual perceptual skills would seem to be valuable in evaluating readiness for and predicting success in reading.

Statement of the Problem

This research study is designed to study the performance of superior and retarded readers at the primary level on perceptual-motor tests in order to ascertain possible approaches to prevention of reading deficiencies. The study will examine certain areas and attempt to answer these questions:

1. Is there a difference in the performance of superior and retarded readers on these tests?

³Henry P. Smith and Emerald V. Dechant, Psychology in Teaching Reading (Englewood Cliffs, N.J.: Prentice-Hall, 1961), p.2.

2. What is the relationship between the performance on the subtests reproducing forms and rhythmic writing of the perceptual tests?
3. Would these tests offer a predictive value for reading readiness?
4. Do the tests isolate deficiencies so that correction through instruction is possible?

The significance of the problem lies in the attempt to acquire additional knowledge concerning possible reasons why children of similar backgrounds and ability vary in their capacity to learn to read.

Identification of deficiencies in perception would permit teachers to be aware of this at an early stage in the child's development. They could then do corrective work in the area of perceptual motor activities to prevent reading disability. Since the tests are simple, it would be possible for teachers to administer them.

Scope and Limitations

The study involved 38 children, 19 pairs of superior and retarded readers. These children were selected from among those enrolled in The Cardinal Stritch College Reading Clinic and second-grade classrooms in the neighboring communities of Cedarburg and Grafton.

The age levels of the pairs were limited to a fourteen month range between the ages 7-4 and 8-6.

The testing for this study was limited to the administration of two sections of the Roach-Kephart Perceptual-

Motor Survey,⁴ testing reproduction of forms and rhythmic writing.

The remaining sections of the Perceptual-Motor Survey were administered to the same group of children by a fellow research worker.⁵ In addition, tests of language development were also administered to this group of children by another investigator.⁶

A vision screening test was administered to each child participating in the study. The Keystone Visual Survey Test was used for this purpose. It detects nearsightedness, astigmatism, muscular imbalance, lack of near and far point fusion, and farsightedness. It also screens for stereopsis. The purpose for using this test was to note any unusual visual problems and their possible relationship to very low scores on the perceptual-motor tests.

⁴E.G. Roach and N.C. Kephart, Perceptual-Motor Survey (Duplicated).

⁵Margaret Werner, "A Study of the Perceptual-Motor Development of Superior and Retarded Readers in the Primary Grades" (unpublished Master's dissertation, Graduate Division, Cardinal Stritch College, Milwaukee, Wisconsin, 1967).

⁶Lois Gruetzmacher, "A Study of the Language Disabilities of Superior and Retarded Readers in the Primary Grades" (Research Study in Progress, Graduate Division, Cardinal Stritch College, Milwaukee, Wisconsin).

CHAPTER II

REVIEW OF THE RELATED LITERATURE

Children who fail in learning to read demonstrate their difficulties early. These difficulties may be observed in beginning reading levels or perhaps even at the "readiness" level.⁷

Extensive research has been done in order to learn more about the process of reading and to find reasons why some children encounter difficulties in learning to read. Studies done in related disciplines have been of value in implementing improvement of instruction in reading and also in understanding the implications of child development as it relates to learning to read.

Research has shown that children, while alike in many ways, are also unique individuals. A child is a product not only of his environment, but of his heredity as well.

Through study it has been recognized that children go through observable stages of growth and development. Individual children differ in the attainment of these stages because of differences in heredity and environment.

It has been observed that the maturation of the human

⁷D.H. Radler with Newell C. Kephart, Success Through Play (New York: Harper & Row, 1960), p. vii.

organism involves not only chronological age and mental development, but also emotional, social, language, and motor development. Each of these can be considered a separate entity, following its own pattern of maturation and contributing to the total development of the organism. That these patterns do not develop and mature at the same time and at equal rate has been demonstrated by the studies done at the Gesell Institute.⁸

Study of children who have failed to learn to read has indicated that adequate chronological and mental age are not always the determinants to successful achievement.⁹

As was noted in the previous chapter, the causes for failure in reading can be varied. School problems observed are often the symptoms of a "lack of early integration of visual, motor, speech, and language skills."¹⁰

Research Findings

Since the middle 1920's, when the concept of reading readiness was recognized, extensive study has been done in order to identify those factors in child development which contribute most to a child's readiness to read and also to his success in reading achievement. Among the many factors

⁸Frances L. Ilg and Louise Bates Ames, School Readiness: Behavior Tests Used at the Gesell Institute (New York: Harper & Row, 1965), pp. 15-18.

⁹Radler, op. cit., pp.11, 12.

¹⁰Ibid., p. viii.

investigated, visual perception and discrimination have received a great deal of attention. It has been observed that all tests of reading readiness contain at least one section involving evaluation of some type of visual perceptual abilities.¹¹

Researchers have been concerned with the task of identifying specific component parts or aspects of visual perceptual skills which singly or in combination contribute most to the assessment of readiness skills and reading achievement.¹²

In a review of the literature pertaining to studies of pre-reading visual discrimination, Barrett considers the relative values of verbal (the ability to see likenesses and differences in forms and/or symbols) and non verbal (naming letters or copying forms and/or symbols) visual discrimination as predictive of first grade reading achievement.¹³

In summarizing investigations of visual discrimination of words and letters Barrett does not state any generalizations; rather he does state two tentative hypotheses:

First, it appears that the visual discrimination and knowledge of letters is somewhat superior to direct letter matching or letter matching from memory. . . .

¹¹Thomas C. Barrett, "Predicting Reading Achievement Through Readiness Tests," Reading and Inquiry, ed. J. Allen Figuel, International Reading Association Conference Proceedings, X (Newark, Delaware, 1965), pp. 26-29.

¹²Thomas C. Barrett, "The Relationships Between Measures of Pre-Reading Visual Discrimination and First Grade Reading Achievement: A Review of the Literature," Reading Research Quarterly, I, No. 1 (Fall, 1965), p. 51.

¹³Ibid., p. 53.

Second, a look at the two investigations which compared discrimination of letters and words as predictors permits two limited observations: 1) there is not much difference between letter matching and word matching as predictors of reading achievement (Steinbach, 1940); and 2) visual discrimination and knowledge of letters is somewhat better than matching words as a predictor of first-grade achievement. (Weiner & Feldman, 1963).¹⁴

Evaluation of studies designed to measure non-verbal visual discrimination tasks indicate that results are equivocal. Barrett states, "It would appear that the value of non-verbal visual discrimination tasks as predictors may depend on the complexity of the visual and/or visual-motor abilities they require."¹⁵

In addition, in summarizing studies which compared verbal and non-verbal discrimination tasks under similar conditions Barrett observes:

First, there is an indication that verbal visual discrimination is a somewhat better predictor of reading achievement than is non-verbal visual discrimination. . . . Second, five investigations permit a comparison of the value of discrimination of words and letters as predictors of reading. . . . Finally, the studies by Potter (1949) and Barrett (1965) give some support to the notion that visual discrimination of geometric designs have possibilities as indices of readiness for reading. Certainly, the tasks considered in these studies or tasks similar to them warrant further investigations.¹⁶

One of the studies pertaining to discrimination of geometric designs to which Barrett refers was done by Keogh. The Bender Gestalt test, used as a predictive instrument, resulted in a correlation of .50 with first grade reading achievement. In this instance the test was administered by

¹⁴Ibid., p. 59.

¹⁵Ibid., p. 64.

¹⁶Ibid., pp. 71-73.

having the children copy the designs as they were presented one at a time. She concluded that this test could be used as a screening device for first grade.¹⁷

Koppitz, also using the Bender Gestalt with beginning first graders, showed a correlation of .60 with reading test scores given at the end of the first grade.¹⁸

A study done by Goins using 14 tests of visual perception compared with reading test scores showed significant correlation. In addition, the test involving pattern copying showed the highest correlation with reading success.¹⁹

Research involving 121 children at third grade level studied the relationship between the Frostig Developmental Test of Visual Perception and reading achievement. It was concluded that "the results of the testing on this population do not support Frostig's postulates concerning the relationship between her tests and specific reading difficulties."²⁰

Investigations sponsored by the Winter Haven, Florida Lions Club have studied various aspects of non-verbal visual perception skills.

¹⁷Ibid., pp. 61-62

¹⁸Elizabeth M. Koppitz, Verdena Mardis, and Thomas Stephens, "A Note on Screening School Beginners with the Bender Gestalt," Journal of Educational Psychology, LII (April, 1961), pp. 80-81.

¹⁹Jean Turner Goins, Visual Perceptual Abilities and Early Reading Progress. Supplementary Educational Monographs, No. 87 (Chicago: University of Chicago Press, 1958), pp. 86-87.

²⁰Arthur V. Olson, "School Achievement, Reading Ability and Specific Visual Perception Skills in the Third Grade," The Reading Teacher, XIX (April, 1966), p. 492.

A perceptual training program was begun in Winter Haven in 1953. The Gesell Institute's Perceptual Achievement Forms were used to test the entire student population in first, second and third grades and a comparison was made between copying ability and success in reading. Using the records of the 1,510 children involved, Lowder reported that a "significant relationship between perceptual ability and school achievement was found."²¹

A follow-up study by Kagerer was done to compare the visual perceptual performance of the group in the early grades with reading achievement in grade four. The following results were noted:

1. There is a relationship between copying performance in the second and third grade and reading achievement in the fourth grade.
2. This relationship does not appear to be related to two of the standard measures of intelligence.
3. Copying ability in the first grade does not predict the reading ability in the fourth grade.
4. There is no significant variance between first and second and between second and third grade performance on the copying task as it was measured by this study.
5. The copying tests should not be used to classify children, but rather to identify those children who have difficulty with the task, and therefore, may be exhibiting difficulty with visual perceptual development.
6. The possibility of rendering aid to children who demonstrate perceptual difficulty should be investigated.²²

²¹Robert Glenn Lowder, "Perceptual Ability and School Achievement, An Exploratory Study," (Unpublished Doctoral Dissertation, Purdue University, LaFayette, 1956), p. 22.

²²Rudolph L. Kagerer, "The Relationship of Visual Perception Performance in Early Grades to Reading Level in Grade Four," Purdue Research Foundation (Study made for Winter Haven Lions Research Foundation, Inc.) 1960 quoted by George D. Spache, "History, Future Developments, Related Research, Educational Implications," Procedure Manual Education Edition, (Winter Haven, Florida: Winter Haven Lions Publications Committee, 1963), pp. 2-3.

Taking into consideration the developmental stages of visual perception has been of value in standardizing test forms. Beery, in the construction of a test of geometric form reproduction has evolved a series of 24 forms to be used as a predictive instrument. The Developmental Form Sequence, as it is titled, focuses "upon the pre-school age range with a view to early identification and remediation."²³

Ilg and Ames, in an extensive study, used a large variety of testing measures, including visual perceptual tasks, in order to determine school readiness on the basis of developmental level rather than on the presently accepted basis of chronological age. From the results of this normative survey, information was derived and charted to be used as guidelines in evaluating a child's level of development at any age from 4½ to 10 years of age.²⁴

It would seem that the study done by Ilg and Ames could be of great value, not only in evaluating present status of development in a child, but also in determining the kind of perceptual training needed before reading is begun.

Ashlock, in a study of 190 children with no learning handicaps in grades 1 through 3, found that no specific type of visual perceptual test was more highly related to reading success than another. He noted that

. . . The proposed hierarchy of difficulty of perceptual tasks was not found to be present at any grade level. The

²³Keith E. Beery, "Geometric Form Reproduction: Developmental Studies of Visual-Motor Integrity," (July, 1964), (Duplicated), p. 24.

²⁴Frances L. Ilg and Louise Bates Ames, School Readiness (New York: Harper & Bros., 1965).

results of this investigation indicate that the hierarchy of difficulty in visual perceptual tasks may differ depending upon whether the subjects are boys or girls. Also, the structure of the hierarchy may differ depending upon what grade level is being studied.²⁵

A study done by Hagin, Silver and Hirsch might be compared to that of Ashlock in that the second study involved a group of 40 boys, eight to eleven years of age, considered to have specific reading disability. The group received individual teaching in specific perceptual areas progressing from the simple to the most complex according to perceptual maturation sequences. From this study it was concluded:

- 1) that perception is modifiable by training, and
- 2) that improved perception is reflected in increased reading achievement.²⁶

The work done by Kephart and his associates has also involved assessment of perceptual skill and follow-up training. Results of research, using tests of visual skills and motor coordination, have demonstrated that these evaluative devices can be used to measure school readiness. In addition, results "demonstrate rather strikingly a substantial relationship between visual skills and school achievement at the kindergarten level."²⁷

²⁵Patrick Ashlock, "The Visual Perception of Children in the Primary Grades and Its Relation to Reading Performance," Reading and Inquiry, ed. J. Allen Figurel, International Reading Association Conference Proceedings, X (Newark, Delaware, 1965), p. 332.

²⁶Rosa A. Hagin, Archie A. Silver, and Marilyn F. Hersh, "Specific Reading Disability: Teaching by Stimulation of Deficit Perceptual Areas," Reading and Inquiry, ed. J. Allen Figurel, International Reading Association Conference Proceedings, X (Newark, Delaware, 1965), pp. 368-370.

²⁷Radler, op. cit., pp. 14, 15.

The research done has indicated that not only can a potential failure be identified through his performance on tests of visual-motor skills but also the child who lacks adequate visual-motor skills can be taught these skills successfully.²⁸

²⁸Ibid., Chapter I.

CHAPTER III

THE PROCEDURE

This study of primary level children was made in order to compare the performance of superior and retarded readers on tests of perceptual-motor skills. A total of 38 children, 10 girls and 28 boys, was selected for the study. Nineteen pairs of superior and retarded readers were matched according to sex, chronological age, IQ, and similar socio-economic background.

Following the selection of matched pairs, two subtests of the Roach-Kephart Perceptual-Motor Survey were administered to the participants. The tests were then scored and these data were then treated statistically. The mean, standard deviation, standard error of the mean, standard error of the differences between means, the t-ratio and coefficient of correlation were computed for the results of the total of both subtests and for each of the subtests individually. In addition, the results of the boys' scores and girls' scores on the tests were analyzed separately.

The Keystone Visual Survey Test was administered to each child participating in the study in order to study the relationship of any unusual visual difficulties to low scores on the perceptual-motor tests.

Administration of Tests

Initially, in order to locate superior and retarded readers, The California Reading Test, Lower Primary, Form W, 1963 Norms, was administered to approximately 133 second grade children enrolled in the Reading Clinic and the Cedarburg and Grafton schools. This test was administered by the three cooperating research workers and the staff of The Cardinal Stritch College Reading Clinic. The test contains subscores in vocabulary and comprehension, in addition to a total score.²⁹ For the purpose of selection of subjects only the total score was used. Superior readers were considered to be those children achieving 6 months or more above their grade placement and retarded readers those achieving 6 months or more below their grade placement. The Stanford-Binet Intelligence Test, Form L-M was then administered to 80 children by the three research workers.³⁰ Information pertaining to the socio-economic background of the children was obtained from study of school records.

Pairs were then formed, matching a superior reader with a retarded reader of the same sex, approximately same mental age, same chronological age, and similar socio-economic background. A maximum variation of 4 months, above or below was allowed for pairing purposes in mental age according to the Binet Scale and also in chronological age.

²⁹Ernest W. Tiegs and Willis W. Clark, California Reading Test, Lower Primary, Form W, 1963 Norms (Monterey, California: California Test Bureau, 1963).

³⁰Stanford-Binet Intelligence Scale, Form L-M (Boston: Houghton Mifflin Co., 1960).

In order to enable the research workers to describe or refer to a specific pair, each matched pair was then assigned a number ranging from 1-19, according to IQ level, from high to low. The list of pairs with accompanying scores may be found in the appendix.³⁰

Equating the Groups

Statistical procedures were applied to verify the data. The mean, standard deviation, standard error of the mean, and standard error of the differences of the means were computed for chronological age, mental age, and IQ. The t-test was used to ascertain significance of difference. In Table 1 are shown the results of the processes involved.

The data in Table 1 show that while the mean chronological ages differ by .43 months in favor of the superior readers and the mean mental ages differ by .48 months, also in favor of the superior readers, the t-ratios obtained indicated that the two groups do not differ significantly and are equated as to chronological age and mental age.

A slight difference of .16 points in mean IQ favoring the retarded readers was noted. Standard deviation of the superior readers was 11.22 indicating a lesser degree of variability when compared to the retarded readers with a standard deviation of 12.10. Nevertheless, the test of significance indicates that these are only chance differences. Therefore, the two groups were comparable in IQ.

³⁰Appendix, pp. 39-40.

TABLE 1

MEAN CHRONOLOGICAL AGES, MENTAL AGES, AND
INTELLIGENCE QUOTIENTS OF EQUATED GROUPS

Basis for Comparison	Mean		S.D.		S.E.M		Diff.	r	S.E.D	t-ratio	Confidence Level
	Superior Readers	Retarded Readers	Superior Readers	Retarded Readers	Superior Readers	Retarded Readers					
C.A. (In months)	95.53	95.10	4.37	3.73	1.03	.88	.43*	.84	.53	.81	Insig.
M.A. (In months)	110.32	109.84	9.42	9.93	2.32	2.34	.48*	.97	.49	.98	Insig.
I.Q.	114.05	114.21	11.22	12.10	2.65	3.85	.16**	.92	1.72	.09	Insig.

*Difference favors superior readers.

**Difference favors retarded readers.

Perceptual-Motor Testing

The tests used in this study were two subtests of the Roach-Kephart Perceptual-Motor Survey, developmental drawing and rhythmic writing.

Developmental drawing consists in the reproduction by the child of seven basic visual achievement forms. Included are the circle, cross, square, triangle, divided rectangle, and vertical and horizontal diamonds. The test forms used were those found in the Teacher's Test Manual.³² Examples of the forms may be found in the appendix.³³

The test of rhythmic writing consists in the reproduction by the child of 8 forms similar to written letters and of actual written letters.³⁴ These test forms were drawn by the examiner.

Both tests were administered individually to the children at their schools and at the Reading Clinic. The procedure used in both tests was similar. The child was given a piece of white paper, 8½" by 11", and a pencil with an eraser. The forms were then presented one at a time and the child was told to "make one like this". At no time was any suggestion made by the administrator as to placement of the figures on the paper nor how to form the shape.

³²Winter Haven Lions Publication Committee, Teacher's Test Manual: Perceptual Copy Forms and Incomplete Copy Forms (Winter Haven, Florida, 1965).

³³Appendix, p. 47.

³⁴Appendix, p. 48.

Following the administration of the subtests, developmental drawing and rhythmic writing, each child's performance was scored according to the criteria for each test.

Developmental drawing was scored according to form and organization, the highest possible total score being 8. Evaluation of form was based on the adequacy of the shape of the drawing while organization involved the placement of the forms on the paper in an organized manner.

The scoring criteria for rhythmic writing were based on rhythm, reproduction, and orientation, the highest total score being 12. Rhythm was scored by noting the child's performance while making the forms and was based on the smoothness and consistency of writing that he demonstrated. Scoring of reproduction involved the size and constancy of shape and reversals or omissions of parts of the figures. Scoring orientation related to the ability of the child in reproducing the forms on an approximate horizontal line and the direction of slanting if it occurred. The highest possible total score for both tests was 20 points.

Vision Screening

The Keystone Visual Survey Test was used to screen the vision of each child participating in the study. Results of the test were then surveyed in order to note any unusual visual problems which might contribute to low scores on the perceptual-motor tests.

Treatment of Data

Following the administration of the subtests--developmental drawing, and rhythmic writing, of the Roach-Kephart Perceptual-Motor Survey--the t-test was used to determine the significance of differences between means of superior and retarded readers on developmental drawing, rhythmic writing, and the total scores of both developmental drawing and rhythmic writing. The scores of the boys and girls on each test and their totals were also analyzed statistically. In order to show differences between individuals, graphs of individual pairs were made.

CHAPTER IV

PRESENTATION AND INTERPRETATION OF RESULTS

This research was done in order to study the relationship between reading achievement and perceptual-motor skills at the primary grade level. A total of 38 superior and retarded readers participated in the study. These children were paired according to reading ability, sex, chronological age, IQ, and socio-economic background. Two subtests of the Roach-Kephart Perceptual-Motor Survey were administered to the participants. The Keystone Visual Survey Test was used to screen the vision of the children.

Analysis of Data on Total of Both Subtests

Table 2 contains the means of the retarded and superior readers on the total of both subtests and on the individual subtests, developmental drawing and rhythmic writing. A difference of 2.00 between the means of the two groups in favor of the superior readers was found in the total of the tests. The standard deviation of 3.39 indicated a greater degree of variability for the retarded readers. The difference was found to be significant at the .05 level of confidence as indicated by the t-ratio of 2.53. This result shows the superior readers to be significantly superior to

TABLE 2

COMPARISON OF THE DEVELOPMENTAL DRAWING AND RHYTHMIC WRITING
SCORES OF SUPERIOR AND RETARDED READERS

Tests	Mean		S.D.		S.E.M		Diff.	r	S.E.D	t-ratio	Confidence Level
	Superior Readers	Retarded Readers	Superior Readers	Retarded Readers	Superior Readers	Retarded Readers					
Developmental Drawing	5.37	5.37	4.50	5.72	1.06	1.35	-----	.005	1.71	-----	Insig.
Rhythmic Writing	8.21	6.26	1.96	2.05	.46	.48	1.95*	.34	.54	3.61	.01
Total of both Tests	13.63	11.63	2.41	3.39	.57	.80	2.00*	.37	.79	2.53	.05

*Difference favors superior readers.

the retarded readers on these perceptual-motor tests in general.

No difference between the means of the superior and retarded readers was found, however, on the test of developmental drawing. Since perception is so closely related to beginning reading with its stress on word recognition, a significant difference might have been expected. However, at the second grade level, the figure perception and reproduction is probably too elementary. A higher level of perception is required.

A difference between means for superior and retarded readers of 1.95 on the rhythmic writing test was found to be significant at the .01 level of confidence. Evidently, it is this section of the perceptual-motor test that discriminates between superior and retarded readers.

Analysis of Data for Girls' Scores

Additional tabulation of results was done in order to evaluate the differences between scores of boys and girls. Results of girls' scores are recorded in Table 3. The results of girls' scores on the total of both tests indicate that the difference between means favors the superior readers, and is significant at the .05 level of confidence. In each instance, the data given indicate a greater variability in scores of superior girl readers. Of the two tests, rhythmic writing again shows the greater degree of variability, with a standard deviation of 2.87 for superior girl readers compared with 1.72 for retarded girl readers. The difference of 2 points

TABLE 3

COMPARISON OF THE DEVELOPMENTAL DRAWING AND
RHYTHMIC WRITING SCORES OF GIRLS (N=5)

Tests	Mean		S.D.		S.E.M		Diff.	r	S.E.D	t-ratio	Confidence Level
	Superior Readers	Retarded Readers	Superior Readers	Retarded Readers	Superior Readers	Retarded Readers					
Developmental Drawing	5.20	5.80	1.60	1.17	.80	.58	.60**	.88	.40	1.50	Insig.
Rhythmic Writing	9.40	6.80	2.87	1.72	1.43	.86	2.60*	.50	1.25	2.08	.10
Total of both Tests	14.60	12.60	1.96	.80	.98	.40	2.00*	.54	.84	2.39	.05

*Difference favors superior readers.

**Difference favors retarded readers.

between the superior and retarded readers is significant at the .05 level of confidence.

It is of interest to note that while there is a small difference between means in developmental drawing, this difference favors the retarded readers. A high correlation of .88 between superior and retarded girl readers is observed in this test.

The results of the rhythmic writing test indicate a difference between means of 2.60 favoring the superior girl readers, significant at the .10 level of confidence only. Since the number of girls included in this study was small, this level of confidence would not appear to be adequate.

Analysis of Data for Boys' Scores

The results of boys' scores, presented in Table 4, again indicate a difference of 2.00 between means on the total of both subtests in favor of superior readers. The standard deviation of 3.86 denotes a greater degree of variability for the retarded readers. The t-ratio of 1.771 showed superiority of the superior boy readers to be significant at the .10 level of confidence.

The comparative results of the superior and retarded boy readers on the test of developmental drawing show a small difference between means of .22, favoring the superior readers. A greater degree of variability is noted in the results of the retarded readers. The t-ratio indicates that the small mean difference is insignificant and can be attributed merely to chance.

TABLE 4

COMPARISON OF THE DEVELOPMENTAL DRAWING AND
RHYTHMIC WRITING SCORES OF BOYS (N=13)

Tests	Mean		S.D.		S.E.M		Diff.	r	S.E.D	t-ratio	Confidence Level
	Superior Readers	Retarded Readers	Superior Readers	Retarded Readers	Superior Readers	Retarded Readers					
Developmental Drawing	5.43	5.21	1.35	1.97	.37	.55	.22*	.48	.49	.45	Insig.
Rhythmic Writing	7.86	6.07	1.43	2.12	.40	.59	1.79*	.15	.66	2.66	.02
Total of both Tests	13.29	11.29	2.46	3.86	.68	1.07	2.00*	.35	1.13	1.77	.10

*Difference favors superior readers.

On the test of rhythmic writing a greater degree of variability is noted in the results of retarded boy readers once again. The mean difference of 1.79, in favor of superior boy readers was found to be significant at the .02 level of confidence. From this it can be concluded that the performance of superior boy readers is significantly higher than that of retarded boy readers on this test of perceptual-motor skill.

Summary of Comparative Study of Groups

Statistical analysis of the scores on the total of the two subtests indicates significant differences between superior and retarded readers. Differences between the total group scores were found to be significant at the .05 level of confidence favoring superior readers. While the total girls' scores showed differences favoring the superior readers which were significant at the .05 level, the differences between superior and retarded boys' scores were significant at only the .10 level.

Analysis of the developmental drawing test showed differences between means in all instances to be insignificant. Results of both girls' and boys' mean scores in developmental drawing showed small differences. In the girls' mean scores the difference was in favor of the retarded readers. On this test the differences between means of boys and girls are attributed to chance.

The rhythmic writing test was found to be the most discriminating test, in that the differences between

superior and retarded readers were statistically significant in each comparison. In studying the total score for both groups of readers, the mean difference in rhythmic writing was found to be significant at the .01 level of confidence. The difference between girls' mean scores was found to be significant at only the .10 level. The results of statistical analysis of boys' scores on the test of rhythmic writing showed a mean difference of 1.79 to be significant. The level of confidence obtained was .02.

Survey of Vision Screening

In order to note if visual problems might be extenuating, results of the Keystone Visual Survey Tests were surveyed by the research worker. It was found that all of the superior readers scored within the expected range. All of the retarded readers, with the exception of three children, also demonstrated satisfactory visual performance on this test.

The three retarded readers who evidenced unsatisfactory performance on the vision screening tests included one girl and two boys. The girl, pair 11, encountered difficulty in tests of fusion--near and far point; usable vision, right eye--near and far point; and stereopsis--far point. She wears glasses and has been under the care of an ophthalmologist since the age of 4 years. Her score, 5, on the developmental drawing test was slightly below the mean of retarded readers of the total group and also that of girls' scores. On the test of rhythmic writing her score of 7 was slightly

above the mean in both instances.

One of the boys, pair 9, scored in the unsatisfactory range of the Keystone Visual Survey Tests in lateral posture--far and near point and fusion--far and near point. While he had some difficulty in the tests of usable vision, left eye--far point and also far point stereopsis, his performance could be considered minimally adequate on these tests. His score of 7 on the tests of developmental drawing and rhythmic writing ranked above the mean of retarded readers on both tests. In fact, his score on developmental drawing was one of the highest of those obtained by either superior or retarded readers.

The other boy, pair 12, scored within the unsatisfactory range in tests of near and far point lateral posture and near and far point fusion. His scores on both of the perceptual-motor tests were low. On the test of developmental drawing his score was 2 and on rhythmic writing he scored 3. In both instances, his score was equal to that of two other children, all of whom achieved the lowest scores in the entire group.

Individual Scores of the Pairs

The individual scores of the superior and retarded readers on both subtests are presented in Figure 1. Most of the scores of both groups are located within a range of 11 and 14. Four of the pairs (numbers 1, 8, 9, and 19) obtained the same total scores. There are three particularly low scores evident, involving retarded readers in each case.

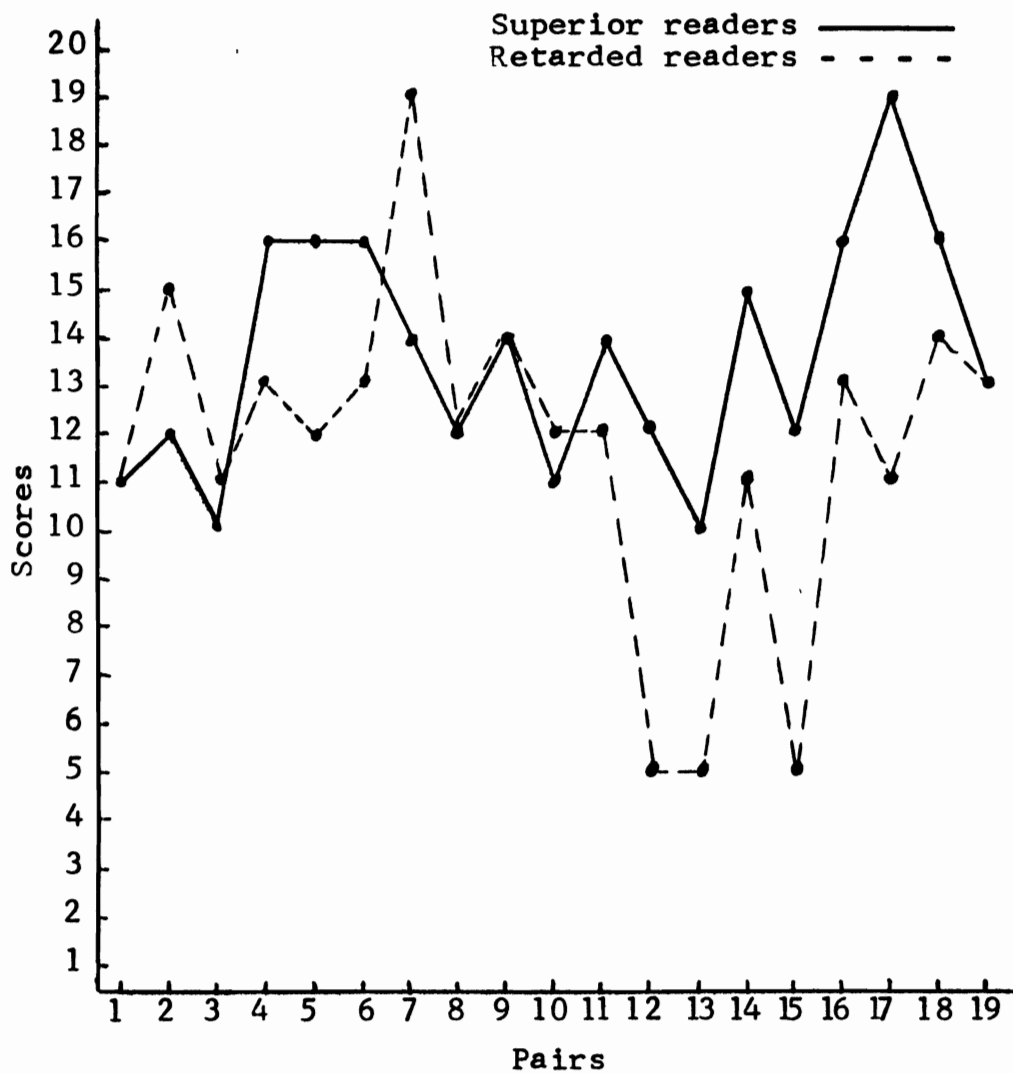


Fig. 1--Individual scores of the pairs on tests of developmental drawing and rhythmic writing.

The extremely high total score of 19 was achieved by both a retarded reader and also by a superior reader.

Figure 2 shows the scores of each child in the developmental drawing test. On this test, it is of interest to note that in most cases retarded readers obtained scores equal to or higher than those of superior readers paired with them. The highest score was obtained by a retarded reader (Pair 7). Again the three low scores were those of retarded readers.

Individual scores on the test of rhythmic writing, presented in Figure 3, indicate a greater degree of variation. This may be caused partially by the greater number of points available in scoring. Nevertheless, more high scores are evident and have been obtained most often by superior readers. The three low scores appear again in relatively the same position as the developmental drawing test and achieved by the same three retarded readers.

Since the pairs were assigned numbers from 1-19 according to the range of IQ from high to low, it is of interest to note that the high and low scores do not appear to coincide with IQ scores. Though the three lowest scores on both tests and the total of both tests occur toward the lower range of IQ's, the highest scores occur at both high and lower levels of IQ range.

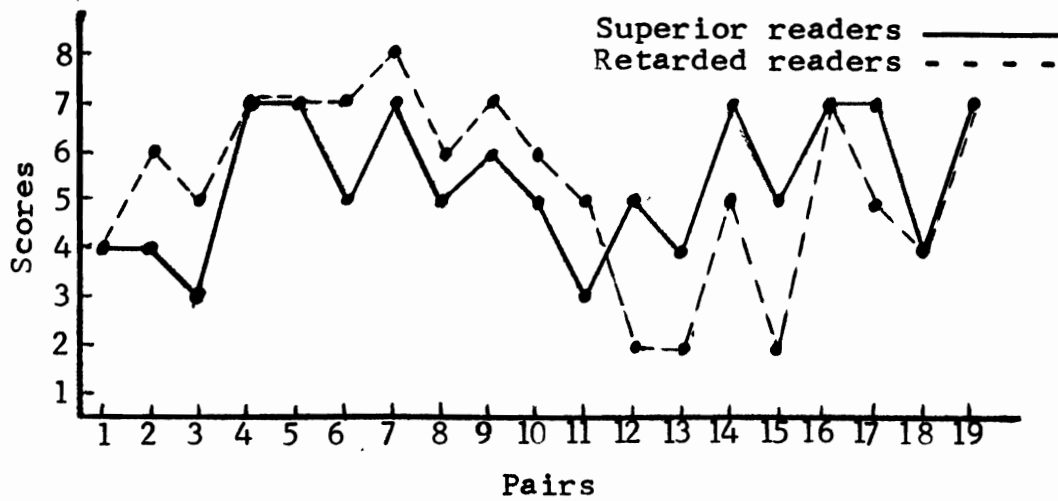


Fig. 2--Individual scores of the pairs on a test of developmental drawing.

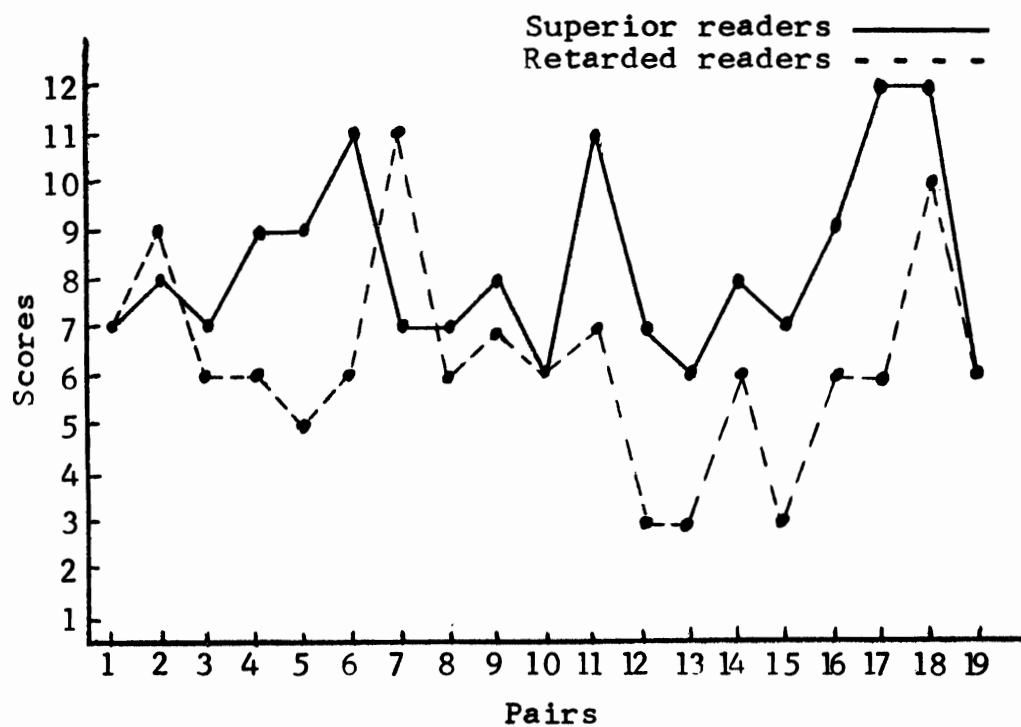


Fig. 3--Individual scores of the pairs on a test of rhythmic writing.

CHAPTER V

SUMMARY AND CONCLUSIONS

Summary

This research study was undertaken in order to compare the performance of superior and retarded readers at the primary level on perceptual-motor tests. It was felt that results of the research could possibly suggest a means of identifying potential retarded readers so that preventive instruction could be given.

There were 38 children selected to participate in the study. These children were paired and matched according to sex, chronological age, IQ, and similar socio-economic background. Each pair, however, consisted of a superior and a retarded reader, reading achievement being the variables. The California Reading Test, Lower Primary, Form W, 1963 Norms was administered in order to locate superior and retarded readers. The Stanford-Binet Intelligence Test, Form L-M was then administered to each of the children. Pairs were then formed according to the criteria.

Appropriate statistical procedures were applied in order to verify that no significant differences existed between the groups of superior and retarded readers.

A visual screening test, the Keystone Visual Survey Test, was administered to each participant in order to note the relevance of possible vision problems to very low scores on the perceptual-motor tests.

Two subtests of the Roach-Kephart Perceptual-Motor Survey, developmental drawing and rhythmic writing, were then administered to each child individually. Following the administration and scoring of these tests, statistical procedures were applied to the data to determine if the difference between the means of the superior and retarded readers on these tests were significant. Differences between groups were computed for the total scores of both subtests and also for each subtest separately. In addition, statistical procedures were applied to the results of the boys' and girls' scores separately. Graphs were made in order to study the individual scores of the pairs on the total of both tests and also on each individual subtest.

Findings

Analysis of the data obtained indicates the following findings:

1. The total scores of the tests used were found to be of significant value in evaluation of perceptual-motor abilities of superior and retarded readers.
2. The least significance was found in the total score of boys. The small number of subjects could be a limiting factor in this finding.

3. The test of rhythmic writing showed a greater significant difference between means of superior and retarded boy readers than that of girls.
4. Developmental drawing was of no discriminative value for either boys, girls, or the total group.
5. Survey of children's scores indicate that IQ level does not appear to contribute to the variation of high or low achievement on these perceptual-motor tests.

Conclusions and Implications

Study of the results of this research suggest the following:

1. Research in the past 35 years has emphasized the importance of reading readiness skills and the fact that readiness is composed of a variety of abilities. It would seem that assessment of perceptual-motor ability could be of value in assisting in the evaluation of reading readiness skills. As evidenced by the findings in this study, the test of rhythmic writing would be one which could be included in such evaluation.
2. Further consideration for the feasibility of instructional activities for developing perceptual-motor skills involved in rhythmic writing is of value.
3. It would seem that the less refined perceptual-motor skills involved in reproducing the figures

are fairly well developed at this time and, while they are a step in the developmental phase, they are not closely allied to the refined nature of perception of word form.

Suggestions for Further Research

1. Further study of the differences in perceptual-motor maturity of boys and girls. This might involve a longitudinal study of the predictive value of developmental drawing and rhythmic writing at the early kindergarten level, grade one, and grade two levels. Through the use of the t-test, it could be determined if there were any variations in the significance of the differences between superior and retarded readers at the different levels. Regression equations could be used with data for each level to determine the change in predictive value at the three different maturation levels.
2. Preparation of developmental exercises to develop perceptual-motor skills followed by experimental study to determine the value of the exercises in relation to reading achievement.

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APPENDIX

MATCHED PAIRS

Pair	Sex	C.A.	M.A.	IQ	California Reading Test Scores		
					Vocabulary	Comprehension	Total
1	Boy	7-7	11-1	147	3.3	3.3	3.4
		7-6	11-3	151	2.1	.8	1.8
2	Boy	8-2	10-0	121	3.0	4.0	3.3
		7-11	10-4	129	2.3	1.9	2.2
3	Boy	7-7	9-8	127	3.1	2.8	3.2
		7-9	9-5	120	1.6	1.2	1.5
4	Boy	7-11	9-9	122	2.9	4.0	3.2
		7-10	9-9	123	1.8	1.7	1.8
5	Girl	7-5	8-11	120	3.0	4.0	3.3
		7-8	9-3	120	1.8	1.2	1.7
6	Boy	8-0	9-10	121	3.1	3.3	3.3
		8-4	9-6	112	1.7	1.2	1.6
7	Boy	8-5	10-0	117	3.1	3.3	3.3
		8-3	9-11	118	1.5	1.5	1.5
8	Boy	7-9	9-1	116	4.0	2.8	3.7
		7-7	8-11	117	1.8	1.4	1.7
9	Boy	8-5	10-0	117	3.0	4.0	3.3
		8-4	9-8	114	1.2	1.2	1.2
10	Girl	7-9	9-1	116	3.3	4.0	3.6
		7-6	8-9	116	1.6	2.1	1.7
11	Girl	8-2	9-4	112	3.6	4.0	3.6
		8-0	9-5	116	1.6	1.5	1.6
12	Boy	7-6	8-4	106	3.3	4.0	3.6
		7-4	8-5	114	1.7	1.4	1.7
13	Boy	8-5	9-1	106	3.1	4.0	3.4
		8-3	9-3	110	2.0	1.5	1.9

MATCHED PAIRS

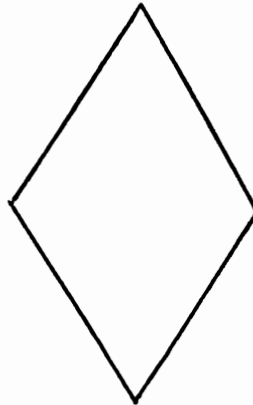
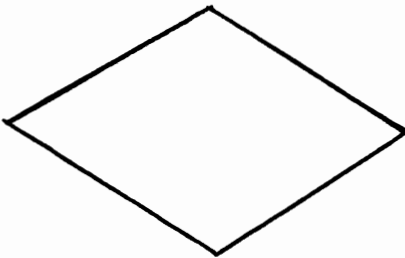
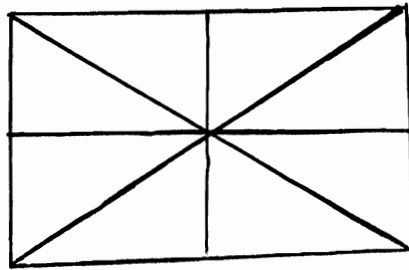
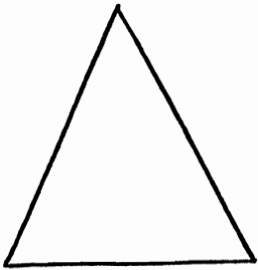
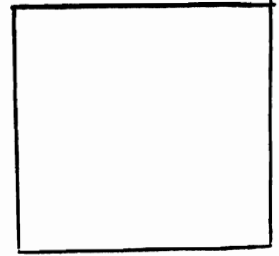
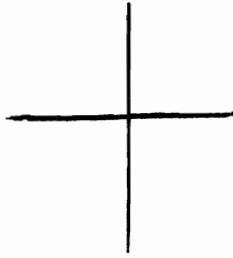
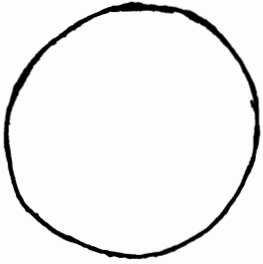
Pair	Sex	C.A.	M.A.	IQ	California Reading Test Scores		
					Vocabulary	Comprehension	Total
14	Boy	8-6	9-2	106	3.6	4.0	3.8
		8-3	9-2	109	1.6	1.6	1.6
15	Boy	7-6	8-1	107	3.3	2.5	3.2
		7-9	7-10	100	1.3	1.2	1.3
16	Girl	7-7	8-2	106	4.0	2.8	3.7
		7-11	8-0	99	1.8	1.9	1.9
17	Boy	7-11	8-4	103	3.4	4.0	3.7
		7-11	8-3	102	1.8	1.4	1.7
18	Girl	8-4	8-5	99	3.6	4.0	3.8
		8-2	8-4	100	1.4	1.5	1.4
19	Boy	8-4	8-4	98	2.9	4.0	3.2
		8-4	8-6	100	1.7	.8	1.5

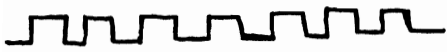
PERCEPTUAL-MOTOR SURVEY RESULTS
OF SUPERIOR READERS

Pair	Developmental Drawing			Rhythmic Writing				Total Score
	Form	Organi- zation	Score	Form	Repro- duction	Orien- tation	Score	
1	1	3	4	2	2	3	7	11
2	1	3	4	3	2	4	8	12
3	1	2	3	2	2	3	7	10
4	3	4	7	2	4	3	9	16
5	4	3	7	3	3	3	9	16
6	1	4	5	4	4	3	11	16
7	3	4	7	2	2	3	7	14
8	1	4	5	2	2	3	7	12
9	2	4	6	3	2	3	8	14
10	3	2	5	2	1	3	6	11
11	1	2	3	4	4	3	11	14
12	1	4	5	2	2	3	7	12
13	1	3	4	2	1	3	6	10
14	4	3	7	4	2	2	8	15
15	1	4	5	1	2	3	6	11
16	3	4	7	4	2	3	9	16
17	3	4	7	4	4	4	12	19
18	1	3	4	4	4	4	12	16
19	3	4	7	1	2	3	6	13

PERCEPTUAL-MOTOR SURVEY RESULTS
OF RETARDED READERS

Pair	Developmental Drawing			Rhythmic Writing				Total Score
	Form	Organi- zation	Score	Form	Repro- duction	Orien- tation	Score	
1	1	3	4	2	2	3	7	11
2	4	2	6	4	2	3	9	15
3	1	4	5	2	1	3	6	11
4	3	4	7	2	1	3	6	13
5	3	4	7	1	1	3	5	12
6	3	4	7	1	2	3	6	13
7	4	4	8	4	4	3	11	19
8	4	2	6	2	1	3	6	12
9	3	4	7	2	2	3	7	14
10	3	3	6	2	1	3	6	12
11	3	2	5	2	2	3	7	12
12	1	1	2	1	1	1	3	5
13	1	1	2	1	1	1	3	5
14	1	4	5	2	1	3	6	11
15	1	1	2	1	1	1	3	5
16	3	4	7	2	1	3	6	13
17	3	2	5	2	1	3	6	11
18	1	3	4	4	3	3	10	14
19	3	4	7	2	1	3	6	13

DEVELOPMENTAL DRAWING FORMS

RHYTHMIC WRITING FORMS

llllllll

lmlmlmlm

mnmnmn

bbbbbbbb

pppppp

pbpbpbpb

CRITERIA FOR SCORING DEVELOPMENTAL DRAWING

Form:

4. Adequate performance throughout.
3. Minor distortions, particularly in diamonds.
2. Any segmenting in any of the drawings.
1. "Dog ears" on diamonds, gross segmenting. Cannot produce recognizable form in one or more drawings.

Organization:

4. Left to right, top to bottom; size adequate.
3. Other organizations if complete. More than four of the forms are organized on the page.
2. Size is markedly too small or too large. Less than five of the drawings are organized on the page.
1. No organization apparent in the drawings.

CRITERIA FOR SCORING RHYTHMIC WRITING

Rhythm:

4. If performance is smooth, certain and consistent. Allow one additional trial.
3. If three or four trials are necessary to achieve the desired rhythmic performance.
2. If extreme difficulty is experienced in any part of the performance.
1. If the child is unable to perform the task.










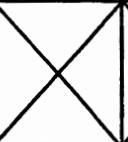
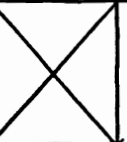
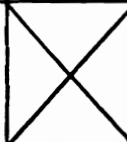
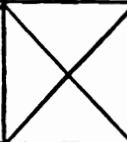

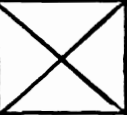

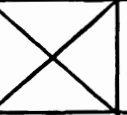
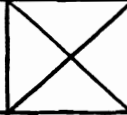
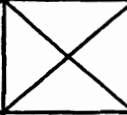
Reproduction:

4. If performance approximates same size and letter constancy of motif presented.
3. If performance shows decided tendency to make motifs larger or smaller than sample motif.
2. If performance reveals reversals and omissions of components in the motifs.
1. If the child is unable to perform task.

Orientation:

4. If performance is adequate in terms of direction, position and follows a straight line course from one side of the body to the other.
3. If performance is slightly slanted as motifs are executed. The slanting can either be up or down.
2. If performance demonstrates that child is incapable of reproducing motifs on an approximate horizontal line.
1. If the child is incapable of performing the task.

VISUAL ACHIEVEMENT FORMS

							
1. Draws the form in one continuous line							
2. Changes the position of the page to alter the problem							
3. There are "ears" on the form							
4. The internal lines of the divided rectangle are drawn so as to bisect the whole figure							
5. They are drawn from the outer edge to the center							
6. The forms are drawn in approximately the same size as the material presented							

7. The forms are oriented on the page in a right to left direction. YES _____ NO _____

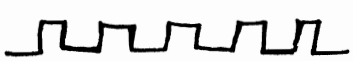




8. The forms are oriented in rows from top to bottom. YES _____ NO _____

RATING SCORE: Circle one 4 3 2 1




Deficiencies: _____

Comments: _____

RHYTHMIC WRITING

Motifs	Consideration for Scoring
	<p>1. Copies as is, performance smooth and unhesitant. Yes___ No___</p>
	<p>2. Execution of sine wave is smooth and unhesitant. Yes___ No___ Size remains constant. Yes___ No___ Slanting: Yes___ No___ Which way___</p>
	<p>3. Letters are copied smoothly and unhesitantly. Yes___ No___ Letters copied look more like "e's". Yes___ No___ Letters become smaller as performance is sustained. Yes___ No___ How many reversals___ None___ Do the letters slant? No___ Yes___ Up___ Down___ Are the letters different in size? Yes___ No___</p>
	<p>4. Letters are copied smoothly and unhesitantly. Yes___ No___ Reversals: Yes___ No___ Which letter___ How many___ Order reversed: Yes___ No___ How many times___ None___ Reproductions poor: Yes___ No___ Do the letters slant? Yes___ No___ Up___ Down___</p>
	<p>5. Letters are copied smoothly and without hesitation. Yes___ No___ Reversals: Yes___ No___ Which letter___ How many___ Order reversed: Yes___ No___ How many times___ None___ Reproductions poor: Yes___ No___ Errors: m___ n___ Do the letters slant? Yes___ No___ Up___ Down___</p>

RHYTHMIC WRITING

Motifs	Consideration for Scoring
	<p>6. Letters are copied smoothly and without hesitation. Yes___ No___</p> <p>Reversals: Yes___ No___ How many___</p> <p>Reproductions poor: Yes___ No___</p> <p>Slanting: Yes___ No___ Up___ Down___</p> <p>Size changes: Yes___ No___</p> <p>Larger___ Smaller___</p>
	<p>7. Letters are copied smoothly and without hesitation. Yes___ No___</p> <p>Reversals: Yes___ No___ How many___</p> <p>Reproductions poor: Yes___ No___</p> <p>Slanting: Yes___ No___ Up___ Down___</p> <p>Size changes: Yes___ No___</p> <p>Larger___ Smaller___</p>
	<p>8. Letters are copied smoothly and without hesitation. Yes___ No___</p> <p>Reversals: Yes___ No___ How many___</p> <p>Which letters_____</p> <p>Reproductions poor: Yes___ No___</p> <p>Slanting: Yes___ No___ Up___ Down___</p>

KEYSTONE VISUAL SURVEY TESTS

School Survey Cumulative
Record Form No. 5A

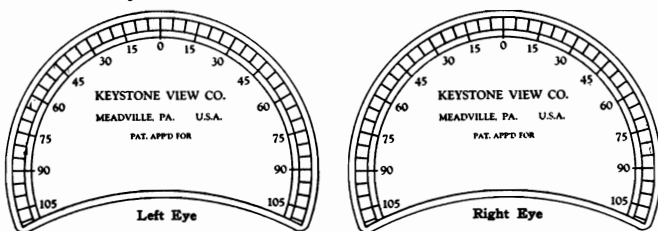
For Use with No. 46 Visual Survey Telebinocular

Name _____ Sex _____
 Date _____ Teacher _____
 Date of Birth _____ C. Age _____ M. Age _____ Grade _____
yr. mo. da. yr. mo. yr. mo.
 School _____ City _____
 Address _____ Phone _____

Referred by _____
 Approved by _____
 Principal or _____
 Wearing Glasses: Yes _____ No _____
 Snellen Standard (if desired)
 With Glasses: Right _____ Left _____
 Without Glasses: Right _____ Left _____

	Left Only	Right Only	UNSATISFACTORY Underconvergence and Low Usable Vision				Hatched Retest Area	EXPECTED Within Heavy Black Lines	Hatched Retest Area	UNSATISFACTORY Overconvergence	
Test 1 (DB-10A) Simultaneous Vision (Far Point)											
Test 2 (DB-8C) Vertical Posture (Far Point)	only 	only 									
Test 3 (DB-9) Lateral Posture (Far Point)	only 	15-14-13 - - 3-2-1 Numbers Only	15	14	13	12	11	10 9 8	7	6 5 4 3 2 1	
Test 4 (DB-4K) Fusion (Far Point)	only 	only 	Four, widely separated 	Four, near each other 						Four, near each other 	Four, widely separated
Test 4 1/2 (DB-1D) Usable Vision, Both Eyes (Far Point)			1 L 49% 2 B 70% 3 T 84% 4 L 88% 5 R 92%			6 T 96%	7 L 98% 8 B 100%	9 B 103%	10 R 105%		
Test 5 (DB-3D) Usable Vision, Right Eye (Far Point)	No Dots Seen Unless Left Eye Is Occluded		1 T 49% 2 R 70% 3 L 84% 4 T 88% 5 B 92%			6 B 96%	7 L 98% 8 R 100%	9 T 103%	10 R 105%		
Test 6 (DB-2D) Usable Vision, Left Eye (Far Point)	No Dots Seen Unless Right Eye Is Occluded		1 B 49% 2 L 70% 3 R 84% 4 R 88% 5 T 92%			6 L 96%	7 B 98% 8 L 100%	9 R 103%	10 T 105%		
Test 7 (DB-6D) Stereopsis (Far Point)	+ only 	only ● 	1 + 2 ○ 3 * 4 ○ 5 □ 6 □ 7 ♥ 8 +			9 *	10 + ♥ ○				
Test 8 (DB-13A) Color Perception (Far Point)	32		79				23		ALL CORRECT		
Test 9 (DB-14A) Color Perception (Far Point)	63		92				56		ALL CORRECT		
Test 10 (DB-9B) Lateral Posture (Near Point)	only 	10-9 - - - 4-3-2 Numbers Only	10	9	8		7	6 5 4	3	2	
Test 11 (DB-5K) Fusion (Near Point)	only 	only 	Four, widely separated 	Four, near each other 						Four, near each other 	Four, widely separated
Test 12 (DB-15) Usable Vision, Both Eyes (Near Point)	1 D 10% 2 L 20%	3 D 30% 4 D 40%	5 L 50% 6 D 50%	7 D 60% 8 L 60%	9 D 70% 10 D 70%	11 G 80% 12 G 80%	13 L 90% 14 L 90%	15 L 100% 16 D 100%	17 L 102% 18 D 102%	19 G 103% 20 D 103%	21 D 105% 22 L 105%
Test 13 (DB-16) Usable Vision, Right Eye (Near Point)	1 D 10% 2 D 20%	3 L 30% 4 D 40%	5 L 50% 6 D 50%	7 D 60% 8 L 60%	9 D 70% 10 D 70%	11 G 80% 12 G 80%	13 L 90% 14 L 90%	15 D 100% 16 D 100%	17 G 102% 18 D 102%	19 L 103% 20 D 103%	21 D 105% 22 L 105%
Test 14 (DB-17) Usable Vision, Left Eye (Near Point)	1 L 10% 2 D 20%	3 D 30% 4 D 40%	5 L 50% 6 D 50%	7 L 60% 8 D 60%	9 D 70% 10 D 70%	11 L 80% 12 L 80%	13 G 90% 14 D 90%	15 L 100% 16 D 100%	17 L 102% 18 D 102%	19 L 103% 20 G 103%	21 D 105% 22 L 105%

Keystone Perimeter Test—75 is Passing.



Complete directions for administration of these tests will be found in the manual provided for this purpose.

For Snellen Equivalents of Tests 4 1/2, 5, 6, 12, 13, and 14 see the Manual, pp. 12 and 14.