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Comparative study of the interrelationship of the Lorge-Thorndike I.Q. scores and reading test scores given to pupils in fourth and sixth grade

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A COMPARATIVE STUDY OF THE INTERRELATIONSHIP OF THE LORGE-THORNDIKE I.Q. SCORES AND READING TEST SCORES GIVEN TO PUPILS IN FOURTH AND SIXTH GRADE

by

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THE PROBLEM

Introduction

In recent years, the use of standardized tests in school programs has become very common. Programs of periodic testing of both achievement and intelligence have been set up on system wide basis in many areas. Such wide scale testing programs were made possible by the innovation of group tests.

The results of these tests serve a valuable function in helping teachers and administrators evaluate pupil growth in various academic areas and serve as guides both in classroom organization and in evaluating curriculum and classroom efficiency. Results of standardized tests are also used as criteria for selection of pupils for special services such as remedial programs and special school clinics.

More recently, however, emphasis has been placed on the effect of culture and reading on the validity of group tests, particularly group intelligence tests. It is the opinion of many reading authorities that reading achievement has a definite effect on the results of group intelligence tests and that current testing programs have been underestimating

the capabilities of retarded readers.[1]

Statement of Problem

The problem of this study is to determine if significant relationships may exist between intelligence scores and reading achievement which may help in designating a valid interpretation of intelligence test scores when used with children with varying degrees of reading ability. This research was made through the comparison of verbal, nonverbal and total intelligence scores with reading at both the fourth and sixth grade level.

Specific objectives of this study were to answer these questions:

1) Is there a significant difference in the relationship between verbal intelligence and reading of superior and retarded readers?

2) Is there a significant difference in the relationship between nonverbal intelligence and reading of superior and retarded readers?

3) Is there a significant difference in the relationship between total intelligence and reading of superior and retarded readers?

4) Is there a significant difference in the relationships between various intelligence scores and reading at the fourth grade and the sixth grade level?

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[1]Leo J. Brueckner and Guy L. Bond, The Diagnosis and Treatment of Learning Difficulties, (New York: Appleton-Century Crofts, Inc., 1955) pp. 31-34

5) Do the relationships suggest possible changes in criteria for the selection of pupils for remedial programs?

Significance

Correlations of verbal and non-verbal intelligence tests scores with reading achievement for the total group of children, the group of superior readers, and the group of retarded readers may aid in determining the answer to the question of validity of intelligence tests for retarded readers. This will give greater insight to the administrator and teacher in evaluation of intelligence quotients of retarded readers.

Scope and Limitations

The seventy-six subjects involved in this study were sixth grade pupils enrolled in a public school in a large midwestern city.

The results of the Iowa Tests of Basic Skills[2] and the Lorge-Thorndike Intelligence Tests[3] were used in this study.

The children selected for the study were the entire enrollment of the sixth grade for which both sixth and fourth grade test results were available.

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[2]E. F. Linquist and A. N. Heironymus, Iowa Tests of Basic Skills, Form 4 (Boston: Houghton Mifflin Company, 1964)

[3]Irving Lorge, Robert L. Thorndike, Elizabeth Hagen, The Lorge-Thorndike Intelligence Tests, Level A-H, Form 1, (Boston: Houghton Mifflin Company, 1964)

General Plan

This study is a correlational study. The steps in the procedure followed in this study are outlined below:

1) Survey of literature related to consistancy of intelligence scores and intelligence as a factor in reading disability.

2) Accumulation of test data from the permanent school records of the pupils.

   a) Intelligence test scores from fourth and sixth grade testings.

   b) Reading test results from fourth and sixth grade testings.

3) Selection of groups from the ranking of reading test scores.

4) Study of data: Use of Pearson Product-Moment Correlation Coefficient.

5) Analysis of results.

CHAPTER II

SURVEY OF RELATED LITERATURE

Introduction to the Problem

Despite the widespread use of standardized tests in today's schools, there is a growing concern over the validity of test results. Of particular concern is the interpretation of scores from tests used with children who lack reading skills or have different cultural backgrounds. Often in recent literature, the effects of reading achievement on the results of group intelligence tests are emphasized. An example is the following statement by Brown and Root.

> The use of group intelligence tests to assess the intelligence level of retarded readers may produce somewhat questionable results. These students may be poorly prepared to approach such a task as required by an intelligence test in that they may have difficulty in following directions, utilizing good independent work habits, etc. In addition, culturally different children may have difficulty in recognizing both verbal and non verbal materials in the test booklet. It is of course unreasonable to expect a group test utilizing verbal material to adequately measure the ability of children who have difficulty reading the test material.[1]

The need for caution in interpreting standardized test scores is more emphatically stated in an article by Arthur McDonald.

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[1]Clair G. Brown, Jr. and Jane H. Root, "Evaluation in the Elementary School: Corrective Reading Instruction," Corrective Reading in the Elementary Classroom, Perspectives in Reading No. 7, ed. Marjorie Johnson and Roy Kress, International Reading Association (Newark, Delaware, 1967) p. 75

> All current intelligence tests penalize the child from impoverished or culturally different background in the sense of showing what he might become if special help were given.[2]

As an alternative to testing, Loretan reports that New York is turning to teacher apprasial as a more accurate measure of evaluating a pupil's learning capability. A set of guidelines have been drawn up for the teacher's use. Loretan feels that intelligence testing does not cover all facets of intelligence but only a very limited variety of verbal and quantitative skills.[3]

Another alternative which has been proposed in an effort to make group test results more accurate measures of intelligence is the comparison of scores from verbal sections of the group tests with scores from non verbal sections of the same tests. The test manual for the Lorge-Thorndike Intelligence test supplies the following word of caution.

> In the case of the retarded reader, one should hesitate to make a diagnosis of low mental ability on the basis of an intelligence test which itself requires reading. The Nonverbal Battery of the Lorge-Thorndike tests is particularly appropriate to use with the retarded reader because it uses pictorial or numerical items only. It enables the teacher to secure an estimate of mental ability not directly dependent upon the ability to read test items.[4]

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[2]Arthur S. McDonald, "Research for the Classroom: Reading Potential: Appraisal or Prediction?" Journal of Reading, Vol. VIII (November, 1964) p. 117

[3]Joseph O Loretan, "The Decline and Fall of Group Intelligence Testing." Teachers College Record, Vol LXVII, (October, 1965) p. 15

[4]Irving Lorge, Robert L. Thorndike, Elizabeth Hagen, The Lorge-Thorndike Intelligence Tests, Level A-H, Manual for Administration, (Boston: Houghton Mifflin Company, 1964) p. 39

However the use of non-verbal tests is not advocated by Bond. In his book, Reading Difficulties: Their Diagnosis and Correction, Bond summarizes his viewpoint.

> Verbal group mental tests are basically reading tests and are not accurate when used with poor readers. Non-verbal group mental tests contain two disadvantages.
> 1) They are not as accurate as would be desirable for individual diagnosis.
> 2) They do not test the type of mental ability needed for success in reading.[5]

In spite of the controversy which surrounds the use of scores from group intelligence tests, often these results are used in initial screening of children for special services or for guidance and vocational counseling. Therefore it is imperative that the tests used produce the most accurate results and be interpreted with caution. This emphasis on more accurate interpretation of test results has spurred a search for specific factors and interrelationships which may be affecting the results of the tests.

Since it is the purpose of this study to determine what significant relationships may exist between the scores of a group intelligence test and a reading test, this chapter will include as background, a survey of literature related to the validity of intelligence tests and to the intellectual factors involved in the reading process. The major areas to be discussed in this chapter will be a) the relationship between reading skills and intelligence and b) the influence of reading on intelligence test scores.

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[5]Guy L. Bond and Miles A. Tinker, Reading Difficulties: Their Diagnosis and Correction, (New York: Appleton-Century Crofts, 1957) p. 75

Relationships Between Intelligence and Reading Skills

According to Bond and Tinker, the reading process is defined as follows;

> Reading involves the recognition of printed or written symbols which serve as stimuli for the recall of meanings built up trough the reader's past experience. New meanings are devised through manipulation of concepts already in his possession. The organization of these meanings is governed by the clearly defined purposes of the reader. In short, the reading process involves both the aquisition of the meanings intended by the writer and the reader's own contributions in the form of interpretations, evaluation and reflection about the meanings.[6]

From these and other statements, it is apparent that the process of reading is considered a complex process which involves many skills which are usually classified as thinking skills. Russell attempts to organize the thinking skills into categories which he feels are very closely related to reading and should be emphasized in the reading curriculum. He feels reading is a creative process which involves perception, analysis of perceptions, inductive and deductive reasoning, concept formation, problem solving, critical and creative thinking.[7]

Several studies which substanciate the close relationship between reading and intelligence have been made. One such study was made by Barbe and Grilk. The study involved the correlation of scores between the Terman-McNemar Intelligence

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[6] Ibid. , p. 19

[7] David H. Russell, "Research on the Processes of Thinking with Some Application to Reading", Elementary English, XXXXII (April, 1965) pp. 370-78

Test and subtests of the Iowa Silent Reading Test. Fifty-two tenth grade youngsters were used in the study. The results showed a significant correlation between various reading skills and intelligence. The total reading score correlated most highly with a coefficient of .72. The subtests which showed the highest correlations with intelligence ranked in this order, word meaning(.69), directed reading (.65), using key words (.65), paragraph meaning (.64) and sentence meaning (.63). Rate of reading showed the lowest correlation (.12).[8]

Another study by Hage and Stroud is concerned with the relationship between reading comprehension and intelligence scores. This study was conducted with eight hundred pupils enrolled in ninth grade. Lorge-Thorndike Intelligence Tests were compared with Pressy Reading Tests and Iowa Tests of Basic Skills. In this study significant relationships were again obtained between reading comprehension and intelligence. However, the reading comprehension correlated more highly with verbal than with nonverbal intelligence test scores. It was concluded that verbal intelligence test scores are affected more by reading than are nonverbal intelligence test scores.[9]

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[8]Walter B Barbe and Werner Grilk, "Correlations Between Reading Factors and IQ", School and Society, (March, 1952) pp. 134-36.

[9]Dean S Hage and James S Stroud, "Reading Proficiency and Intelligence Scores: Verbal and Nonverbal", Journal of Educational Research, Vol. LII (March, 1959) pp. 258-62.

Some interesting relationships are revealed in a study by Gunderson and Feldt. Five hundred twenty-two fourth grade pupils were involved in the study. The children were given the California Test of Mental Maturity. A comparison of language and non-language scores showed these scores to range from twenty-four points in favor of language to a simular discrepancy in favor of non-language. Two groups were formed based on a matching of total IQ scores with one group containing children with superior language scores and the other containing children with superior non-language scores. The groups were compared on standardized test achievement. Teacher observation was also considered. Significant differences were found in reading, vocabulary, work study skills, and arithmetic. In each case the children with superior language scores were high. Greatest differences were found in reading, language and vocabulary skills. The language group tended to prefer verbal activities during free time while non-language group showed preference for physical activities. It was also noted that teachers seemed to be more aware of special talents in the language group.[10]

In a brief summary, it is apparent from the literature reviewed that there is a definite relationship between intelligence and reading skills. It seems also apparent that intelligence tests scores correlate closely with reading test

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[10]R. O. Gunderson and L. S. Feldt, "The Relationship of Differences Between Verbal and Non-verbal Intelligence Scores to Achievement", Journal of Educational Psychology, Vol. LI (1960) pp. 115-121

scores. The verbal intelligence tends to correlate to a higher degree than the nonverbal intelligence with reading achievement. It is sometimes indicated that this relationship between verbal intelligence and reading indicates that reading achievement is affecting the results of verbal intelligence. However, Bond and Tinker feel that there are two possible reasons for this relationship and have made the following statement.

> These findings could indicate either that these children have native limitations in verbal ability as compared with their general intelligence and are therefore poor readers, or that they are limited in developing language because they are poor readers and therefore lack verbal experience.[11]

Influence of Reading on Intelligence Test Scores

> Any individual who has reading retardation, ie. fails to develop a reading proficiency level commensurate with mental level, is handicapped when given an aptitude test requiring reading beyond his reading achievement level.[12]

This statement by Wheeler reflects an observation which is held by most reading authorities. It is obvious that no test can adequately measure the knowledge and skills of a child if that child is unable to read the test items. However, Strang feels that the effect of reading skills on the results of intelligence tests goes beyond the reading of

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[11]Guy L. Bond, op. cit., p. 72

[12]Lester R. Wheeler, "The Relationship of Reading to Intelligence", School and Society, LXX (October, 1949) p. 226

test items. In her book, Diagnostic Teaching of Reading, Strang commented that; "Intelligence tests measure developed ability not innate or potential intelligence."[13] Because of this, she feels that the handicapped readers is at a disadvantage even if he can read test items. She states that, "His store of information which is limited by the small amount of reading he has done works against him."[14]

From the aforegoing survey, it is apparent that there are close and significant relationships between reading skills and general intelligence. It is also apparent that reading achievement may have an influence on intelligence scores if the intelligence scores are determined by verbal, group tests. Questions, however, have been raised in regard to the extent to which reading influences the group tests and also the extent to which reading influences individual intelligence tests. Several studies have been performed in an effort to answer some of these questions.

A study by Plallor compared the intelligence scores of 266 children whose reading performance was below grade level with the intelligence scores of forty-three pupils whose reading achievement was on or above grade level. The Pinter Verbal and Pinter Nonverbal tests were used to obtain intelligence scores. The children were seventh grade members of twelve classes in New York schools. The results of the study

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[13]Ruth Strang, Diagnostic Teaching of Reading,(New York, McGraw-Hill Book Company, 1964) p. 212

[14]Ibid.

showed that for the retarded readers, nonverbal scores were higher than verbal scores. For those reading at grade level, verbal scores tended to be highest. Differences for the groups were significant. The conclusions drawn were;

> Clearly the data strongly supports the basic hypothesis of the study, namely that low intelligence quotients obtained by retarded readers may reflect their reading retardation rather than basic inability to learn.[15]

She concludes the study by saying, When only verbal intelligence tests are used, published data concerning the IQ's of children in schools where severe reading disability is prevalent gives an erroneous picture of the learning capacity of the children."[16]

Somewhat simular results were obtained in a study by Poellman. This study compared the results of several group and individual intelligence tests when used with children whose reading achievement varied. The tests compared were the Otis Self-Administering, Lorge-Thorndike, California Test of Mental Maturity, WISC and Stanford Binet. The children in the study ranged from fourth to eighth grade. The results of this study showed that for the superior readers on all grade levels, the highest mean intelligence scores were obtained on the group verbal tests, the Lorge-Thorndike and California. The lowest mean intelligence scores were

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[15]Emma Plallor, et al., "The Relationship Between Reading Retardation and the Measurement of Intelligence," Personel and Guidance Journal, Vol. XXXVIII, (September, 1959) P. 51

[16]Ibid.

obtained by the nonverbal sections of the above mentioned tests. For average readers in grades four to six, the California non-language gave the highest mean IQ. Average readers in grades seven and eight obtained the lowest mean IQ score on the California non-language. For the total group of average readers, the Lorge-Thorndike verbal and California language gave the highest mean scores. Low readers in the fourth and fifth grades received highest mean IQ scores on nonverbal sections of the group tests while the verbal sections gave the lowest IQ scores. Seventh and eighth graders received highest IQ scores from the verbal sections and lowest IQ scores from the nonverbal sections. It was concluded that the verbal sections of tests most closely related to the performance in reading.[17]

Two studies investigating the relationship between reading and intelligence were conducted by Neville. The first study compared the results of intelligence scores obtained on the Lorge-Thorndike Verbal Battery, Wechsler Intelligence Scale for Children, Verbal Performance and Full Scale, and the Peabody Picture Vocabulary Test for good, average and poor readers. The subjects were 148 fifth grade youngsters. A summary of the findings of the study is as follows;

> 1. Poor readers in this fifth grade sample tended to make scores on group intelligence tests requiring reading which were significantly lower than the scores made on tests requiring little or no reading.

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[17]Sister Mary Michaella Poellman O.S.F., "An Experimental Study of Group Tests of Intelligence Used with Children of Varying Degrees of Reading Efficiency", (unpublished Master's Thesis, Cardinal Stritch College, Milwaukee, Wisconsin, 1959)

> 2. The good fifth grade readers tended to make scores on the group intelligence tests which were as high or higher than their scores on the individual tests.
> 3. Average readers tended to make scores on group intelligence tests which were not different from their scores on individual tests.
> 4. Poor readers tended to make scores on most intelligence measures which were significantly lower than those made by good readers.
> 5. Poor readers obtained IQ scores significantly lower than average readers on some tests (Lorge-Thorndike, WISC Verbal, WISC Full Scale) but not significnatly different on other tests (WISC Performance, Peabody).
> 6. Good readers made on all intelligence measures IQ scores which were significantly superior to poor and average readers.[18]

He concludes the study with this comment;

> In terms of application, the educator can conclude that a youngster in the intermediate grades whose reading level is below grade 4.oo is almost certain to have his intellectual functioning significantly underestimated by verbally oriented group intelligence tests. It then becomes necessary to administer an individual test if this pupil's academic aptitude is to be assessed realistically. The data prestnted here indicates that the Peabody Picture Vocabulary Test can serve as substitute for the administratively more complicated WISC.[19]

A second study by Neville attempts to examine the performances of poor readers on intelligence tests. In this study Neville first discusses the results and findings of twelve studies which examines the characteristics of poor readers as shown by performances on the Wechsler Intelligence Scale for Children. The results of the twelve studies were tabulated, analyzed and application to remedial or preventative programs are made. Analysis of the WISC studies shows much

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[18]Donald Neville, "The Relationship Between Skills and Intelligence Test Scores," The Reading Teacher, XVIII, No.4 (January, 1965) p. 260

[19]Ibid., p. 261

agreement amoung the studies concerning the weaknesses of poor readers and less agreement concerning the strengths. All twelve studies found the poor readers to be weak in the Arithmetic subtest, ten found them to be weak in Coding, nine found them to be weak in Information and five found them to be weak in Digit Span. By comparison, only eight of the studies found the poor readers to be strong in Picture Arrangement, eight found them to be strong in Picture Completion, five found them to be strong in Block Design and five found them to be strong in Comprehension. Several studies reported the analysis of performances of poor readers on the Stanford-Binet. Neville summarized the findings of these studies as follows.

> Poor readers did best on those items which involved visual memory, auditory memory of meaningful material, and some reasoning items requiring little verbal production on the part of the examinee; They did most poorly on those items which involved defining words, auditory memory of non-meaningful material, and completion of sentences read to and/or by the examinee.[20]

A study which investigated the performance of poor readers on the Illinois Test of Psycholinguistic Ability was also included in the analysis. It was found that poor readers scored low on only two of the nine sub-tests (Auditory-Vocal Automatic and Visual-Motor Sequential).

Neville summarizes the characteristics of poor readers on the individual tests as follows;

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[20]Donald Neville, "Learning Characteristics of Poor Readers as Revealed by the Results of Individually Administered Intelligence Tests," Vistas in Reading, ed. J. Allen Figurel, (International Reading Association Conference Proceedings, Vol. II, Part 1; Newark, Delaware, 1967) p. 555

a) They are weak in some, but not all, verbal skills. Some weaknesses are reflected in those tasks most closely related to school learning.
b) They show deficits in auditory and visual memory tasks when these tasks involve material which has no clear meaning.
c) They exhibit weaknesses in ability to organize separate auditory or visual stimuli into meaningful wholes.
d) They have a deficit in visual discrimination and association activities.[21]

In conclusion, Neville suggests the following approaches for use with retarded readers;

a) Structure the task to be learned carefully.
b) Utilize a multi-sensory approach by presenting materials to non-deficit areas first.
c) Plan carefully for the attainment and retention of automatic responses.[22]

Summary

A summary of the survey shows that there is agreement amoung reading authorities regarding the significance of the relationship between reading and intelligence. Reading is conceived of as a thinking process. There is also much agreement amoung reading authorities regarding the relationship between reading test scores and scores on group intelligence tests. There is sufficient evidence that there exists between reading tests scores and the results of group verbal intelligence tests a significant relationship. It is felt by many authorities that this relationship may be due to to the effect of the pupils reading efficiency in the testing

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[21] Ibid., p. 556-57

[22] Ibid., p. 557-58

situation. It is also felt that this relationship may be due to the lack of language background of the poor readers. In general it is felt that group, verbal intelligence tests are not adequate measures of intelligence when used with children who are deficient in reading.

A survey of recent literature has shown increased interest in studies which investigate the performance of good and poor readers on individual intelligence tests. These studies have revealed definite patterns of strengths and weaknesses in the performances of retarded readers which may suggest more effective methods for use with retarded readers. A need for more studies of this type is noted.

CHAPTER III

THE PROCEDURE

Introduction

This study attempts to determine if there is a significant relationship between the various intelligence scores and reading achievement scores.

The steps necessary to complete this study are: 1) the accumulation of the test results; 2) the ranking of the reading test scores and the designation of groups of superior and retarded readers; 3) the correlation of the test results; and 4) the analysis and tabulation of the results of the correlations.

Population

The subjects chosen for this study were pupils enrolled in the sixth grade of a public school in a large Midwestern city. The school is located in an area populated by people of middle class socio-economic status. The occupations of the parents included ministers, teachers, policemen, small business operators, skilled and unskilled laborers, and welfare recipients. The educational background of the parents ranged from completion of eight grade to college graduation. The ethnic background of the parents include a wide variety of nationalities, however, there is a large percent which are of Polish decent. Some are foreign-born and do not speak English.

Testing Program

The testing program of the school system from which the subjects were selected includes group intelligence testing every two years beginning in the Kindergarten and a complete battery of achievement tests every two years beginning with fourth grade.

The test results with which this study is concerned were obtained at the beginning of fourth and sixth grade. The tests were given to the children by the classroom teacher approximately four to six weeks after the beginning of the semester. The tests were then sent to the school administration office where they were scored by computer. The resulting scores and profiles were returned to the school and recorded in the pupil's permanent record.

The test results with which this study is concerned were obtained from the pupil's permanent record by the author.

Selection of Groups

The data used in the selection of the groups is recorded in Table 5[1]. There are seventy-six subjects. The selection of the groups was based on the ranking of the subjects' reading levels. The scores from the reading section of the Iowa Test of Basic Skills was used to determine the reading levels of the subjects. The superior group consisted of twenty pupils whose reading scores fell in the top twenty-seven percent of the total group, while the retarded group consisted of twenty

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[1]See Appendix, p.

pupils whose reading scores fell in the lowest twenty-seven percent of the total group. The total group consisted of all seventy-six pupils, including the superior and retarded groups.

Treatment of Data

The final step in the procedure followed in this study was to determine the relationship of each of the various intelligence scores with reading levels of the subjects. The correlation of the intelligence scores with reading was determined by the Pearson Product-Moment Coefficient. A comparison of the resulting coefficients was made. The findings were analyzed and recorded in tabular form.

CHAPTER IV

ANALYSIS AND INTERPRETATION OF DATA

The purpose of this reaearch is to study the results of correlations between group intelligence test scores and reading achievement on the fourth and sixth grade level. The correlations were performed and the results were analyzed to determine if significant relationships exist.

Analysis of Fourth Grade Correlations

Superior Readers

The results of the fourth grade correlations are included in Table 1. The correlation of the Lorge-Thorndike verbal intelligence score with the results of the reading score from the Iowa Test of Basic Skills resulted in a coefficient of .495, which is significant at the .05 level of confidence. Correlation of the nonverbal section of the intelligence test with reading resulted in a coefficient of -.016, which is statistically insignificant. The results of the correlation involving the total intelligence score and reading showed a coefficient of .534 which is significant at the .05 level of confidence.

Retarded Readers

Results of the correlations for the group of retarded readers are also recorded in Table 1. The results of the correlation of verbal intelligence with reading scores showed

TABLE 1

RELATIONSHIP OF VERBAL, NONVERBAL, AND TOTAL INTELLIGENCE QUOTIENTS WITH READING ACHIEVEMENT OF PUPILS AT FOURTH GRADE LEVEL

Tests	Coefficient of Correlation with Reading Achievement		
	Total Group	Superior Readers	Retarded Readers
Verbal Intelligence	.636 **	.495 *	.306
Nonverbal Intelligence	.389 **	-.016	.365
Total Intelligence	.514 **	.534 *	.371

* Statistically significant at the .05 level
** Statistically significant at the .01 level

a coefficient of .306 which is insignificant. The correlation of nonverbal intelligence with reading resulted in a coefficient of .365 which is statistically insignificant. The correlation of total intelligence with reading resulted in a coefficient of .371 which is again insignificant.

Total Group

All three correlations for the total group resulted in coefficients which were significant at the .01 level of confidence. The correlation of verbal intelligence with reading showed a coefficient of .636. The results of the correlation of nonverbal intelligence with reading showed a coefficient of .389 and the correlation of total intelligence with reading resulted in a coefficient of .514.

A review of fourth grade correlations for the total group shows significant relationship between reading scores and each of the three intelligence scores. This would seem to indicate a close relationship between reading and intelligence as measured by the group tests used in this study.

An examination of the correlations of superior and retarded readers reveals two significant correlations; verbal intelligence with reading achievement of superior readers and total intelligence with reading achievement of superior readers. All other correlations were insignificant. This would seem to indicate that reading achievement may be a factor which influences the results of group intelligence tests, particularly the scores obtained on the verbal sections of the tests.

Analysis of Sixth Grade Correlations

Superior Readers

The results of the sixth grade correlations are included in Table 2. The correlation of verbal intelligence and reading on the sixth grade level resulted in a coefficient of .613. This coefficient is significant at the .01 level of confidence. The results of the correlation of nonverbal intelligence with reading showed a coefficient of .231. The total intelligence and reading resulted in a coefficient of .340. Both the nonverbal coefficient and the total coefficient were insignificant.

TABLE 2

RELATIONSHIP OF VERBAL, NONVERBAL, AND TOTAL INTELLIGENCE QUOTIENTS WITH READING ACHIEVEMENT OF PUPILS AT SIXTH GRADE LEVEL

Tests	Coefficient of Correlation with Reading Achievement		
	Total Group	Superior Readers	Retarded Readers
Verbal Intelligence	.719 **	.613 **	.329
Nonverbal Intelligence	.507 **	.231	-.003
Total Intelligence	.652 **	.340	.102

* Statistically significant at the .05 level
** Statistically significant at the .01 level

Retarded Readers

As with the fourth grade correlations, all of the coefficients resulting from the correlation of scores of retarded readers were insignificant. The verbal intelligence correlated with reading and resulted in a coefficient of .329. This correlation showed the highest coefficient of the three correlations. The nonverbal intelligence and reading correlation resulted in a coefficient of -.003. Total intelligence and reading resulted in a coefficient of .120.

Total Group

Again the results for the total group showed correlation coefficients which were significant at the .01 level of confidence. The results of the correlation of verbal intelligence with reading showed a correlation coefficient

of .719. The correlation of nonverbal intelligence with reading resulted in a coefficient of .507. A coefficient of .653 resulted from the correlation of total intelligence with reading.

A review of the sixth grade correlations for the total group shows significant relationships between reading scores and each of the three intelligence scores as did the fourth grade correlations for this same group. However, the correlations are slightly higher for the sixth grade scores. It would appear that the relationship between reading achievement and intelligence as measured by the group tests in this study, is slightly closer at the sixth grade level than at the fourth grade level.

A study of the correlations of superior and retarded readers reveals only one significant coefficient at the sixth grade level which is the correlation of verbal intelligence with reading of the superior readers. Four of the coefficients for the sixth grade testing are slightly higher than corresponding coefficients for the fourth grade testing. These coefficients were for verbal intelligence and nonverbal intelligence of the superior readers, and verbal intelligence and total intelligence of retarded readers.

Discussion of Mean Scores and Ranges

A study of the chronological ages of the subjects shows comparable age ranges for all three groups. At the fourth grade testing, the chronological ages of the total group ranged from 8-3 to 10-11 with a mean age of 9-7. The superior

readers showed ages ranging from 8-5 to 10-3 with a mean of 9-3. The ages of the retarded readers ranged from 8-3 to 10-6 with a mean age of 9-5. Mean ages, reading levels and intelligence scores are recorded in Table 3.

A study of the results of the Lorge-Thorndike fourth grade testing would indicate a fairly average group of children with the normal ranges expected in a classroom. In reviewing the mean intelligence quotients of the retarded readers it would appear that they are lower ability pupils but this is open to study. If they are actually lower in ability, they might not be retarded readers, but readers below grade level but in line with capacity.

The results of the Lorge-Thorndike fourth grade testing of the superior readers show a range in verbal scores from 125 to 88, in nonverbal scores from 128 to 77 and in total scores from 123 to 93 with mean scores of 108, 112 and 110 respectively. Sixth grade scores for the same group show a range in verbal scores from 127 to 78, in nonverbal scores from 134 to 79 and in total scores from 128 to 79 with mean scores of 102, 112 and 108 respectively.

The ranges of intelligence scores shown on the fourth and sixth grade testings by retarded readers show some interesting patterns. Verbal scores obtained at the fourth grade level ranged from 114 to 70 with a mean of 92, while verbal scores obtained at the sixth grade level ranged from 93 to 62 with a mean score of 80. Nonverbal scores obtained at the fourth grade level ranged from 114 to 71 with a mean of 95, while sixth grade nonverbal scores ranged from 120 to 72

TABLE 3

MEANS AND RANGES OF CHRONOLOGICAL AGE, READING SCORES AND INTELLIGENCE QUOTIENTS FOR FOURTH AND SIXTH GRADE

		Total Group	
		4B	6B
Verbal Intelligence	Mean	97	91
	Range	70-128	62-127
Nonverbal Intelligence	Mean	103	101
	Range	71-128	72-134
Total Intelligence	Mean	100	96
	Range	74-127	74-128
Reading Achievement	Mean	3.8	5.3
	Range	1.6-8.5	3.5-8.5
Chronological Age	Mean	9-7	11-4
	Range	8-3 to 10-11	10-4 to 12-11

With a mean of 94. Total scores obtained at the fourth grade level ranged from 113 to 74 with a mean of 94. Sixth grade total scores showed a range from 107 to 74 with a mean of 87. It is interesting to note that while the ranges and mean scores for the verbal and nonverbal tests were somewhat similar at the fourth grade level, there was a considerable drop in both range and mean of the sixth grade verbal scores which did not hold true for the nonverbal scores. The drop in verbal scores of retarded readers is an indication of the affect of reading achievement on scores obtained on group verbal intelligence

Table 3--Continued

Superior Readers		Retarded Readers	
4B	6B	4B	6B
108	102	92	80
88-125	78-127	70-114	62-93
112	112	95	94
77-128	79-134	71-114	72-120
110	108	94	87
93-123	79-128	74-113	74-107
4.8	6.8	3.3	3.9
3.5-8.5	6.0-9.5	2.4-4.1	3.0-4.4
9-3	11-5	9-5	11-7
8-5 to 10-3	10-4 to 12-4	8-3 to 10-6	11-0 to 12-5

tests.

A study of the sixth grade reading scores shows the scores of the superior readers to range from 9.5 to 6.0. The mean score of 6.8 is less than a year above the actual grade placement of the subjects. It would appear from these scores that the group of superior readers were actually only slightly above average in reading achievement as compared to what is normally expected in a normal classroom. Reading scores of the retarded readers ranged from 4.4 to 3.0. The mean reading score of this group is 3.9, which

is 2.1 years below the actual grade placement of the subjects. It is noted that the mean reading level of the total group is 5.3, which is .7 year below the actual grade placement of the subjects. This would indicate that at the sixth grade level, the average reading level is slightly below what could be expected in the average classroom.

The fourth grade reading scores of the superior readers ranged from 8.3 to 3.5 with a mean score of 4.8. The mean is .8 year above the actual grade placement. The reading scores of the retarded readers ranged from 4.1 to 2.4 with a mean score of 3.3. The mean is .7 year below actual grade placement. Again the mean score (3.8) for the total group is below the actual grade placement of the group, however, the distribution of scores is closer to the average range of scores expected in the normal classroom than is apparent in the range of sixth grade scores. This would suggest that the total group of children tended to be more retarded in the sixth grade than in the fourth grade.

Analysis of the Mean Differences Between Fourth and Sixth Grade Test Results

A comparison of the mean differences between the fourth and sixth grade intelligence tests results is found in table 4. A study of the mean verbal scores at the fourth and sixth grade level show that the difference between mean verbal scores is significant at the .01 level of confidence for the total group and the retarded readers but not for the superior

TABLE 4

COMPARISON OF MEAN DIFFERENCES BETWEEN FOURTH AND SIXTH GRADE TEST RESULTS

Test	Grade	Mean	SD
Verbal Intelligence			
Total Group	4B	97	10.81
	6B	91	13.42
Superior Readers	4B	108	9.02
	6B	102	11.77
Retarded Readers	4B	92	19.93
	6B	80	0.78
Nonverbal Intelligence			
Total Group	4B	103	12.98
	6B	101	14.16
Superior Readers	4B	112	11.24
	6B	112	12.97
Retarded Readers	4B	95	13.47
	6B	94	11.59
Total Intelligence			
Total Group	4B	103	13.89
	6B	96	13.04
Superior Readers	4B	110	0.03
	6B	100	14.02
Retarded Readers	4B	94	10.48
	6B	87	8.16

readers. The difference between nonverbal intelligence scores at the fourth and at the sixth grade level was insignificant for all three groups. The difference between mean total intelligence scores at the fourth and sixth grade level was significant at the .01 level of confidence for the total group,

TABLE 4--Continued

SEM	SED	t-Ratio	Level of Confidence
1.25 1.55	1.99	3.02	.01
2.07 3.70	4.24	1.42	Insig.
4.57 1.56	4.81	3.02	.01
1.50 1.63	2.22	.90	Insig.
2.83 2.98	4.11	.0	Insig.
3.09 2.68	4.08	.25	Insig.
1.26 1.60	2.04	3.43	.01
1.84 3.41	3.86	.52	Insig.
2.43 1.83	3.08	2.27	.05

at the .05 level for the retarded readers and was statistically insignificant for the superior readers.

A review of the differences between means for fourth and sixth grade testings show that the differences for verbal intelligence and total intelligence are significant for both

the retarded readers and the total group, whereas there are no significant differences found for the superior readers. Reading can therefore be considered a factor which influences the results of group, verbal intelligence tests as was found by Poellman, Plallor and Neville in their studies.

In the nonverbal sections, which do not require reading, there was no significant differences between the pupil's fourth and sixth grade mean intelligence scores. Both the retarded readers and the total group maintained similar mean IQ's when reading was not involved in the tests.

CHAPTER V

SUMMARY AND CONCLUSIONS

Summary of Problem

The research was conducted in an effort to determine, through the study of the correlations of group intelligence scores and reading test results obtained at the fourth and sixth grade levels, the validity of intelligence test scores for retarded readers. Knowledge of the relationships between various intelligence scores and reading achievement may help in designating more valid interpretations of the results of group verbal intelligence tests when used with retarded readers.

Summary of Literature

A survey of related literature shows that educators agree that there is a significant relationship between reading and thinking skills. It is also generally accepted that this relationship between reading and thinking skills results in a close relationship between scores on intelligence tests and reading achievement scores especially when the intelligence scores are obtained from group verbal tests. Although it is obvious that the poor readers will be handicapped if the readability of the test items is above his reading level, there is disagreement amoung reading authorities regarding the effect of the poor readers lack of verbal background on items which he can read. Some educators feel

the lack of verbal background causes low performance on the intelligence test while others feel that the intelligence test results indicate a lack of native verbal ability. Knowledge of the specific strengths and weaknesses of the learning capacities of poor readers has been increased through the findings of several studies. Educators are enthusiastic over the implications of these findings. However, there is a great need for further investigations into this area.

Summary of Procedure

The specific objectives of this study were to answer the following questions regarding the test data gathered for this research.

1) Is there a significant difference in the relationship between verbal intelligence and reading of good and poor readers?

2) Is there a significant difference in the relationship between nonverbal intelligence and reading of good and poor readers?

3) Is there a significant difference in the relationship between total intelligence and reading of good and poor readers?

4) Is there a significant difference in the relationship between various intelligence scores and reading at the fourth and sixth grade level?

5) Do the relationships suggest possible changes in criteria for the selection of pupils for remedial programs?

To answer these questions, the results of the fourth and sixth grade standardized reading and intelligence tests were gathered from the permanent school records of seventy-six sixth grade pupils enrolled in a public school in a large midwestern city. Groups of superior and retarded readers were selected on the basis of a ranking of scores on the sixth grade reading achievement test. The intelligence scores of the children obtained at both the fourth and sixth grade level were correlated with the corresponding reading scores and the correlations were analyzed. The significant of difference between mean intelligence and reading scores at fourth and sixth grade level was also determined and the results analyzed.

Findings

Subject to the limitations in size and sampling, the following findings are presented.

1) Regarding the difference in the relationship between verbal intelligence and reading of good and poor readers at fourth and sixth grade level, it was found that the correlations for good readers were significant at the .01 level of confidence at the sixth grade and at the .05 level of confidence at the fourth grade. Correlations for poor readers were insignificant at both the fourth and sixth grade levels. However, it was found that the difference between fourth and sixth grade verbal mean scores was significant at the .01 level of confidence for the poor readers but was statistically insignificant for good readers. A review of the correlations

and mean scores reveals evidence of a significant relationship between reading achievement and the scores obtained on verbal sections of the Lorge-Thorndike. It also suggests that reading achievement is a significant factor which influences the results of scores on the verbal sections of the test.

2) Regarding the difference in the relationship between nonverbal intelligence and reading of good and poor readers at the fourth and sixth grade level, it was found that the correlations for both good and poor readers at both grade levels were statistically insignificant as were the differences between the means for both groups. A review of the correlations show no evidence of a significant relationship between nonverbal intelligence and reading. There is also no significant difference in means. This would suggest that when reading is not involved in the test, reading achievement is not a significant factor and does not influence the results of scores on the nonverbal section of the test.

3) Regarding the difference in the relationship between total intelligence and reading of good and poor readers at fourth and sixth grade level, it was found that the correlations for good readers was significant at the .05 level of confidence at the fourth grade level, but was insignificant at the sixth grade level. Correlations for poor readers were statistically insignificant at the sixth grade and fourth grade levels. The difference between fourth and sixth grade total intelligence means was significant at the .01 level of confidence for poor readers but was statistically insignificant for the good readers. A review of the correlations

and means again show evidence of a significant influence of reading achievement on intelligence scores obtained on the Lorge-Thorndike.

4) Regarding the difference in relationship between the various intelligence scores and reading of the total group at fourth and sixth grade level, it was found that all the correlations for both the fourth and sixth grade level were significant at the .01 level of confidence. It was also found that the difference in mean verbal and total intelligence scores for the total group were significant at the .01 level of confidence. Difference in mean nonverbal intelligence scores for the total group were insignificant. A review of the relationships and differences between scores for the total group suggest a significant influence of reading achievement on the scores of intelligence tests which involve reading which increases with the amount of reading required on the intelligence test.

Conclusions and Implications

Through the study of the data, the following conclusions and implications were arrived at.

1) Verbal intelligence scores obtained on the Lorge-Thorndike are significantly affected by achievement in reading.

2) Nonverbal intelligence scores obtained on the Lorge-Thorndike are not significantly affected by ancievement in reading.

3) The effect of reading achievement on intelligence scores, particularly verbal intelligence scores, obtained

on the Lorge-Thorndike is more significant at the sixth grade level than at the fourth grade level.

Suggestions for Further Study

Because of the limitations found in this study and because of questions which arose in the mind of the writer as the study progressed, several aspects requiring further study are suggested:

1) That a similar study on a larger scale and with a more random sampling be performed.

2) That similar studies comparing the effect of reading on the results of other group and individual intelligence tests obtained at various grade levels be conducted.

3) That an experimental study be conducted to investigate the effect of a program of Language Development on verbal scores of group tests.

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APPENDIX

TABLE 5

DATA FOR SELECTION OF GROUPS

SUPERIOR READERS

Subj No.	4B Testing					6B Testing				
		Lorge-Thorndike			Iowa		Lorge-Thorndike			Iowa
	C.A.	V	NV	T	Rdg.	C.A.	V	NV	T	Rdg.
1.	9-4	116	119	118	7.6	11-3	127	111	119	9.5
2.	9-3	125	112	118	8.5	11-3	115	126	121	8.1
3.	9-3	106	125	116	5.3	11-2	114	123	119	7.4
4.	10-3	94	114	104	4.4	12-3	97	107	102	7.3
5.	8-5	119	117	118	4.4	10-4	117	131	124	7.3
6.	9-0	110	100	105	4.3	11-0	96	103	100	7-2
7.	9-0	114	114	114	5.2	11-0	122	134	128	7.1
8.	9-1	110	124	117	5.0	11-1	115	115	115	7.1
9	8-10	110	113	112	4.2	10-9	100	100	100	6.8
10	9-5	103	107	105	5.0	11-4	96	102	99	6.7
11.	9-2	106	128	117	3.7	11-2	95	130	113	6.5
12.	10-3	86	98	94	4.0	12-4	78	79	79	6.5
13.	9-9	109	77	93	5.2	11-9	99	99	99	6.4
14.	9-1	122	124	123	3.9	11-1	109	118	114	6.4
15.	9-0	113	112	112	5.1	11-0	101	103	102	6.4
16.	9-10	103	107	105	4.4	11-10	97	106	102	6.1
17.	9-2	110	119	114	4.2	11-2	107	108	108	6.1
18.	9-3	99	110	104	3.5	11-3	97	116	107	6.1
19.	9-5	96	111	104	4.2	11-5	97	109	103	6.1
20.	9-2	109	122	116	4.4	11-1	101	120	111	6.0

TABLE 1--Continued

MIDDLE SECTION OF TOTAL GROUP

Subj. No.	4B Testing					6B Testing				
		Lorge-Thorndike			Iowa Rdg.		Lorge-Thorndike			Iowa Rdg.
	C.A.	V	NV	T		C.A.	V	NV	T	
21.	9-4	92	101	96	3.3	11-3	86	98	92	6.0
22.	9-1	111	113	112	4.7	11-1	101	113	107	5.9
23.	9-8	96	112	104	3.9	11-7	99	100	100	5.9
24.	9-11	86	90	88	4.4	11-11	82	84	83	5.9
25.	9-1	95	103	99	3.3	11-1	92	97	95	5.9
26.	9-3	111	126	120	4.8	11-3	103	126	115	5.9
27.	8-7	128	126	127	6.5	10-6	118	126	122	5.8
28.	9-6	91	113	102	3.7	11-5	91	94	93	5.8
29.	9-4	98	101	100	3.5	11-4	88	104	96	5.8
30.	10-1	91	98	94	3.5	12-1	80	107	94	5.8
31.	9-1	95	94	94	3.6	11-1	96	91	94	5.6
32.	10-5	82	100	91	3.4	12-5	79	113	96	5.4
33.	9-1	106	103	104	4.4	11-1	93	110	102	5.4
34.	9-3	105	101	103	5.3	11-2	98	103	101	5.4
35.	10-3	91	92	92	3.7	12-3	85	97	91	5.4
36.	9-2	95	92	94	3.8	11-2	87	93	90	5.3
37.	9-8	92	107	100	3.2	11-2	92	102	97	5.3
38.	10-1	86	112	99	3.1	12-1	77	97	87	5.3
39.	10-0	82	117	100	1.6	11-11	84	115	100	5.3
40.	10-7	85	109	97	3.6	12-7	85	108	97	5.2

TABLE 1--Continued

MIDDLE SICTION OF TOTAL GROUP

Subj. No.	4B Testing					6B Testing				
		Lorge-Thorndike			Iowa Rdg.		Lorge-Thorndike			Iowa Rdg.
	C.A.	V	NV	T		C.A.	V	NV	T	
41.	9-3	95	94	85	2.5	11-3	70	75	73	5.2
42.	9-3	95	105	99	2.8	11-3	91	105	99	5.2
43.	9-4	108	109	108	3.9	11-3	103	110	107	5.1
44.	10-2	82	94	85	3.6	12-2	67	75	71	5.1
45.	10-3	90	95	93	3.7	12-2	85	90	88	5.1
46.	8-9	99	92	96	2.8	10-8	105	109	107	5.1
47.	10-11	72	91	82	3.1	12-11	68	92	80	5.1
48.	9-4	111	97	104	3.5	11-3	99	110	105	4.9
49.	9-9	96	103	100	3.2	11-8	88	82	85	4.9
50.	9-3	106	123	114	3.4	11-2	95	107	101	4.9
51.	9-4	97	87	92	3.4	11-4	88	74	81	4.7
52.	8-11	104	108	106	3.8	10-9	91	101	96	4.6
53.	9-8	84	85	84	3.1	10-11	75	94	85	4.6
54.	9-4	97	109	103	3.4	11-3	101	105	103	4.4
55.	10-1	86	96	91	2.7	12-1	81	95	88	4.4
56.	10-0	75	87	81	4.4	12-0	75	87	81	4.4

TABLE 1--Continued

RETARDED READERS

Subj. No.	4B Testing					6B Testing				
		Lorge-Thorndike			Iowa Rdg.		Lorge-Thorndike			Iowa Rdg.
	C.A.	V	NV	T		C.A.	V	NV	T	
57.	9-1	99	105	102	3.5	11-0	77	96	87	4.4
58.	9-9	103	100	100	3.3	11-8	83	96	90	4.2
59.	9-5	93	105	99	3.4	11-5	85	100	93	4.2
60.	10-0	94	103	98	3.2	11-11	81	95	88	4.2
61.	10-6	81	71	76	3.1	12-5	75	72	74	4.2
62.	9-6	101	110	106	3.7	11-6	85	108	97	4.0
63.	9-9	88	87	88	3.7	11-9	76	77	77	4.0
64.	9-8	92	100	96	2.4	11-8	83	105	94	4.0
65.	10-0	88	93	90	3.4	12-0	84	89	87	3.9
66.	9-2	102	87	94	2.9	12-0	81	78	80	3.9
67.	10-0	85	93	89	2.7	12-4	81	89	85	3.9
68.	9-5	90	113	102	3.3	11-5	89	111	100	3.9
69.	9-7	74	86	80	3.9	11-6	72	93	83	3.9
70.	9-10	92	98	95	3.5	11-10	76	92	84	3.7
71.	9-7	97	95	96	4.1	11-6	88	99	94	3.7
72.	9-1	103	114	108	3.4	11-1	93	120	107	3.7
73.	8-3	114	112	113	3.8	12-3	72	81	77	3.7
74.	10-4	84	76	80	2.7	12-3	81	90	86	3.5
75.	10-2	87	82	84	2.8	12-1	81	86	84	3.5
76.	10-2	70	78	74	2.9	12-2	62	96	79	3.0