AN INVESTIGATION OF SELECTED READINESS

VARIABLES AS PREDICTORS OF READING

ACHIEVEMENT AT SECOND

GRADE LEVEL

By

CARYL NEMAN SEALS

Bachelor of Science in Education
Southwest Texas State University
San Marcos, Texas
1964

Master of Science in Library Science
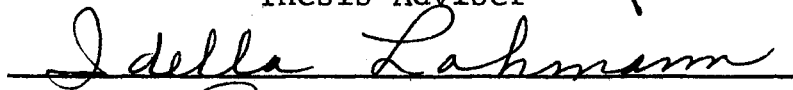East Texas State University
Commerce, Texas
1967

Submitted to the Faculty of the
Graduate College of the
Oklahoma State University
in partial fulfillment of
the requirements for
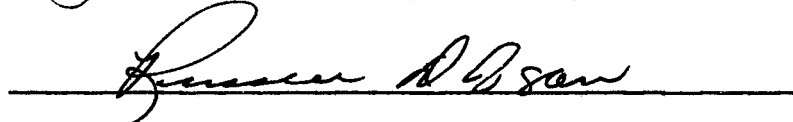the Degree of
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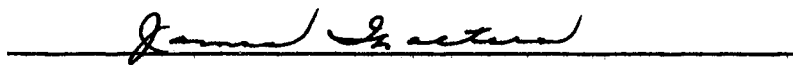AN INVESTIGATION OF SELECTED READINESS

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Thesis Approved:

_____
Thesis Adviser

_____

_____

_____

_____
Dean of the Graduate College

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CHAPTER I

INTRODUCTION

In the past, it has been an accepted educational prac-
tice to remediate reading failures. This position makes
apparent certain assumptions which some researchers feel are
untenable. The first assumption is that remediation is bet-
ter than prevention.

A second assumption can be drawn from the remediation
principle. That is, it takes for granted that the present
state of the science is not sufficiently sophisticated to
identify students before they actually begin to fail in read-
ing at which time they are easily spotted.

There is another assumption dealing with this problem--
that mere identification of a potential reading disability
does not aid the classroom teacher with her limited knowledge
of teaching reading by giving her direction for planning a
program of study for the child. However, this is the step
after our immediate problem, which is identification of
readiness variables predictive of reading achievement.

Significance of the Study

The present investigation gains its significance from
the fact that the results can lead to more sensitivity to

individual needs in the beginning reading programs now in operation. An individual profile of the readiness factors related to reading achievement will give the classroom teacher direction for a program in beginning reading which will direct the learning experiences through the child's areas of strength. Special instruction can be given in areas of weakness which require additional skill building. The identification of factors significantly related to reading achievement will serve to reduce chance factors in trial and error instructional techniques by classroom teachers; thus, putting the emphasis on planned rather than coincidental learning.

This study differs from previous research in predicting reading achievement in that it looks specifically for variables identifiable from group administered readiness tests. Most other studies deal in the area of predictive validity of a specific test (Akers, 1969; Powell & Parsley, 1961) or comparison of group and various individual tests (Bilka, 1970; Lino, 1969; Hopkins & Sitkei, 1969). The present study is not concerned with predictive validity of the tests as a whole, or with the comparison of predictive validity of different instruments, although information will be gained relative to validity of these instruments. Rather, the concern of this study is with the subtests as readiness variables.

Another contribution of this study will be that the subjects were not randomly selected but were in fact the complete population of the school system who had started

kindergarten and remained in the system until mid-year of the second year in school. Even the best sampling procedures can lead to the possibility of a Type II error; however, using a whole population this should not be a factor.

This investigation could also point out significant variables related to reading achievement which should continue to be tested, while identifying areas which do not warrant testing. The information gained in this study should lead to experimental teaching programs designed around the concept of building skills in the beginning reader as indicated by his scores on the test battery constructed of variables significantly related to reading achievement.

Limitations

1. The results of this study can be generalized only to those subjects included in this study, the kindergarten class of 1970 of a small Oklahoma community.

2. The reliability of the measuring instruments will to some degree affect the reliability of any conclusions drawn in the study.

3. There was no attempt to control for teacher differences.

Assumptions

1. It is assumed that the data is linear in nature thereby meeting the restrictions of the statistical technique, Pearson product-moment correlation.

2. It is assumed that although students were not administered all of the tests as a group, that the administration of the tests was uniform.

Statement of the Problem

The problem of this study was to determine the correlation between reading performance as measured by the New Developmental Reading Tests--Bond-Balow-Hoyt: Upper Primary Reading (from Middle of Grade 2 through Grade 3--Form U-II) at mid-year of the second year in school and subtest scores on three measures of readiness: The Stanford Early School Achievement Test, Level I; the Metropolitan Readiness Tests, Form A; and the Macmillian Reading Readiness Test.

Definition of Terms

The following definitions are given to clarify terms used throughout the study.

Reading Achievement is defined as achievement in these areas as measured by scores on the Word Recognition test, the Comprehending Significant Ideas test, and the Comprehending Specific Instructions Test, which are the test battery of the New Development Reading Tests.

Reading readiness variables are defined as those factors which are measured by scores on the following subtests:

The Environment (Stanford Early School Achievement Test, Level I):

The Environment items are taken almost equally from the social and natural environments, social sciences,

and natural sciences. Knowledge of the environment
is absorbed by children from many sources, includ-
ing parents, brothers and sisters, neighbors, trips,
television, books, and just contact with things.
Through voluminous inner speech and overt talk,
children organize a mental file that is well ad-
vanced upon entrance to school. Such knowledge
should be defined and capitalized upon (Madden,
1969, p. 12).

Mathematics (Stanford Early School Achievement Test,
Level I):

Preschool mathematics consists of concepts in the
following areas: conservation of number, space, and
volume; counting; measurement; numeration, classi-
fication, simple operations; and occasionally of the
algorithms. The emphasis in this set of items is
upon concepts which can be learned from general
experience rather than from direct intervention.
(Madden, 1969, p. 12).

Letters and Sounds (Stanford Early School Achievement
Test, Level I):

The items in this section measure both the ability
to recognize upper and lower case letters (14 items)
and the auditory perception of beginning sounds (14
items). These abilities are the best single pre-
dictors of success in learning to read. The reasons
for this may be that (1) pupils who have acquired
the knowledge on their own have a propensity for
reading, or (2) those who have been taught at home
have a potential source of assistance that contin-
ues to serve them after they enter school. (Madden,
1969, p. 12).

Aural Comprehension (Stanford Early School Achievement
Test, Level I):

Items in aural comprehension require the abilities
to pay attention to, organize, interpret, infer, and
retain what has been heard. This part required the
highest level of thinking of any of the four parts.
Most of the items involve some degree of interpre-
tation; all require attention. This set of items
is not merely a "spoken reading comprehension" test;
it involves a carefully planned set of experiences
that range from mere recall to adaptations of
aspects of logic. (Madden, 1969, p. 12).

Visual Perception (<u>Macmillian Reading Readiness Test</u>:

Visual perception uses only two kinds of stimuli-- alphabet letters and words. . . The format used, requiring the marking of the stimulus which is ex- actly like the one at the left, is commonly used in readiness practice materials and tests. (Harris, 1966, p. 5).

Auditory Perception (<u>Macmillian Reading Readiness Test</u>:

Auditory perception stresses two aspects of audi- tory discrimination that are very important in the development of phonic skills in the first grade: (1) ability to hear similarities and differences in initial consonant sounds; (2) ability to select words with rhyming endings. . . In each item the child must mark both of two correct answers. This reduces the chance of guessing correctly to only one in six, and thus increases the reliability of the test. (Harris, 1966, p. 5).

Vocabulary and Concepts (<u>Macmillian Reading Readiness Test</u>):

Vocabulary and Concepts requires the child to mark one of four pictures that illustrates a word or idea spoken by the examiner. (Harris, 1966, p. 5).

Word Meaning (<u>Metropolitan Readiness Test, Form A</u>):

This is a measure of the child's store of verbal concepts. It is presented in the form of a picture vocabulary test and permits the child to indicate the breadth of his oral vocabulary. Words are chosen from standard kindergarten and primary word lists. Vocabulary is, of course, one of the best indices of general mental maturity, and it is be- lieved that the <u>Word Meaning</u> test does provide for a representation of this general mental maturity in the total readiness score. (Hildreth, 1965, p. 11).

Listening (<u>Metropolitan Readiness Test, Form A</u>):

This test strives to tap the child's ability to comprehend phrases and sentences. It presents the child with a series of statements varying in length and complexity and has him indicate his comprehen- sion of the statements by marking one of three pic- tures. In certain of the items there is need for the child to make inferences beyond a literal under- standing of what he hears. In all of them the child must attend carefully to what is said and keep one

or several ideas in mind for brief periods of time, activities which seem to parallel what pupils are regularly called on to do in first grade. (Hildreth, 1965, p. 11).

Matching (Metropolitan Readiness Test, Form A):

Matching seeks to get at visual-perceptual skills akin to those involved in discriminating word forms in beginning reading. This test has consistently correlated well with beginning reading skills. (Hildreth, 1965, p. 11).

Alphabet (Metropolitan Readiness Test, Form A):

Alphabet gets at the child's ability to recognize letters of the alphabet when these are spoken by the examiner. This ability has been demonstrated to be among the best predictors of success in the early stages of reading. (Hildreth, 1965, p. 11).

Numbers (Metropolitan Readiness Test, Form A):

This test is an inventory of the child's stock of number concepts, number knowledge, ability to manipulate quantitative relationships, recognition of and ability to produce number symbols, and related knowledge, such as concepts of money. . . a test of this kind is also symptomatic of a general mental alertness that will help him in all first-grade work. (Hildreth, 1965, p. 12).

Copying (Metropolitan Readiness Test, Form A):

In this test the child manifests a combination of visual perception and motor control similar to what is called for in learning handwriting. (Hildreth, 1965, p. 12).

Criterion variables, dependent variables, in this study refer to the three subtests of the New Developmental Reading Tests. These will be referred to in this study by their individual names which are Word Recognition, Comprehending Significant Ideas, and Comprehending Specific Instructions.

Predictor variables, independent variables, (readiness variables) in this study refers to the subtests of the above defined tests. In the remainder of this study, the predictor

variables will be referred to by their subtest names only. They will be designated as follows and in the following order: Environment, Mathematics, Letters & Sounds, Aural Comprehension, Visual Perception, Auditory Perception, Vocabulary & Concepts, Word Meaning, Listening, Matching, Alphabet, Numbers, and Copying.

Hypotheses

Each hypothesis will be examined separately for each of the following readiness factors: Environment, Mathematics, Letters and Sounds, Aural Comprehension, Visual Perception, Auditory Perception, Vocabulary and Concepts, Word Meaning, Listening, Matching, Alphabet, Numbers, and Copying.

Ho_1: There is no significant correlation between the scores on the readiness variables and reading achievement as measured by scores on the Word Recognition test.

Ho_2: There is no significant correlation between the scores on the readiness variables and reading achievement as measured by scores on the Comprehending Significant Ideas test.

Ho_3: There is no significant correlation between the scores on the readiness variables and reading achievement as measured by scores on the Comprehending Specific Instructions test.

Questions

1. In regard to the dependent variable, Word Recognition, what will be revealed by the multiple correlation when all of the significant contributing predictor variables are used in the correlation?

2. In regard to the dependent variable, Comprehending Significant Ideas, what will be revealed by the multiple correlation when all of the significant contributing predictor variables are used in the correlation?

3. In regard to the dependent variable, Comprehending Specific Instruction, what will be revealed by the multiple correlation when all of the significant contributing predictor variables are used in the correlation?

Organization of the Study

The present chapter includes an introduction to the problem, the significance of the study, a statement of the problem, definitions of terms, hypotheses, questions, limitations and assumptions. Chapter II contains a review of the research literature pertinent to this study. Chapter III describes the variables, subjects, treatments, instrumentation, and analysis of the data. Chapter IV contains the findings and a discussion of the results of the study. Chapter V includes a discussion of the results of the study, conclusions, and implications for further research.

CHAPTER II

REVIEW OF LITERATURE

The purpose of this chapter will be to review pertinent research literature related to this study. The research will be presented in historical order. The studies selected for the review of the literature date from 1961, although there were previous studies in the area; those included here reflect the present state of current research in the area of predicting reading achievement from readiness measures. All of the studies do not have as their major purpose the identification of readiness variables only; however, the designs utilized by the researchers did produce data relevant to this study.

Research in the area of predicting reading achievement from reading readiness measures and validity studies of reading readiness tests all had the same basic design. The independent variables or predictor variables referred to were scores on objective tests or rating scales completed either at the end of kindergarten or the beginning of first grade. There was usually no attempt to experimentally manipulate the learning experience of the subjects. A criterion measure was taken anywhere from eight weeks to four years later.

The criterion variable or dependent variable scores were measures of reading achievement.

Pearson product-moment correlations were computed to determine the correlation between the predictor variables and the criterion variables. In some studies t tests were run to determine if the correlation coefficients were significantly different from each other. The statistical technique of multiple regression was often used to determine the relative effectiveness of and optimum combinations of the predictor variables in predicting reading achievement. Correlations were computed in all of the studies, however the other two tests were not used by all researchers.

Powell and Parsley (1961) investigated the relationship between scores on the <u>Lee-Clark</u> <u>Reading</u> <u>Readiness</u> <u>Test</u> which was administered at the beginning of first grade and scores on the <u>California</u> <u>Reading</u> <u>Test</u> administered to the same students at the beginning of second grade to determine whether the <u>Lee-Clark</u> as a whole or one of the subtests offered the best prediction.

Subjects were 703 students who remained in the school system for the duration of the study. Scores were analyzed using the Pearson product-moment correlation technique. For purposes of further analysis the scores on the <u>Lee-Clark</u> were grouped into four groups, those scoring high, medium, low and the total group. Although the correlations were not significant for the low group, all correlations were significant at the 0.05 level of confidence for the middle, high

and total groups. The authors concluded, ". . . that the
Lee-Clark is useful primarily as a predictor of the Total
Reading test results for the entire group." (Powell and
Parsley, p. 233).

In an attempt to identify factors significantly related
to reading failure at the end of second grade, DeHirsch,
Jansky, and Langford (1966) used thirty-seven kindergarten
tests as predictor variables. Nineteen of the kindergarten
measures were significantly related to the Overall Reading
Performance Index. The significant tests were further
reduced to ten and used as an instrument termed a Predictive
Index. These subtests were Pencil Use, six of nine Bender
Visuo-Motor Gestalt test designs, Wepman Auditory Discrimina-
tion Test, Number of Words Used in a Story, Categories,
Horst Reversals Test, Word Recognition I, Word Recognition
II and Word Reproduction.

The relationship between auditory discrimination at the
beginning of the first year in school and reading achieve-
ment at the end of that year was the purpose of a study by
Dykstra (1966). His research sample consisted of 331 boys
and 301 girls who remained in the Minneapolis Public Schools
throughout the whole year. At the beginning of the school
year, the subjects were administered seven subtests selected
from various readiness tests. These subtests were Rhyming
Test, Making Auditory Discriminations, Using Context and
Auditory Clues, Auditory Discrimination of Beginning Sounds,
Auditory Discrimination of Ending Sounds, Discrimination of

Correct Pronunciation, and Auditory Blending. Chronological

age and intelligence were also used as predictor variables.

The Gates Primary Reading Tests, 1958 was administered

in the spring. The Word Recognition and Paragraph Reading

subtests were used as criterion measures. Correlation matri-

xes were constructed and the analysis revealed that all of

the predictor variables except chronological age were sig-

nificantly related to reading achievement at the 0.01 level

of confidence. For the purposes of predicting reading

achievement, a combination of these measures was felt to be

most useful. The author cautioned that, . . . "About all

that is possible in the classroom is the making of gross

discriminations between individuals who are likely to suc-

ceed in learning how to read and those who are likely to

encounter difficulty." (Dykstra, p. 31).

Mayans (1966) was primarily interested in the differ-

ences in culturally different students. However, her design

provided information about the predictive validity of her

research instruments which were: the Metropolitan Readiness

Tests, Peabody Picture Vocabulary Test, Stanford-Binet Intel-

ligence Scale-Vocabulary Test, and the Teacher Questionnaire

which was constructed by Mayans. The subjects in the study

were 245 first grade students who were Caucasian and were

classified as culturally advantaged, culturally mixed, or

culturally disadvantaged. The Metropolitan Readiness Tests

yielded the highest consistent correlation with the criterion

variable, the Gates Primary Reading Test, than any of the

other predictor variables.

McClellan (1968) was also primarily interested in first grade children of the lower socio-economic level. Her subjects were 230 children who had enrolled in the COPE program and 275 children who had not enrolled in the program. Using the Metropolitan Readiness Test, Form A and the Goodenough-Harris Draw A Man Test, Form R, administered at the beginning of first grade and the Metropolitan Achievement Test, Primary I Battery, Form A, she found that:

> For prediction of success in reading of the first grade children from a low socio-economic level, it is desirable to study the sexes separately. Predictions for girls can be made from scores obtained on readiness tests. Predictions for the boys can be made more accurately using the scores on the readiness tests in combination with an intelligence test score. (McClellan, p. 77).

Akers' (1969) sample consisted of 630 randomly selected students from a large metropolitan school system. The Metropolitan Readiness Test, Form A, the predictor variable, was administered during the spring of the kindergarten year. The criterion variable, the Gates-MacGinitie Reading Test, Primary A, Form 1 was administered in first grade. Using a multiple linear technique, he found significant t values for the total sample on all subtests of the Metropolitan Readiness Test subtest except Word Meaning. Copying was significant at the 0.05 level, Listening was significant at the 0.01 level, while the significance levels of the Matching, Alphabet and Numbers were 0.001. In discussing the results, the author felt that the total test was the most consistent and efficient predictor of reading achievement in grade one.

Clutts (1969) compared two measures of reading readiness to determine their relative effectiveness as predictors of reading achievement at the end of first grade. Her 235 subjects were in twelve first grade classrooms in Fairbanks, Alaska, which were taught by teachers with a minimum of three years of primary teaching experience. The predictor variables in this study were the Metropolitan Readiness Test, Form A and a teacher rating scale of reading readiness designed for the study. The teacher rating scale was completed before the Metropolitan Readiness Test was administered three weeks after school began. The criterion measure, the Stanford Reading Achievement Test, Primary I, Form W, was administered at the end of the eighth month of school.

Product moment coefficients of correlations were computed between the predictor variables and the criterion variables to determine the predictive validity of the readiness test and scale. Multiple regression analysis was used to determine the relative predictive value of each of the readiness test and scale. The Metropolitan had a correlation of .74 with reading achievement, while the Reading Readiness Rating Scale had a correlation of .67. Both correlations were significant, yet they were not significantly different from each other.

She concluded that the combination of (1) visual discrimination, (2) desire to read, (3) ability to attend, and (4) auditory discrimination, when appraised subjectively on the teacher rating scale constructed by the researcher; plus

a standardized readiness measure was a better predictor of reading achievement than either measure used alone.

The predictive validites of the <u>Lee-Clark Reading Readiness Test</u>, (1962 revision) and the <u>California Test of Mental Maturity</u> (1957 S-form) were compared by Hopkins and Sitkei (1969). Their subjects were all entering first grade pupils from two elementary schools in a lower-middle class community. The readiness and intelligence tests were administered during the first three weeks of school, while the criterion test, the <u>Lee-Clark Reading Test</u>; Primer (Form A) was administered near the end of school. The correlation coefficients computed between the predictor variables and the reading test were reported as .612 for the readiness test and .541 for the intelligence test, both of which were significant at the 0.05 level of confidence. When the predictive validity of the two tests were compared there was no significant difference in the two correlations.

The correlation coefficients between the two predictor variables and end of the year teacher marks were also significant at the 0.05 level, yet again not significantly different from each other. These coefficients were .571 for the readiness test and .513 for the intelligence test.

A multiple regression equation using both predictor variables did not significantly increase the predictive power of the readiness test when used alone. Considering this fact plus the factors of time, expense, and the ability to make accurate interpretations from I. Q. tests, the authors felt

that the use of readiness tests for prediction purposes was preferable to that of intelligence tests.

In attempting to determine the predictive validity of (1) the <u>Frostig Developmental Test of Visual Perception</u>; (2) the <u>Olson Reading Readiness Test</u>: (3) the <u>Gates Reading Readiness Test</u>; (4) the <u>Metropolitan Readiness Test</u> and the <u>Wechsler Intelligence Scale for Children</u>--combined: when compared with the criterion variables of <u>Stanford Achievement Test</u> subtests Word Reading and Paragraph Meaning, Johnson (1969) found different predictors for first and third grade. He studied the same students from beginning first grade through third grade; due to attrition there were only 148 who completed the study.

It was determined by using a multiple correlation technique that the best predictor for Word Reading at the first grade level was the <u>Olson Reading Readiness Test</u>, while the best predictor for this subtest at the third grade level was the combined variable of the <u>Metropolitan Readiness Test</u> and the <u>Wechsler Intelligence Scale for Children</u>. The <u>Olson Reading Readiness Test</u> was also the best predictor for Paragraph Meaning at first grade, while the combined <u>Metropolitan Readiness Test</u> and the <u>Wechsler Intelligence Scale for Children</u> was the best predictor of Paragraph Meaning at the third grade level. The author feels that

> . . . The classroom teacher could get valuable information about the degree of success to be expected from a test comparable to the <u>Olson Reading Readiness Tests</u> or a general reading readiness test in combination with an intelligence test. The administration of more than one type of readiness test

would not appear to yield very much additional information helpful in determining a child's reading potential. (Johnson, 1969, p. 7).

The <u>Wechsler</u> <u>Preschool</u> <u>and</u> <u>Primary</u> <u>Scale</u> <u>of</u> <u>Intelligence</u> (WPPSI), the <u>Sartain</u> <u>Reading</u> <u>Readiness</u> <u>Test</u> (SRRT) and an <u>Oral</u> <u>Language</u> <u>Sample</u> were the predictor variables that Livo (1969, 1970) studied. The criterion variables were the <u>Metropolitan</u> <u>Achievement</u> <u>Test</u>, Primary Battery (MAT) and its subtests Word Knowledge, Word Discrimination, and Reading (Comprehension). Her subjects were sixty-three boys and ninety-three girls who were randomly selected from thirteen classrooms in six schools.

The statistical techniques employed were the Pearson product-moment coefficients of correlation, multiple correlation, multiple regression, and regression equations. Results indicated that at the .01 level of confidence all tests and their subtests were significantly related to Word Knowledge and Word Discrimination. The WPPSI-Vocabulary was the only predictor variable not significantly related to the Total Reading Test score, while the WPPSI-Sentences and SRRT-Rhyming were the only predictors not significantly correlated with Reading (Comprehension).

The highest correlations (r = .70) were reported between the WPPSI-Full Scale I. Q. and both Word Knowledge and Word Discrimination. The highest correlation for the Reading subtest was .45 for both the WPPSI-Block Designs and Full Scale I. Q. In considering the Total Reading Test, the highest correlation was with the SRRT Total, r = .60. This led the

author to conclude :

> The WPPSI, although somewhat helpful, does not appear to be the most effective and efficient test to use for predicting success in beginning reading. . .

> The SRRT appears to be quite effective in predicting success in beginning reading. The unique sub-test, Word Memory, did an excellent job of discriminating and predicting. (Livo, 1970, p. 128).

She agreed with Dykstra when she also concluded that reading achievement was better predicted by combinations of the tests rather than by a single test score. She further suggested the use of subtest scores as a diagnostic tool in identifying individual strengths and weaknesses.

Although Lovell (1969) approached the prediction of reading achievement through the use of readiness factors, he employed standardized test for his predictor variables. The criterion variable was an average grade equivalent score for the Word Recognition, Oral Reading and Silent Reading subtest of the <u>Diagnostic Reading Scales</u>. Table I presents the readiness factors used in the research, the test and subtest from which the measure of each factor was taken, and its correlation with the criterion variable.

His subjects were 209 first grade students who were tested at the beginning and end of school. Correlations of .50 were accepted as significant because that indicates a thirteen per cent better than chance estimate of prediction using the following forecasting formula:

$$1 - \sqrt{1 - r^2}$$

TABLE I

LOVELL'S READINESS FACTORS AND CORRELATIONS

Readiness Factors	Test--Subtest	$\underline{r}$
Visual discrimination	Lee-Clark Reading Readiness Test (1962 revision)--	
	Letter Symbols	.35
	Letter & Word Symbols	.34
Concepts	Concepts	.20
Visual memory	Murphy-Durrell Diagnostic Reading Test (1949)--	
	Visual test	.48
Auditory discrimination	Murphy-Durrell Reading Readiness Analysis (1965 Ed.)	
	Phonemes	.51*
Knowledge of alphabet letter names	Letter Names	.63*
Word Learning Rate	Learning Rate	.53*
Mental Ability	Tests of General Ability (SRA)	
	Information	.40
	Reasoning	.33

*Accepted as significant by Lovell

Using this criterion, Lovell concluded that of the readiness factors studied only Knowledge of Alphabet Letter Names (r = .63) was an important predictor of success in reading. Word Learning Rate (.53) and Auditory Discrimination (.51) were of "borderline" value as predictors of reading achievement.

The subjects in Bilka's (1970) study were 353 remaining students who had participated in the U. S. Office of Health, Education and Welfare Project #2729 from 1964 to 1967. The predictor variables in her study were: (1) Pintner Cunningham Primary Test, Pintner General Abilities Test, Form A for Grade One; 1964; (2) Individual Record Checklist--Maturity Level for School Entrance and Reading Readiness for Kindergarten and First Grade by Katherine Banham; (3) Murphy-Durrell Diagnostic Reading Readiness Test, Revised Ed., 1964; (4) Metropolitan Readiness Test, Form A, Standardized Ed., 1964; and (5) Thurstone-Jeffery Primary Perception Tests, 1956.

The criterion variables were measured by the (1) Word Reading, (2) Paragraph meaning, (3) Vocabulary, and (4) word study skills subtest of the Stanford Achievement Test, Primary I, Form X, 1964; administered in May, 1965. The appropriate forms of the Stanford Achievement Test were given in 1966 and 1967.

Statistical analysis using the techniques of canonical correlations, analysis of variance, and tests of significance for the correlations yielded the following results.

1. The Murphy Durrell and Metropolitan tests were the strongest and best predictors of reading achievement as measured by the <u>Stanford</u> <u>Achievement</u> <u>Test</u>.

2. There was a significant contribution of all subtests of the Murphy-Durrell to reading prediction.

3. The subtests of Word Meaning, Numbers, and Alphabet were strong contributors to prediction of reading achieve-ment.

4. The combination of the Word Meaning subtest from the Metropolitan plus Phonemes, Letter Names, and Learning Rate subtests from the Murphy-Durrell provide the strongest and most stable correlation with reading achievement over a three year period.

One hundred and eight children were measured for reading achievement using the total score of the Word Recognition and Language Perception subtest of the <u>SRA</u> <u>Achievement</u> <u>Test</u> <u>for</u> <u>Reading</u>, (Level 1-2) as the criterion variable. The group had originally been administered the predictor tests as an evaluation of a head-start program. The predictor variable that was most significant in predicting reading achievement at the beginning of second grade was the total score for the <u>Metropolitan</u> <u>Readiness</u> <u>Test</u>. The following subtests are also significantly related to reading achievement at the 0.01 level: (1) Alphabet, (2) Numbers, (3) Matching, (4) Copying, and (5) Listening. Goodstein, Whitney, and Cawley (1970) conclude that ". . . The <u>Metropolitan</u> <u>Readiness</u> <u>Test</u> total

score appears to offer the most potential for adequate dis-
crimination among failing and adequate readers." (p. 28).

Harckham (1970) used 553 subjects in her study of pre-
diction from kindergarten measures to reading achievement in
grades one, two, three, and four. The predictor variables
were measured by scores on the following tests: (1) Metro-
politan Readiness Test (MRT); (2) Goodenough Draw-a-Man Test
(DAMT); (3) Teacher Ranking (TR); and (4) Rating on a com-
posite behavior rating scale (BRS). The criterion variables
were measured by the Metropolitan Achievement Test in the
first grade and thereafter by the appropriate form of the
Stanford Achievement Test.

Using the statistical operations of multiple correla-
tions, multiple regression, and intercorrelation; she found
that the best predictor of reading achievement for all four
years was the MRT with coefficients from .63 for first grade
to .74 for the third grade. When the MRT subtests were ana-
lyzed instead of the total score, it was found that the
Alphabet and Numbers subtests were the best predictors,
while Word Meaning, Matching and Copying had correlations
that ranged in the .40's and .50's. Listening was the poor-
est predictor of all.

Ward (1970) used a sample of 278 students to compare the
predictive validity of two measures of readiness for reading,
the Murphy-Durrell Reading Readiness Test and the Coding sub-
test of the Wechsler Intelligence Scale for Children. The
criterion variables studied were the subtests of the Stanford

Achievement, Primary I Battery. All of the Pearson product-
moment correlations were higher for the Murphy-Durrell than
for the Coding subtest. Furthermore, there was a significant
difference at the .01 level in the correlations for the fol-
lowing subtests: Word Reading, Paragraph Meaning, Spelling,
Word Study Skills, and Arithmetic.

Two of the purposes of the study by Wood (1970) were to
determine the relative effectiveness of several tests admin-
istered to kindergarten children in predicting reading
achievement at the end of second and third grade, and to
determine the optimum combination of variables in the pre-
diction of reading achievement. Her subjects were 595 stu-
dents from the Cedar Fall Public Schools who were enrolled
in the school system from 1966 to 1970.

The predictor variables in the study were: (1) Class-
room teachers' ratings; (2) a Self Portrait test; (3) The
Metropolitan Readiness Test (MRT); (4) SRA Primary Mental
Abilities Test (SRA-PMAT); and (5) a Kindergarten Inventory
(KI) developed by Wood. The criterion variable for the
second grade was the Paragraph Meaning subtest of the Stan-
ford Achievement Test. The criterion variable for the
third grade was measured by the Reading Comprehension subtest
of the Iowa Test of Basic Skills.

A step-wise multiple regression analysis revealed that
all the predictor variables except the Kindergarten Inventory
were significantly (0.01 level) correlated to reading
achievement at the end of second and third grades. Analysis

of the MRT subtests showed that they were all correlated to
reading achievement in both grades at the 0.01 level, except
for Listening at the 0.05 level.

Haraughty (1971) in attempting to identify factors sig-
nificantly correlated to reading failure at the first grade
level, used 100 students in her population. Of seven tests
on her Pre-Reading Predictive Index, three subtests, Learning
Rate, Peabody Picture Vocabulary Test, and Oral Language were
significantly related to reading achievement as measured by
the Vocabulary subtest of the Gates-MacGinitie Reading Test,
Primary A, Form I. Learning rate, Peabody Picture Vocabulary
Test, and the Sentences test all correlated significantly
with reading achievement as measured by scores on the Compre-
hension subtest on the Gates-MacGinitie.

Summary

Selected research studies in the area of predicting
reading achievement from readiness measures have been pre-
sented in this chapter. Some of the research studies were
in the form of validity studies for specific readiness tests,
some compared the efficiency of instruments for predicting
reading achievement; however only one study (Lovell, 1969)
dealt with readiness factors as predictors of reading
achievement.

Since the purpose of this study is the identification
of readiness variables as predictors of reading achievement,
a tabular summary of predictor variables previously found

to be significantly related to reading achievement is pre-
sented in Table II. Presented in the table will be the
author, the predictor variables (usually subtests of readi-
ness measures) which were found to be significantly related
to reading achievement as measured by the criteria variable
which is the third column in the table.

TABLE II

A SUMMARY OF PREDICTOR VARIABLES

Researcher	Most Significant Predictor Variables Excluding Total Readiness Test Scores	Criterion Variables
DeHirsch, Jansky, and Langford (1966)	Pencil Use Six of nine Bender Visuo-Motor Gestalt designs Wepman Auditory Discrimination Test Number of Words Used in a Story Categories Horst Reversals Test Word Recognition I, II Word Reproduction	Overall Reading Peformance Index

Dykstra (1966)	Gates Reading Readiness Test, 1939
	    Rhyming Test
	Harrison-Stroud Reading Readiness Profiles, 1956
	    Making Auditory Discriminations
	    Using Context and Auditory Clues
	Murphy-Durrell Diagnostic Reading Readiness Test, 1949
	    Auditory Discrimination of Beginning Sounds
	    Auditory Discrimination of Ending Sounds
	Monroe Reading Aptitude Tests, 1935
	    Discrimination of Correct Pronumciation
	    Auditory Blending
		Gates Primary Reading Tests, 1958

Lovell (1969)	Murphy-Durrell Reading Readiness Analysis (1956 Ed.)
	    Phonemes
	    Letter Names
	    Learning Rate
		Diagnostic Reading Scales

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TABLE II (CONTINUED)

Researcher	Most Significant Predictor Variables Excluding Total Readiness Test Scores	Criterion Variables

Goodstein, Whitney and Cawley (1970)	Metropolitan Readiness Tests, Form A
	    Alphabet
	    Numbers
	    Matching
	    Copying
	    Listening
		SRA Achievement Test for Reading, (Level 1-2) Word Recognition and Language Perception total score

Harckham (1970)	Metropolitan Readiness Test, Form A
	    Alphabet
	    Numbers
	    Word Meaning
	    Matching
	    Copying
		Stanford Achievement Test

Wood (1970)	Metropolitan Readiness Test, Form A
	    Word Meaning
	    Listening
	    Matching
	    Alphabet
	    Numbers
	    Copying
		Stanford Achievement Test Paragraph Meaning

Haraughty (1971)	Learning Rate Peabody Picture Vocabulary Test Oral Language Learning Rate Peabody Picture Vocabulary Test Sentences	Gates-MacGinitie Reading Test, Vocabulary Comprehension

CHAPTER III

DESIGN AND METHODOLOGY

Variables

The purpose of this study is to determine if there is a
significant predictive relationship between the readiness
variables on three measures of readiness, and performance
scores at mid year of the second year in school.

Readiness for reading was measured by thirteen subtests
from the following instruments: The Stanford Early School
Achievement Test, Level I; the Metropolitan Readiness Tests,
Form A; and the Macmillan Reading Readiness Test. The tests
were administered in April, 1970, to the entire kindergarten
population of the school system.

Reading performance was measured by the New Develop-
mental Reading Tests--Bond-Balow-Hoyt: Upper Primary Read-
ing (from Middle of Grade 2 through Grade 3--Form U-II. This
test was administered in January, 1972, to the students from
the 1970 kindergarten class who were still enrolled in the
same school system.

Subjects

Subjects for this study included the entire kindergar-
ten population of a small Oklahoma town. Originally, there

were 53 students in the class, however due to attrition two years later there were only 30 of the original group remaining with complete data. There was no attempt at randomization because the researcher was not working from a sample population, rather from the whole population for an entire school system. The students in the study could not accurately be described as second grade students because the school system does not recognize gradedness in its traditional sense. The subjects would all be considered second year students.

Treatment

All subjects were administered the three tests of readiness in April, 1970. The administration required several testing periods since only half of the students in each of the sessions (morning and afternoon) could be tested at the same time.

There was no experimental variable in operation during the intervening time. The students proceeded with their education in a manner prescribed by school policy. Those subjects who were still in the school system one and one half years later were retested, this time with a measure of reading performance. The test was administered by a reading specialist. This testing was done in the testing room of the elementary school and only those subjects who were in the 1970 kindergarten class were included in this testing. The test was not preannounced to the children and all make-up

tests were administered as soon as the child returned to school. Make-up tests were administered by the reading specialist employed by the school system.

Instrumentation

The instruments used in this study were of two types. The first type was readiness tests. The particular tests chosen for this study were those which were routinely used in the school district for all kindergarten classes, plus one additional readiness test which would measure some abilities already measured although not in exactly the same way and some abilities that had not been measured, such as copying.

The second type of test used in this study was a test of general reading performance. This test was administered as a criterion measure. It was felt that this particular measure had a range large enough to adequately measure the abilities of all of the subjects measured.

The Readiness Tests

The Stanford Early School Achievement Test, Level I, was constructed by Richard Madden and Eric F. Gardner, " . . . to provide a measure of the child's cognitive abilities. . ." The authors describe their test only as a readiness test in the "sense that an achievement test at Grade 1 is a readiness test for Grade 2. . ." (Madden and Gardner, 1969, p. 12).

The SESAT-I consists of four parts which are described below:

Part I: The Environment is a 42-item test in which the subject responds by marking a response picture which is described by the examiner. It is designed to measure the subject's knowledge of his environment.

Part II: Mathematics is a 28-item test of mathematics concepts. The examiner reads a statement and the subject marks the correct response picture.

Part III: Letters and Sounds is a 28-item test. The first fourteen items are a letters test in which the subject is asked to mark a specific letter. In the second fourteen items, the subject is asked to mark the response picture that begins with the same sound as the stimulus word.

Part IV: Aural Comprehension is a 28-item test which requires the child to listen to a story and mark the response picture that completes the story (Madden, 1969).

Statistical data concerning the reliability of the instrument was computed using the split-half reliability coefficients and were corrected with the Spearman-Brown Prophecy Formula. The following table which was taken from the manual of directions also reports the standard errors of measurement (Table III).

Albert J. Harris developed the Macmillan Reading Readiness Test, which is to be administered at the end of kindergarten or the beginning of first grade. The test has four parts but only the last three parts were used in the study because of the subjectivity involved in scoring. This test was a check list of characteristics generally considered to

TABLE III

RELIABILITY COEFFICIENT AND STANDARD ERRORS OF
MEASUREMENT FOR EACH PART BY GRADE

Part	Grade K.1		Grade 1.1	
	r^a	SEm^b	r^a	SEm^b
1. The Environment	.85	2.8	.82	2.4
2. Mathematics	.79	2.3	.82	2.0
3. Letters and Sounds	.79	2.3	.89	2.0
4. Aural Comprehension	.76	2.3	.77	2.1

be involved in a reading readiness test. A description of the other three tests follows;

Part II. Visual Perception is a 24-item test of visual perception. The subject is asked to select from four possible responses the one that is the same as the stimulus. The stimuli are of two kinds, letters and words.

Part III. Auditory Perception is an eighteen-item test of auditory perception which is divided into two parts. On the first nine items, the subject is asked to mark two of the four response pictures that begin with the same sound as the stimulus word. The examiner says the stimulus word and all of the response words. On the second nine items, administration is the same, however the subject marks the two response pictures that rhyme with the stimulus word.

Part IV: Vocabulary and Concepts is a 27-item test in which the subject is asked to mark the one of four response pictures which is uniquely described by the examiner (Harris, 1966).

The statistical data on the reliability of the test is presented in two forms: one for the total population, and one table for a disadvantaged population. While this might be of value when working with a disadvantaged population, the population of this research is not considered disadvantaged and therefore only the data for the total population will be reported. Table IV is an abbreviated form of the table found in the technical manual for this instrument.

TABLE IV

RELIABILITY COEFFICIENTS AND STANDARD ERROR OF
MEASUREMENT FOR TESTS II, III, IV, AND
THE SUMS OF II, III, IV OF THE
MACMILLIAN READING
READINESS TEST

Test	r^a	SEm^b
II	.85	1.56
III	.80	1.79
IV	.78	1.33
Sum of II, III, IV	.90	2.79

Metropolitan Readiness Tests were devised to measure
the extent to which school beginners have developed
in the several skills and abilities that contribute
to readiness for first-grade instruction. Designed
for testing pupils at the end of the kindergarten
year or the beginning of the first grade, these
tests provide a quick, convenient, and dependable
basis for early classification of pupils, thus help-
ing teachers manage the instructional effort more
efficiently. (Hildreth, 1956, p. 3).

There are six tests included in the test plus a seventh
which is optional. This test is a Draw-a-Man test and omit-
ted because of the degree of subjectivity involved in scor-
ing the items. Descriptions of the six tests follow.

Test 1. Word Meaning, a 16-item picture vocabulary
test. The pupil selects from three pictures the
one that illustrates the word the examiner names.

Test 2. Listening, a 16-item test of ability to
comprehend phrases and sentences instead of indi-
vidual words. The pupil selects from three pic-
tures the one which portrays a situation or event
the examiner describes briefly.

Test 3. Matching, a 14-item test of visual per-
ception involving the recognition of similarities.

The pupil marks one of three pictures which matches a given picture.

Test 4. Alphabet, a 16-item test of ability to recognize lower-case letters of the alphabet. The pupil chooses a letter named from among four alternatives.

Test 5. Numbers, a 26-item test of number knowledge.

Test 6. Copying, a 14-item test which measures a combination of visual perception and motor control. (Hildreth, 1956, p. 2).

Reliability data was gathered from samples of pupils from three different school systems participating in the standardization of the instrument. Odd-even coefficients were figured and corrected by the Spearman-Brown formula. Standard error of measurement was computed for each of the three samples for the total score. Table V is an abbreviated form of Table 8 in the manual of instructions.

TABLE V

RELIABILITY DATA FOR SUBTEST AND TOTAL SCORES ON
FORM A, METROPOLITAN READINESS TESTS

Test	Sample A (N = 167)		Sample B (N = 173)		Sample C (N = 200)	
	r_{11}[a]	SEm[b]	r_{11}[a]	SEm[b]	r_{11}[a]	SEm[b]
1. Word Meaning	.69		.58		.61	
2. Listening	.50		.33		.33	
3. Matching	.82		.83		.86	
4. Alphabet	.85		.87		.89	
5. Numbers	.78		.68		.84	
6. Copying	.81		.79		.85	
Total, 1 - 6	.91	4.2	.91	4.3	.94	4.3

[a]Odd-even coefficients, corrected by Spearman-Brown formula.
[b]Standard error of measurement of total score.

The Criterion Test

The New Developmental Reading Tests were developed by
Guy L. Bond, Bruce Balow and Cyril Hoyt. These tests are
composed of a battery of three parts with a total testing
time of 40 minutes. The tests were "designed to measure and
diagnose the general reading growth of all children in the
primary grades." (Bond, 1956, p. 2). For the purposes of
this research, it was found most convenient to use the Upper
Primary form of the New Developmental Reading Tests which
provides measurement for a large range of reading abilities
on the part of the students.

The following is a description of the parts that make
up this test.

Part I. Word Recognition. In each form Part I con-
tains 36 (for Lower Primary) or 42 (for Upper Prima-
ry) four-choice items for assessing the pupil's
word-recognition ability. The correct words as well
as over ninety percent of the distractors are sampled
from words that are common to the primary level books
of several basic reading series used most widely in
the schools of the country. The pupil is required
to read the four words in each item and select the
one which is most appropriately represented by a
simple picture. The tests are so constructed that
the pupil must read each of the four words for each
item before he can be reasonably confident that he
has chosen the correct one to go with the picture.

Part II. Comprehending Significant Ideas. Part II
of each form on both the Lower and Upper Primary
Tests consists of 40 four-choice items testing the
child's ability to comprehend ideas expressed in a
brief paragraph. Each paragraph is followed by two
items, one of which requires a certain degree of
interpretation and does not use the same words as
the paragraph. Thus, the child's ability to com-
prehend the meaning of the ideas expressed is
tested. These items test the following aspects of
reading comprehension: recognizing the main idea,
grasping the general significance, deducing a con-
clusion, drawing an inference, forming an opinion,

judging the relevancy and the reasonableness of re-
sponse choices as appropriate to the information
given in the paragraph.

Part III. Comprehending Specific Instructions.
Part III of each form consists of 26 (for Lower
Primary) and 32 (for Upper Primary) three response
items which test the child's ability to comprehend
specific instructions. The instructions become
more difficult and involve comprehension of more
ideas as the pupil progresses through the test. . .
One of the more difficult items in the Upper Pri-
mary Test requires more involved instructions:
"Tom painted his wagon brown. Tom's father painted
the sides of the house white. He painted the fence
the same color as Tom's wagon. Put C on what was
painted white. Draw a line under what Father
painted brown. (Bond, 1965, p. 3)

Technical data for the reliability statistics were gath-

ered by administered alternate forms of the test to 150 stu-

dents, half of them taking Form U-1, first and the other half

taking Form U-11 first. In less than a week, the order was

reversed and all subjects took the alternate form. Table VI

gives a summary of these statistics.

TABLE VI

CORRELATION COEFFICIENTS BETWEEN FORMS, AND STANDARD
ERROR OF MEASUREMENT FOR PARTS I, II, & III OF NEW
DEVELOPMENTAL READING TESTS-UPPER PRIMARY

Part	r	SEm
Word Recognition	.90	1.0
Comprehending Significant Ideas	.89	1.1
Comprehending Specific Instructions	.90	.9

N = 150   Source: Bond, 1965, p. 9, 10

Statistical Analysis

The statistical analysis was performed by the computer at the Oklahoma State University Computer Center. Three different treatments of the data yielded the information for the study.

The first step was the construction of an intercorrelation matrix. The statistical technique used was the Pearson product-moment correlation; the formula is:

$$r = \frac{N\Sigma XY - (\Sigma X)(\Sigma Y)}{\sqrt{[N\Sigma X^2 - (\Sigma X)^2][N\Sigma Y^2 - (\Sigma Y)^2]}}$$

where

N = number of pairs of scores

ΣXY = sum of the products of the paired scores

ΣX = sum of scores on one variable

ΣY = sum of scores on the other variable

ΣX^2 = sum of the squared scores on the X variable

ΣY^2 = sum of the squared scores on the Y variable

(Brunning and Kintz, 1968, p. 153).

The second statistical technique used was Multiple correlation. This technique allowed the identification of the optimum combinations of predictor variables and their unique contribution to the multiple correlation. The formula for the multiple correlation technique is as follows:

$$R = B_1 r_1 + B_2 r_2 + \ldots B_n + r_n$$

where

R = multiple correlation coefficient

B_1 = Beta weight for predictor #1

r_1 = Pearson product-moment correlation between predictor # and the criterion variable.

Some further explanation of multiple correlation should be added. The amount of total variance in the dependent variable that can be accounted for by the combined variables represented in the multiple correlation can be determined by squaring the multiple correlation coefficient (R). The R^2 represents the variance in the dependent variable accounted for by the combination of independent variables in the particular multiple correlation.

The Beta weight factor in the multiple correlation equation represents the amount of unique variance in the dependent variable which can be accounted for by an individual predictor variable.

The last statistical technique employed was that of factor analysis. In this case, the computer was asked to separate individual variables into as many g r o u p s (or factors) as necessary so that each factor would be composed of variables measuring a unique facet of readiness. The principal upon which factor analysis operates is that of least intercorrelation. Each individual factor is composed of those variables which are most highly intercorrelated. While factors are separated on the basis of being composed of variables which have small and/or insignificant inter-correlations.

Summary

Chapter III has presented a description of the variables used in the present study. The predictor variables were measured by scores on thirteen subtests found in three standardized measures of readiness. The criterion variables were measured by scores on three subtests of a standardized measure of reading performance.

The subjects were 30 second year students from a small Oklahoma town. The subjects represented the entire student population who had remained in the school system from kindergarten to second grade. These subjects were given the readiness measures in April, 1970, and the reading performance tests, the New Developmental Reading Tests, in January, 1972.

The statistical techniques employed were Pearson product-moment correlation, multiple correlation and factor analysis.

CHAPTER IV

ANALYSIS OF THE DATA

The purpose of this chapter is to report the results of
the analysis of the data. The findings will be reported in
three sections. The tests of the three hypotheses will be
presented first. Following that the results of the multiple
correlation will be presented. Finally the results of the
factor analysis will be discussed.

Results Related to Hypothesis I

Correlations of the readiness variables and the crite-
rion variable, Word Recognition, are presented in Table VII.
The readiness variable Letter and Sounds was significantly
correlated $(r = .370)$ to Word Recognition at the 0.1 level of
confidence. The Auditory Perception variable was correlated
$(r = .453)$ with Word Recognition at the 0.02 level of confi-
dence. No other readiness variable was significantly re-
lated to reading achievement as measured by the Word
Recognition Test. Hypothesis I will be rejected for the
readiness variables Letters and Sounds, and Auditory Percep-
tion, while it will be accepted for all other readiness
variables.

TABLE VII

RESULTS OF CORRELATIONS OF READINESS VARIABLES
WITH WORD RECOGNITION

Readiness Variable	Mean	S. D.	Correlation Coefficient
Environment	32.100	4.270	-0.106
Mathematics	19.800	4.642	0.047
Letters & Sounds	18.500	4.006	0.370*
Aural Comprehension	19.233	3.202	0.129
Visual Perception	19.967	2.539	0.178
Auditory Perception	9.100	3.458	0.453***
Vocabulary & Concepts	24.100	1.583	0.152
Word Meaning	8.467	2.543	0.246
Listening	9.733	2.477	-0.072
Matching	9.367	2.748	0.055
Alphabet	12.067	3.237	0.224
Numbers	13.367	2.988	0.127
Copying	5.500	1.834	0.180

*Significant at the 0.10 level of confidence.

***Significant at the 0.02 level of confidence.

Results Related to Hypothesis II

The Pearson product-moment correlations for the readiness variables and the criterion variable, Comprehending Significant Ideas, are presented in Table VIII. The readiness variable Letters and Sounds was significantly correlated to (r = .468) Comprehending Significant Ideas at the .02 level of confidence.

TABLE VIII

RESULTS OF CORRELATION OF READINESS VARIABLES WITH
COMPREHENDING SIGNIFICANT IDEAS

Readiness Variable	Mean	S. D.	Correlation Coefficient
Environment	32.100	4.270	0.000
Mathematics	19.800	4.642	0.020
Letters & Sounds	18.500	6.006	0.468***
Aural Comprehension	19.233	3.202	0.288
Visual Perception	19.967	2.539	0.106
Auditory Perception	9.100	3.458	0.417**
Vocabulary & Concepts	24.100	1.583	0.067
Word Meaning	8.467	2.543	0.220
Listening	9.733	2.477	-0.007
Matching	9.367	2.748	0.037
Alphabet	12.067	3.237	0.263
Numbers	13.367	2.988	0.175
Copying	5.500	1.834	0.146

**Significant at the 0.05 level of confidence.

***Significant at the 0.02 level of confidence.

The Auditory Perception variable was significantly correlated (r = .417) with Comprehending Significant Ideas at

the .05 level of confidence. No other readiness variables were significantly related to reading achievement as measured by the Comprehending Significant Ideas test.

Hypothesis II will be rejected for the readiness variables of Letters and Sound, and Auditory Perception; while it will be accepted for all other readiness variables.

Results Related to Hypothesis III

The Pearson product-moment correlations for the readiness variables and the criterion variable, Comprehending Specific Instructions, are presented in Table IX. The readiness variables of Visual Perception ($r = .326$) and of Copying ($r = .323$) were significantly related to Comprehending Specific Instructions at the 0.1 level of confidence. The Letters and Sounds variable ($r = .472$) was significantly related to Comprehending Specific Ideas at the .02 level of confidence. The Auditory Perception variable and the Word Meaning variable were both significantly correlated to Comprehending Specific Instructions at the .01 level of confidence.

Hypothesis III will be rejected for the readiness variables of Letters and Sounds, Visual Perceptions, Auditory Perception, Word Meaning, and Copying; while it will be accepted for all other readiness variables.

Results Related to Question I

The multiple correlation figures for all predictor variables which contributed significantly to the multiple

TABLE IX

RESULTS OF CORRELATIONS OF READINESS VARIABLES WITH
COMPREHENDING SPECIFIC INSTRUCTIONS

Readiness Variable	Mean	S. D.	Correlation Coefficient
Environment	32.100	4.270	0.076
Mathematics	19.800	4.642	0.249
Letters & Sounds	18.500	4.006	0.472***
Aural Comprehension	19.233	3.202	0.287
Visual Perception	19.967	2.539	0.326*
Auditory Perception	9.100	3.458	0.495****
Vocabulary & Concepts	24.100	1.583	0.191
Word Meaning	8.467	2.543	0.488****
Listening	9.733	2.477	-0.001
Matching	9.367	2.748	0.232
Alphabet	12.067	3.237	0.221
Numbers	13.367	2.988	0.182
Copying	5.500	1.834	0.323*

*Significant at the 0.10 level of confidence.

***Significant at the 0.02 level of confidence.

****Significant at the 0.01 level of confidence.

correlation are presented in Table X. Of major importance in this table is the fact that the predictor variables were added to the equation beginning with the variable that ac-counted for the greatest amount of unique variance in the criterion variable. The last predictor added contributed least to the multiple correlation coefficient.

TABLE X

RESULTS OF THE MULTIPLE CORRELATION FOR WORD RECOGNITION

Readiness Variable	Correlation With Word Recognition	Unique Con-tribution to the Multiple Correlation	Cumulative Multiple Correlation Coefficient	Level of Sig-nificance
Auditory Perception	0.453***	0.873	.453	0.05
Letters & Sounds	0.370*	0.676	.528	0.01
Mathematics	0.047	-0.532	.594	0.01
Aural Comprehension	0.129	-0.575	.651	0.01
Word Meaning	0.246	0.057	.679	0.01
Matching	0.055	-0.530	.692	0.01
Copying	0.180	0.301	.717	0.01
Vocabulary & Concepts	0.152	0.464	.735	0.01
Alphabet	0.224	-0.235	.750	0.01
Visual Perception	0.178	0.261	.760	0.01
Numbers	0.127	-0.242	.778	0.01
Listening	-0.072	-0.073	.781	0.01
Environment	-0.106	0.111	.782	0.01

*Significant at the 0.10 level of confidence.

***Significant at the 0.02 level of confidence.

The combination of all the predictor variables yields a multiple correlation coefficient of .782 which is significant at the 0.01 level of confidence, as are all of the multiple correlation coefficients in this case. However, by visual inspection of the coefficients, it becomes apparent that the first four readiness variables, Auditory Perception, Letters and Sounds, Mathematics, and Aural Comprehension, are contributing most heavily to the multiple coefficient.

Results Related to Question II

The total multiple correlation for all readiness variables which made a significant contribution to the multiple correlation coefficient can be found in Table XI. As stated before the variables were added one at a time to the question, beginning with the readiness variable which contributed most to the correlation, down to the one which made the least contribution. The Alphabet variable was not included in the table because it was rejected by the computer as being of insignificant importance to the multiple correlation.

The total multiple correlation coefficient was 0.759 for the twelve significant contributors to the correlation. This was significant at the 0.01 level of confidence as were all preceding multiple correlation coefficients in this case. The first three readiness variables, Letters and Sounds, Auditory Perception, and Mathematics, are apparently contributing most heavily to the multiple correlation coefficient.

TABLE XI

RESULTS OF THE MULTIPLE CORRELATION FOR
COMPREHENDING SIGNIFICANT IDEAS

Readiness Variable	Correlation With Comp. Significant Ideas	Unique Contribution to the Multiple Correlation	Cumulative Multiple Correlation Coefficient	Level of Significance
Letters & Sounds	0.468***	0.371	0.468	0.01
Auditory Perception	0.417**	1.062	0.565	0.01
Mathematics	0.020	-1.188	0.637	0.01
Aural Comprehension	0.211	-0.381	0.663	0.01
Environment	-0.001	0.660	0.702	0.01
Word Meaning	0.220	0.225	0.714	0.01
Copying	0.146	0.208	0.723	0.01
Matching	0.037	-0.303	0.743	0.01
Visual Perception	0.106	0.163	0.746	0.01
Numbers	0.175	-0.162	0.752	0.01
Vocabulary & Concepts	0.067	0.096	0.757	0.01
Listening	-0.007	0.060	0.759	0.01

**Significant at the 0.05 level of confidence.

***Significant at the 0.02 level of confidence.

Results Related to Question III

The criterion variable, Comprehending Specific Instructions, was the dependent variable for the third set of multiple correlations.

The multiple correlation table utilizing all thirteen of the predictor variables is presented in Table XII. All of the multiple correlation coefficients were significant at the .01 level of confidence. Using all of the predictor variables the multiple correlation coefficient was 0.778. The first four predictor variables, Auditory Perception, Letters and Sounds, Word Meaning, and Mathematics, seemed to be the variables contributing the most to the multiple correlation.

Results Related to the Factor Analysis

Factor analysis is one way of examining factors which are highly correlated with a group or factor and which have small correlations between groups or factors. Table XIII shows the five factors. Those predictor variables contributing most heavily to each factor are underscored. In the case of Matching which loaded heavily in two factors, it was used only in the Visual Discrimination factor because its weight was somewhat greater in this factor than in the Word Association factor.

Factor I - Experiential Background

The readiness variables Environment, Mathematics, and Word Meaning were loaded most heavily in this factor. These

TABLE XII

RESULTS OF MULTIPLE CORRELATION FOR COMPREHENDING
SPECIFIC INSTRUCTIONS

Readiness Variable	Correlation with Comp. Specific Instructions	Unique Contribution to the Multiple Correlation	Cumulative Multiple Correlation Coefficient	Level of Significance
Auditory Perception	0.495****	0.718	0.495	0.01
Letters & Sounds	0.472***	0.422	0.616	0.01
Word Meaning	0.488****	0.390	0.658	0.01
Mathematics	0.249	-0.508	0.695	0.01
Copying	0.323*	0.312	0.724	0.01
Matching	0.232	-0.308	0.737	0.01
Aural Comprehension	0.287	-0.316	0.744	0.01
Listening	-0.001	0.076	0.750	0.01
Alphabet	0.221	-0.203	0.755	0.01
Vocabulary & Concepts	0.191	0.220	0.761	0.01
Visual Perception	0.326	0.217	0.770	0.01
Numbers	0.182*	-0.156	0.776	0.01
Environment	0.076	0.102	0.778	0.01

*Significant at the 0.10 level of confidence.

***Significant at the 0.02 level of confidence.

****Significant at the 0.01 level of confidence.

TABLE XIII

ROTATED FACTOR MATRIX

Predictor Variables	Factor I Experiential Background	Factor II Educational Background	Factor III Word Association	Factor IV Visual Perception	Factor V Auditory Perception
Environment	0.912*	0.113	-0.003	0.054	0.054
Mathematics	0.872*	-0.049	0.064	0.290	0.208
Letters & Sounds	0.208	0.613*	-0.110	0.265	0.313
Aural Comprehension	0.098	0.063	0.054	0.062	0.923*
Visual Perception	0.252	0.178	-0.092	0.728*	0.250
Auditory Perception	0.285	-0.208	0.122	0.185	0.568*
Vocabulary & Concepts	0.100	0.124	0.938*	-0.070	0.033
Word Meaning	0.653*	0.098	0.371	0.144	0.076
Listening	-0.098	0.673*	0.118	-0.152	0.106
Matching	0.170	-0.100	0.574	0.658*	0.193
Alphabet	0.001	0.751*	0.109	0.350	-0.194
Numbers	0.394	0.618*	-0.054	0.190	-0.126
Copying	0.112	0.133	-0.019	0.848*	-0.072

*Indicates those readiness variables loading most heavily in each factor.

subtests tend to measure preschool learning of the child.

Table XIV shows variable contributions to this factor.

TABLE XIV

READINESS VARIABLE COMPONENTS OF FACTOR
I--EXPERIENTIAL BACKGROUND

Variable	Contribution
Environment	0.912
Mathematics	0.872
Word Meaning	0.653

Factor II - Educational Background

Letters and Sounds, Listening, Alphabet, and Numbers
were the readiness variables most heavily loaded in this fac-
tor. These variables tend to measure the planned learning
that takes place at the kindergarten level, rather than the
incidental learning which is measured in Factor I--Experien-
tial Background Factors. Table XV shows the variable com-
ponents of Factor II.

TABLE XV

READINESS VARIABLE COMPONENTS OF FACTOR
II--EDUCATIONAL BACKGROUND

Variable	Contribution
Alphabet	0.751
Listening	0.673
Numbers	0.618
Letters & Sounds	0.613

Factor III--Word Association Factor

This factor contains only the variable of Vocabulary and
Concepts which measures a child's ability to associate a
spoken work or idea with the correct picture. Table XVI
shows the variable components of Factor III.

TABLE XVI

READINESS VARIABLE COMPONENTS OF FACTOR
III--WORD ASSOCIATION

Variable	Contribution
Word Meaning	0.938

Factor IV--Visual Perception

This factor was most heavily loaded by Visual Percep-
tion, Matching and Copying. All of these tasks require the
subject to make visual discriminations in carrying out the
required tasks of the subtests. Table XVII shows the varia-
ble components of this factor.

TABLE XVII

READINESS VARIABLE COMPONENTS OF FACTOR
IV--VISUAL PERCEPTION

Variable	Contribution
Copying	0.848
Visual Perception	0.728
Matching	0.658

Factor V--Auditory Perception

Aural Comprehension and Auditory Perception were the two predictor variables most heavily loaded in this factor. Both of these tasks require the subject to listen to a stimulus word or idea and then to discriminate the correct response. Table XVIII shows the readiness variable components of this factor.

TABLE XVIII

READINESS VARIABLE COMPONENTS OF FACTOR
V--AUDITORY PERCEPTION

Variable	Contribution
Aural Comprehension	0.923
Auditory Perception	0.568

Summary

This chapter presented the results of the correlations between the predictor variables and the criterion variables. Readiness variables significantly related to Word Recognition and Comprehending Significant Ideas were Auditory Perception and Letters and Sounds. In addition to these two variables, Copying, Visual Perceptions, and Word Meaning were significantly related to Comprehending Specific Instructions. Table XIX gives a summary of the significant correlations.

Multiple correlations indicate that Auditory Perception, Letters and Sounds, Mathematics, and Aural Comprehension are

TABLE XIX

SUMMARY OF SIGNIFICANT CORRELATIONS

Criterion Variables	Predictor Variables	Correlation Coefficient
Word Recognition	Auditory Perception	0.453***
	Letters & Sounds	0.370*
Comprehending Significant Ideas	Letters & Sounds	0.468***
	Auditory Perception	0.417***
Comprehending Specific Instructions	Word Meaning	0.488****
	Letters & Sounds	0.472***
	Visual Perception	0.326*
	Copying	0.323*

*Significant at the 0.10 level of confidence.

**Significant at the 0.05 level of confidence.

***Significant at the 0.02 level of confidence.

****Significant at the 0.01 level of confidence.

the optimum combination for predicting reading achievement as measured by Word Recognition. For Comprehending Significant Ideas, the best combination of predictors is Letters and Sounds, Auditory Perception, and Mathematics. The best combination of predictors for Comprehending Specific Instructions was Auditory Perception, Letters and Sounds, Word Meaning and Mathematics. Table XX gives a summary of the most significant multiple correlation coefficients.

TABLE XX

SUMMARY OF MOST SIGNIFICANT MULTIPLE
CORRELATION COEFFICIENTS

Criterion Variable	Combination of Predictor Variables	Multiple Correlation Coefficient
Word Recognition	Auditory Perception	
	Letters & Sounds	
	Mathematics	
	Aural Comprehension	0.651****
Comprehending Significant Ideas	Letters & Sounds	
	Auditory Perception	
	Mathematics	0.637****
Comprehending Specific Instructions	Auditory Perception	
	Letters & Sounds	
	Word Meaning	
	Mathematics	0.695****

****Significant at the 0.01 level of confidence.

Factor analysis yielded five factors: I--Experiential Background, II--Educational Background, III--Word Association, IV--Visual Perception, and V--Auditory Perception. Table XXI gives a summary of factors and their component readiness variables.

TABLE XXI

SUMMARY OF FACTORS AND COMPONENT
READINESS VARIABLES

Factors	Readiness Variables
Factor I--Experiential Background	Environment
	Mathematics
	Word Meaning
Factor II--Educational Background	Alphabet
	Listening
	Numbers
	Letters & Sounds
Factor III--Word Association	Vocabulary & Concepts
Factor IV--Visual Perception	Copying
	Visual Perception
	Matching
Factor V--Auditory Perception	Aural Comprehension
	Auditory Perception

CHAPTER V

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

This chapter will be presented in three sections. First a general summary of the investigation will be given. The second section will be concerned with the conclusions drawn from the study. The last section will discuss recommendations for future research.

Summary

The purpose of this study was to determine the predictive relationship of certain readiness variables to reading achievement in the second grade. A factor analysis of the readiness variables was made in an attempt to determine which of the readiness variables were measuring the same readiness factor.

Three hypotheses were stated in the null concerning the predictive relationship of the readiness variables to each of the three criterion variables. These hypotheses were as follows:

Ho_1: There is no significant correlation between the scores on the readiness variables and reading achievement as measured by scores on the Word Recognition Test.

Ho$_2$: There is no significant correlation between the scores on the readiness variables and reading achievement as measured by scores on the Comprehending Significant Ideas test.

Ho$_3$: There is no significant correlation between the scores on the readiness variables and reading achievement as measured by scores on the Comprehending Specific Instructions test.

A question was asked concerning the nature of the multiple correlations when all significant contributing predictor variables are multiple correlates of each criterion variable. These questions were as follows:

1. In regard to the dependent variable, Word Recognition, what will be revealed by the multiple correlation when all of the significant contributing predictor variables are used in the correlation?

2. In regard to the dependent variable, Comprehending Significant Ideas, what will be revealed by the multiple correlation when all of the significant contributing predictor variables are used in the correlation?

3. In regard to the dependent variable, Comprehending Specific Instructions, what will be revealed by the multiple correlation when all of the significant contributing predictor variables are used in the correlation?

The data utilized in this investigation were collected from 30 subjects who were administered three standardized readiness tests which were used as predictor variables

(independent variables) and a standardized reading perform-
ance test which was administered twenty-one months later at
mid-year of the second grade. The three subtests of this
standardized reading performance test were used as the cri-
terion variables (dependent variables).

Analysis of the data using the Pearson product-moment
technique was used to test the hypotheses. It was found that
for the criterion variable Word Recognition there was a posi-
tive significant correlation with the variables of Letters &
Sounds, and Auditory Perception. For the criterion variable,
Comprehending Significant Ideas there was a significant posi-
tive correlation with the predictor variables of Letters &
Sounds, and Auditory Perception. Significant positive corre-
lations were also found for the predictor variables Letters
& Sounds, Visual Perception, Auditory Perception, Word Mean-
ing, and Copying and the criterion variable of Comprehending
Specific Instructions.

The results of the multiple correlations indicated that
except in the case of Comprehending Significant Ideas, all of
the predictor variables did make a contribution to the multi-
ple correlation coefficients. For all three of the criterion
variables, three predictor variables consistently accounted
for the greatest contribution to the multiple correlation
coefficient. These predictor variables were Auditory Per-
ception, Letters & Sounds, and Mathematics.

Factorial analysis produced five unique factors with
each readiness variable appearing only once as a contributor

to that factor: Factor I--Experiential Background was composed of the readiness variables Environment, Mathematics, and Word Meaning; Factor II--Educational Background was composed of Letters & Sounds, Listening, Alphabet, and Numbers; Factor III--Word Association was composed of the Vocabulary & Concepts variable only; Factor IV--Visual Perception was composed of the Visual Perception, Matching, and Copying variables; and Factor V--Auditory Perception was composed of Aural Comprehension and Auditory Perception.

Conclusions

The results of the analysis of data in the present investigation warrant the following conclusions:

1. Scores on the readiness variables Letters & Sounds and Auditory Perception are predictive of reading achievement as measured by scores on the Word Recognition test.

2. Scores on the readiness variables Letters & Sounds, and Auditory Perception are predictive of reading achievement as measured by scores on the Comprehending Significant Ideas test.

3. Scores on the readiness variables Letters & Sounds, Visual Perception, Auditory Perception, Word Meaning, and Copying are predictive of reading achievement as measured by scores on the Comprehending Specific Instructions test.

4. The best combination of predictor variables for predicting reading achievement as measured by scores on the Word Recognition test in the order of their importance are Auditory Perception, Letters & Sounds, Mathematics, and Aural Comprehension.

5. The best combination of predictor variables for predicting reading achievement as measured by scores on the Comprehending Significant Ideas test in the order of their importance are Letters & Sounds, Auditory Perception, and Mathematics.

6. The best combination of predictor variables for predicting reading achievement as measured by scores on the Comprehending Specific Ideas test in the order of their importance are Auditory Perception, Letters & Sounds, Word Meaning, and Mathematics.

7. The most effective predictors of overall reading achievement at mid-year of the second year in school appear to be Auditory Perception, Letters & Sounds, and Mathematics.

8. These three important predictor variables, Auditory Perception, Letters & Sounds, and Mathematics, all appear to be independent measures because the factor analysis showed that they contributed most heavily to different factors.

9. The thirteen readiness variables appeared to measure five independent factors in readiness, these were: Experiential Background, Educational Background,

Word Association, Visual Perception, and Auditory
Perception.

Recommendations

The present study has made a significant contribution
to reading readiness research by identifying significant pre-
dictive readiness variables as subtests of standardized
instruments that have not been researched previously. How-
ever, additional research is needed to allow for further
generalizationability of these findings and to verify the
results on populations other than the one used in the study.
Recommendations for further research based on the present
study are as follows:

1. The results of this study were based on data col-
   lected from one small school system. Although the
   whole population was used in the study, it is rec-
   ommended that a similar study be conducted with a
   larger and different (urban and rural) population.

2. Further research is needed to identify significant
   predictive variables on other readiness tests.

3. Research is needed to determine if teaching directed
   specifically at deficiencies which have been identi-
   fied in these significant readiness variables is
   effective.

4. Using the same sample, a re-evaluation in third and
   fourth grade would demonstrate the stability of the
   predictor variables over a period of time.

Concluding Statement

The present investigation was designed to study the relationship of thirteen reading readiness variables as predictors of reading achievement at the second grade level. It was found that in most cases the best predictions of reading achievement could be made by the combination of the readiness variables Auditory Perception, Letters & Sounds, and Mathematics.

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VITA

Caryl Neman Seals

Candidate for the Degree of

Doctor of Education

Thesis: AN INVESTIGATION OF SELECTED READINESS VARIABLES AS PREDICTORS OF READING ACHIEVEMENT AT SECOND GRADE LEVEL

Major Field: Elementary Education

Biographical:

Personal Data: Born in Temple, Texas, December 17, 1940, the daughter of Ben and Lorena Scott Neman.

Education: Attended public schools in Temple, Texas; Corrigan, Texas; and New Orleans, Louisiana. Graduated from Warren Easton High School in 1958. Attended Louisiana State University, Baton Rouge, Louisiana (1958-59); Mary Hardin-Baylor College, Belton, Texas (1959-60); received a Bachelor of Science in Education degree from Southwest Texas State University, San Marcos, Texas, in 1964; received a Master of Science degree in Library Science from East Texas State University, Commerce, Texas, in 1967; completed requirements for the Degree of Doctor of Education in May, 1972, from Oklahoma State University, Stillwater.

Professional Experience: Third grade teacher, spring 1964, first grade teacher 1964-1965 at Rose Garden Elementary School, Universal City, Texas; graduate assistant in the Curriculum Library at East Texas State University, Commerce, Texas, 1965-1966; Head of the Bindery and Assistant Periodicals Librarian at East Texas State University Library, 1967-1968; Reading Teacher for the seventh and eighth grades in 1969-1970, and reading specialist for the elementary school, 1970-1971, in the Drumright Public Schools, Drumright, Oklahoma; graduate assistant in the Reading Center at Oklahoma State University, 1971-1972, teaching the College Reading

Improvement Program in the fall and the Develop-
ment of Study Habits in the spring; Educational
Extension Instructor in the spring 1972, teaching
Developmental Reading for Oklahoma State
University.