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ABSTRACT

The purpose of this study was to determine whether there were statistically significant correlations among standardized test scores due to general reading ability and whether these correlations were affected by the factors of sex, race, and I.Q. Scores were collected for three different tests (Nelson-Denny Reading Test, Lorge-Thorndike I.Q. Test, and the verbal section of the SAT) taken by 154 senior students throughout their high school careers. Statistics resulting from computations indicated that all tests shared a large common variance, with reading ability more closely related to verbal aptitude than to intelligence. To determine the key element most likely linking the three tests, reading ability and then intelligence were held constant for these correlations. Resulting partial-order correlations pointed to reading ability as the factor most highly related to standardized test scores. Sex accounted for insignificant differences while race is a far more significant variable as a predictor of verbal ability and test score results. It is suggested that inexpensive and easy to administer standardized reading tests can be used more efficiently by educators in the schools. (Author/JM)

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STANDARDIZED TEST PERFORMANCE AS A FUNCTION OF GENERAL READING ABILITY

A THESIS

SUBMITTED TO THE FACULTY

OF THE GRADUATE SCHOOL OF EDUCATION

OF

RUTGERS

THE STATE UNIVERSITY OF NEW JERSEY

BY

MARJORIE S. EISENBERG

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REQUIREMENTS FOR THE DEGREE

OF

MASTER OF EDUCATION

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CHAPTER I

INTRODUCTION

Background of the Study

A question arises within the field of education as to the relationship of reading ability to various scores on standardized tests. Since the majority of tests prepared for secondary school students are of the paper-and-pencil variety, they all necessitate the ability to read. That is to say, an individual must be able to follow written directions, understand certain vocabulary terms, and comprehend the written material presented to him during the testing situation if he is to display his abilities on tests that require and demand reading. Therefore, general reading ability should function to produce stable individual differences among subjects; and these individual differences should be evidenced by significant correlations among different standardized test scores.

One relationship for which there is a lack of specific information is that of reading scores as measured by the Nelson-Denny Reading Test to verbal scores on the Scholastic Aptitude Test. A study conducted by

Garrett (1949) has shown a high correlation with collegiate scholastic success for each test separately. Weiner and Kay (1972), in a study conducted with approximately 32,000 high school students admitted to the City University of New York (CUNY), conclude that inexpensive standardized tests which measure achievement in reading may be used to predict scores on the SAT. No studies, however, have been conducted to see if there is a relationship among the Nelson-Denny Reading Test, Lorge-Thorndike Intelligence Test, and verbal section of the SAT due to the factor of general reading ability. In addition, one may ask what role the factors of sex and racial background play in the aforementioned relationship.

The present study constitutes an exploratory attempt to begin gathering evidence for examining the notion that general reading ability will function to produce relatively stable performances by different individuals on different standardized tests.

Statement of the Problem

Will general reading ability, as measured directly by raw scores on the Nelson-Denny Reading Test, function to produce statistically significant correlations with standardized scores on the verbal section of the Scholastic Aptitude Test and Lorge-Thorndike I.Q. Test? Will there be any statistically significant differences in the

correlations due to sex, race, and I.Q.?

These hypotheses are investigated in this study:

1. There will be no correlation between reading ability, as measured by raw scores on the Nelson-Denny Reading Test, and either verbal scores on the SAT or Lorge-Thorndike I.Q. scores (total, verbal, and nonverbal) for the total population, males, females, whites, and minority students, respectively.

2. There will be no correlation between verbal scores on the SAT and I.Q. scores (total, verbal, and nonverbal) holding reading ability constant for the total population, males, females, whites, and minority students, respectively.

3. There will be no correlation between raw scores on the Nelson-Denny Reading Test and verbal scores on the SAT holding total I.Q. scores constant for the total population, males, females, whites, and minority students, respectively.

Importance of the Study

Reading ability, as measured directly by the Nelson-Denny Reading Test, has not been compared to I.Q. scores and aptitude scores on the verbal section of the SAT. All three tests, based on face validity, require students to use reading skills in knowledge of vocabulary and comprehension of written materials. A need for

research of the relationship among these tests is apparent as it would be useful to determine whether or not individual scores on standardized tests are a function of general reading ability. If such is the case, all standardized tests might, in fact, only measure globally general reading ability in spite of the title of the test.

If a strong relationship is found to exist among these tests, it might serve as an important consideration for high school counselors and teachers in their assessment of students' programs and needs. As a screening device, these tests could enable school personnel to identify those students who might need further testing of reading skills, and could possibly assist in the preparation of students to achieve that which they are capable of achieving through developmental, supplemental, and remedial programs. In addition, educators might be able to eliminate the need for all testing except that which specifically measures certain reading skills.

Definitions of Terms

For the purposes of this study, these limited definitions need to be recognized.

Reading ability is measured by those scores obtained through the use of the Nelson-Denny Reading Test, Form A, 1960 edition. These scores are divided into two categories: word knowledge, and level of comprehension,

all of which are expressed in raw scores.

I.Q. is measured by those standardized scores obtained through the use of the Lorge-Thorndike Intelligence Tests, Level 4, 1957 edition.

Verbal aptitude is measured by those standardized scores obtained through the use of the verbal section of the Scholastic Aptitude Test.

Minority students are those students considered to be nonwhite by the counseling staff of Franklin High School, Somerset, New Jersey.

Limitations of the Study

The population for this study was limited to 154 students in their senior year in Franklin High School located in Somerset, New Jersey. This population was about evenly divided between male and female students, of whom approximately 20% were of minority status. Income levels varied from the low to the upper middle-class bracket, and the population was drawn from urban, suburban, and rural settings according to the makeup of the entire community.

This study was limited by the fact that those students who were not tested with the Nelson-Denny Reading Test, the Lorge-Thorndike Intelligence Test, and the Scholastic Aptitude Test were not considered in the evaluation. In addition, all testing was conducted by either

members of the High school Guidance or English department, not by the investigator. Students taking the SAT did so during various times in their junior and senior years.

CHAPTER II

REVIEW OF THE LITERATURE

Testing Problems

Throughout a child's developmental years, he is constantly subjected to a barrage of tests to measure numerous skills and abilities that incorporate reading ability. Very often, educators and administrators are at a loss to justify the use of such tests; indeed, it is not infrequent to learn that these people do not have a clear understanding of the differences among intelligence tests, scholastic aptitude tests, and reading tests. It is no wonder that scores are misunderstood by incompetent people and often filed away for indefinite periods. Testing does have its place within the realm of education if we understand its purposes and put it to good use, i.e., the welfare of the child so that he might benefit from it. Testing, in and of itself, has no unique purpose.

Triggs (1943) clearly states the differences among intelligence tests, scholastic aptitude tests, and reading tests. An intelligence test is designed to measure intellectual capacity or native ability not dependent greatly on linguistic skills or any other special

abilities. Aptitude tests, however, are designed to measure an individual's native or acquired abilities for specific kinds of activities. Reading tests (group survey tests) generally try to measure vocabulary and comprehension. One may ask, however, if these tests actually measure what they purport to measure. Traxler (1958) states that there is a lack of clear differentiation between measurement of reading comprehension and measurement of intelligence. Triggs (1943) also asks whether or not intelligence tests and aptitude tests, in fact, actually measure the same thing--a general verbal ability more related to reading than to the design of the two tests mentioned.

Reading as the Key to Test Results

What is it that we actually measure when we test children? Can it be said in all fairness that we accurately measure those things known as reading, intelligence, and scholastic aptitude? Farr (1969) has stated that the choice of a particular test can greatly influence test scores. In addition, he states that performance on a test is merely one sample of a given individual's behavior at one particular moment in time. When the time of day, the content of the material on the test, or the administrator are varied, significant differences in test performance may occur.

It has been shown by Vineyard and Massey (1957) that intelligence correlates highly with the linguistic skills of vocabulary, paragraph comprehension, and spelling for college freshmen. Tests used included the Nelson-Denny Reading Test, Form A, the spelling test of the Differential Aptitude Tests, and the American Council on Education Psychological Examination, 1952 edition. Coefficients of correlation were 0.708, 0.659, and 0.573 between intelligence and vocabulary, speed of comprehension, and spelling, respectively. Lennon (1950) has pointed out that as chronological age increases, the correlations between intelligence and reading increase. On the other hand, research by Durrell (1933) has strongly suggested that reading is the key to performance on academic achievement and intelligence tests. He states:

> The group intelligence test involving a great number of reading items should not be used as a basis for intelligence or accomplishment quotients. It appears to be a reading test incorrectly labeled [p. 416].

Reading Subskills

What, then, is reading and how can it be measured? Traxler (1958) states that "reading is a complex, unified, continuous activity which does not naturally fall into subdivisions or measurable units [p. 2]." Harris (1970) has defined reading as "the meaningful interpretation of written or printed verbal symbols [p. 3]." Although not

easily measured, most test publishers such as Nelson (1960) have defined reading in terms of vocabulary, comprehension, and rate.

Most group intelligence tests, academic achievement tests, and reading survey tests include questions dealing with vocabulary. It is a most complex measurement task when one can see that there are 26 different approaches for measuring knowledge of word meanings. Kelley and Krey (1934) have categorized the approaches as follows:

1. Unaided recall
   - A. Checking for familiarity
   - B. Using words in a sentence
   - C. Explaining the meaning
   - D. Giving a synonym
   - E. Giving an opposite
2. Aided recall
   - A. Recall aided by recognition
     1. Matching tests
     2. Classification tests
     3. Multiple-choice tests
        - a. Choosing the opposite
        - b. Choosing the best synonym
        - c. Choosing the best definition
        - d. Choosing the best use in sentences

4. Same-opposite tests

5. Same-opposite-neither tests

6. Same-different tests

B. Recall aided by association

1. Completion test

2. Analogy test

C. Recall aided by recognition and association

1. Multiple-choice completion test

2. Multiple-choice substitution test

With so many approaches and no one best technique, it seems highly unlikely that an individual's reading vocabulary can be accurately measured. In addition, many vocabulary subtests, such as that included in the Nelson-Denny Reading Test, impose such severe time limits that they reduce the test's validity. Farr (1972) concludes that the vocabulary subtest for the Nelson-Denny should be titled "Speed of Reading Vocabulary." Boag and Neild (1962) point out that the average student who is slow and accurate comes out nearer the top when given plenty of time, but suffers when there is a time limit. The inclusion of an alternate-form or equivalent-form only compounds the problem of measuring vocabulary as stated by Farr (1969).

Another subskill measured by most group tests is comprehension. Kress (1966) has defined "comprehension in

reading is thinking stimulated by orthographic symbols [p. 34]." Nine skills believed to be components of reading comprehension were developed by Davis (1944). They include:

1. knowledge of word meanings;

2. ability to select the appropriate meaning for a word or phrase in light of its particular contextual setting;

3. ability to follow the organization of a passage and to identify antecedents and references to it;

4. ability to select the main thought of a passage;

5. ability to answer questions that are specifically answered in a passage;

6. ability to answer questions that are answered in a passage but not in words in which the question is asked;

7. ability to draw inferences from a passage about its content;

8. ability to recognize the literary devices used in a passage and to determine its mood and intent;

9. ability to determine a writer's purpose, intent, and point of view, i.e., to draw inferences about a writer.

This list of skills shows the diversity and complexity in the measurement of comprehension. Applebee

(1972) and Carver (1970) point out that, in essence, many tests involving reading comprehension actually measure a blend of intelligence, general knowledge, reading, and test-taking strategy to arrive at a final score. Farr (1969) goes on to cite additional problems affecting the measurement of reading comprehension. These include the effects of timing, allowing examinees to look back at the reading selection, personality traits of the examinees, and purposes for reading.

The problem seems clear that there is a diversity of opinion as to how to measure reading subskills, if indeed they can be measured at all; and if the process of reading itself can be clearly defined. Certainly, no one test can accurately measure all of the components involved in the reading process (Kingston, 1960).

Factors Related to Performance

Many factors exert an influence on an individual's performance in a testing situation. One that has received the greatest amount of research attention is sex differences. Traditional thought has been that girls perform significantly better than boys on tasks that require verbal skills. Age plays a large role with greater differences in reading test performance evidencing themselves in the lower grades. Possibly this might be accounted for by the American culture as cited by Farr (1969).

Within our society, young females are seen stereotypically as enjoying reading activities while young males are engaged in more physical adventures. Few tests, however, acknowledge sex differences in reading test performance by providing separate norms for each sex.

Edmonds (1964), in a study conducted in the South using eleventh-grade students from 66 high schools, came to some interesting conclusions summarized here. From his research he found that sex could not be assumed as a valid predictor of verbal ability, but that the socioeconomic level of the student was a far more consistent index. Differences between the sexes were no greater within economically depressed groups than within advantaged groups.

Fremer and Chandler (1971) summarize the findings on sex differences for candidates on the first SAT ever offered--June 1926. The data showed that girls were significantly superior to boys on the test as a whole. When subtest scores were analyzed, it was also found that girls performed significantly better than boys on Artificial Language, Antonyms, and Paragraph Reading; however, boys had a significant advantage on Arithmetical Problems and Number Series Completion. When the SAT's first reported separate verbal and mathematical scores--June 1930--girls did better on verbal, but boys were superior

on mathematical.

Recently, however, it has been found that boys and girls perform equally well on the SAT verbal section while there is still a substantial difference in favor of boys on the SAT mathematical. In a study carried out by the College Board (1968), the mean scores for all seniors who took the SAT from May 1967 through March 1968 can be summarized as follows:

	Verbal	Mathematical
SAT candidates--senior boys	463	510
SAT candidates--senior girls	464	466

Boykin (1955) conducted a study in 1953 with 596 college freshmen in a Negro college. Using the Reading Comprehension Test C1, Form R, of the Cooperative English Test, he concluded from the data that men averaged slightly higher than women in total reading ability. The question can be raised as to whether or not we can infer from the results that one sex exceeds the other in verbal ability or whether the items on the test caused the discrepancy in scores.

Scores, such as those reported by the College Board, do not in and of themselves prove that boys and girls are equal in verbal ability. Coffman (1961) points out:

It is well known that women tend to make higher

> scores than men on tests of verbal aptitude. Therefore, if men and women make comparable scores on a [particular] test of verbal aptitude, one is likely to suspect some bias in the sampling of either men or women or both. On the other hand, consider the possibility that the observed differences in favor of women may be a function of their superiority on some of the questions in the test and not others. If such be the case, and if the test constructor is not aware of which items are producing the differences, he might at some point construct a test form which produces essentially equivalent scores for men and women even though there is no bias in the samples of the people [emphasis by Coffman] [p. 117].

Test Bias as Related to Performance

Another factor that affects performance is that of test bias as seen in terms of individual test items. Cleary and Hilton (1968) investigated the difficulty of test items on the PSAT for different racial and socioeconomic groups. Their sample included an equal number of black and white twelfth-grade students from seven integrated schools in three large metropolitan centers. From the data, they concluded that there were few items producing an uncommon discrepancy between the performance of Negro and white students. This is in agreement with their definition of bias which states that item bias occurs when there is an uncommon discrepancy between the performance of members of one group and members of other groups. They also indicate that this definition of bias does not connotate "unfair," merely that the mean of a particular group may be higher or lower than expected.

Racial Background as Related to Performance

The last factor to be examined here is that of racial background or socioeconomic status. Boykin's study (1955), in addition to examining the factor of sex, questioned why Negro students scored so poorly on the Cooperative English Test. Farr (1969) draws the conclusion that the low scores obtained by minority students are not due to the test or the students, but are created by the educational system and society within which we live. That is to say, children can only learn what their environment provides. Chandler (1966) feels that differences in test intelligence and reading achievement between the races can be attributed to the dearth of intellectual stimulation often lacking in the lower-class home. Even though socially disadvantaged students perform poorly on standardized tests, that is not to say that these students lack the ability to learn. Wheeler (1949), for example, states that intelligence scales are constructed on the assumption that a child comes to a testing situation with the advantages of a normal cultural and social environment. He concludes that reading ability and the linguistic phases of intelligence scales are actually dependent on such variables as schooling, purposes, ambitions, physical characteristics, emotional patterns, personalities, and opportunities. We shortchange the

student by not taking these highly related variables into account when we analyze results from standardized tests.

A clear indictment of the problems faced by minority students due to the nature of this society is contained within the survey conducted for the United States government by Coleman (1966) on the equality of educational opportunity. The blame for the deficiency of achievement by minority students, which increases progressively throughout the grades, is leveled mainly at the schools. Blame is also placed on nonschool factors such as poverty, community attitudes, and low educational level of parents. However, the schools have done little to help students overcome their initial deficiencies. Consequently, minority students fall farther and farther behind their white counterparts as their ages increase. Regional differences are also a factor. Students, both white and black, score significantly higher (as seniors) in the North than they do in the South. This may be due though to the higher dropout rate for blacks that exists in the North and eliminates those students who do most poorly in the schools.

One may ask what are the legitimate reasons for the continuing discrepancies in achievement for white and minority students. The Coleman report (1966) asserts that the school seems unable to exert independent

influences to make achievement less dependent on the child's background. Those factors in a student's background that affect his achievement are indicated in the survey as:

1. Urbanism of background
2. Parents' education
3. Structural integrity of the home
4. Smallness of the family
5. Items in the home (i.e., TV, telephone, record player, refrigerator, car, vacuum cleaner)
6. Reading material in the home
7. Parents' interest
8. Parents' educational desires

Another important conclusion reached as a result of the Coleman survey (1966) about minority achievement is:

> Attributes of other students account for far more variation in the achievement of minority group children than do any attributes of school facilities and slightly more than do attributes of the staff [p. 302].

One final implication for the academic achievement of minority students stands out above the others. Although the schools perpetuate the educational disparities between the races, they are helpless against the odds of the child's immediate social environment. The prognosis for improvement of the education of minority students is poor without drastic changes in our societal

ways.

In conclusion, it can be said that testing procedures and analyses are inadequate. Most of the standardized testing now being conducted on the secondary school level in essence measures a common factor of reading ability which in itself is extremely difficult to determine accurately. Factors beyond the scope of the school compound the problems inherent in testing and are evidenced by the discrepancies in scores for males and females, and for whites and minority students. This study is an attempt to tie together the factors cited previously and to gain worthwhile insights into the relationships between the tests that require reading achievement and the factors affecting the resultant scores.

CHAPTER III

PROCEDURE

This chapter deals with the subjects used in this study, the tests, their selection and administration, and the statistical design.

Subjects

The study population consisted of a total of 154 students in their senior year in Franklin High School located in Somerset, New Jersey. This population was about evenly divided between male and female students, of whom approximately 20% were of minority status. Income levels varied from the low to the upper middle-class bracket, and the population was drawn from urban, suburban, and rural settings, in agreement with the total community population.

Selection of Tests

Three tests were used in this study: the Nelson-Denny Reading Test, the Lorge-Thorndike Intelligence Test, and the Scholastic Aptitude Test.

The revised forms of the Nelson-Denny Reading Test, 1960 edition, were used for this study. These

forms are designed to measure the reading skills of vocabulary and comprehension on the secondary level (9 to 12). Form A of the test was used for this study. This test was chosen because it is the one used by the high school to assess the reading ability of all sophomores. It is also one of the basic reading tests used widely on the secondary level.

The Lorge-Thorndike Tests, 1957 edition, are available in five levels in two equivalent forms--Form A and Form B. Use of both the verbal and nonverbal batteries is designed to give maximum data for judging the mental ability of school pupils. Level 4, Form A, was used in this study. This test was chosen because it is the one used by the high school to assess the intelligence of all incoming freshmen.

The verbal section of the Scholastic Aptitude Test was also used for this study. It is designed to measure verbal abilities--among them, students' grasp of the meaning of what is read, the extent of vocabulary, and the ability to understand the relationships among ideas. This test was chosen because it is taken by a large majority of students who plan to attend college, and has been demonstrated to measure verbal abilities accurately.

Administration of Tests

The Lorge-Thorndike Intelligence Test, Level 4, Form A, was administered to all freshmen in their English classes over a two-day period in December 1970. Members of the high school guidance staff administered the tests to the students. Total scores and those for the verbal and nonverbal batteries were obtained through the Houghton Mifflin Scoring Service.

The Nelson-Denny Reading Test, Form A, 1960 edition, was administered to all sophomores in their English classes over a period of one week in April 1972. Those administering the test consisted of English teachers who had been prepared to do so, plus the reading specialist in the high school. Raw scores were obtained through the Houghton Mifflin Scoring Service.

The Scholastic Aptitude Test was administered to students at various times during their junior and senior years by the high school guidance staff in different locations of the school depending on how many students were taking the test at any one sitting. Scores were obtained through the Educational Testing Service. Although many of these students took the SAT more than once, only the first testing scores on the verbal section were included in this study. This was done in order to

eliminate the effect of the factor of practice on the test scores.

Statistical Design

This study involved the collection of seven sets of data--raw scores from the Nelson-Denny Reading Test, verbal scores on the SAT, I.Q. scores (verbal, nonverbal, and total), sex, and race for a total of 154 students to determine the relationship among standardized test scores as a function of general reading ability; and what effects, if any, sex, race, and I.Q. have on the aforementioned relationship.

All data were entered on Fortran coding sheets and key punched by the examiner prior to being submitted to the Rutgers University Center for Computer and Information Services (CCIS) for computation. The program selected for use was BMD02D Correlation with Transgeneration. The System Card, Problem Card, F-Type Variable Format Card, Plot Selection Card, and Finish Card were prepared and arranged with Data Input Cards as outlined in BMD: Biomedical Computer Programs (Dixon, 1967).

The entire deck of 154 cases was submitted for computation to establish correlations. Coefficients of correlation were obtained through the computer program BMD02D Correlation with Transgeneration.

Correlations were generated for the total

population, males, females, whites, and minority students between:

1. Nelson-Denny with Lorge-Thorndike total I.Q., verbal I.Q., nonverbal I.Q., and verbal SAT.

2. Lorge-Thorndike verbal I.Q., with nonverbal I.Q., total I.Q., Nelson-Denny, and verbal SAT.

3. Lorge-Thorndike nonverbal I.Q. with verbal I.Q., total I.Q., Nelson-Denny, and verbal SAT.

4. Lorge-Thorndike total I.Q. with verbal I.Q., nonverbal I.Q., Nelson-Denny, and verbal SAT.

5. Verbal SAT with Lorge-Thorndike total I.Q., verbal I.Q., nonverbal I.Q., and Nelson-Denny.

In order to determine whether or not I.Q. or reading ability affected the correlations, partial-order correlations (Otis, 1926) were used holding total I.Q. and then Nelson-Denny scores constant for previously obtained correlations. The formula is:

$$r_{12.3} = \frac{r_{12} - (r_{13} \times r_{23})}{\sqrt{(1 - r^2_{13})\ (1 - r^2_{23})}}$$

CHAPTER IV

FINDINGS AND DISCUSSION

The major analyses performed upon the data were the correlation coefficients which were calculated to investigate whether or not the three tests in question--the Nelson-Denny Reading Test, the verbal section of the SAT, and the Lorge-Thorndike I.Q. Test--are related as a result of reading ability for the total population tested of 154 students, now seniors, enrolled in Franklin High School; correlations were also obtained to examine differences among males, females, whites, and minority students. In addition, partial-order correlations were obtained to try to ascertain what variable seeks to unite the three tests used within this study.

Presentation of Data

To test the first hypothesis, correlation coefficients, derived by means of the computer program BMD02D Correlation with Transgeneration, were calculated between the Nelson-Denny Reading Test with the verbal SAT and with the Lorge-Thorndike I.Q. Test (total, verbal, and nonverbal scores). Tables 1 and 2 summarize the results. The null hypothesis was rejected as all correlations but

TABLE 1

CORRELATION COEFFICIENTS BETWEEN THE NELSON-DENNY READING TEST AND VERBAL SCORES ON THE SCHOLASTIC APTITUDE TEST

Group	Correlation coefficient
Total (N = 154)	r = .8051**
Whites (N = 132)	r = .7893**
Minorities (N = 22)	r = .6361**
Males (N = 78)	r = .7421**
Females (N = 76)	r = .8596**

**Significant at the .01 level.

TABLE 2

CORRELATION COEFFICIENTS OF THE NELSON-DENNY READING TEST WITH LORGE-THORNDIKE TOTAL I.Q., VERBAL I.Q., NONVERBAL I.Q., AND SAT FOR THE TOTAL POPULATION, WHITES, MINORITIES, MALES, AND FEMALES

	(N=154) Total	(N=132) Whites	(N=22) Minori-ties	(N=78) Males	(N=76) Females
Verbal I.Q.	.6577**	.6238**	.5806**	.5976**	.7098**
Nonverbal I.Q.	.4699**	.3700**	.5307*	.5098**	.4326**
Total I.Q.	.6604**	.6217**	.5841**	.6276**	.6984**
SAT	.8051**	.7893**	.6361**	.7421**	.8596**

**Significant at the .01 level.

*Significant at the .05 level.

one were significant at the .01 level. Correlation coefficients were the highest between the Nelson-Denny and the SAT ranging from .6361 for minorities to .8596 for females. The total population had a correlation coefficient of .8051.

When the Nelson-Denny was correlated with total I.Q. scores, correlation coefficients ranged from .5841 for minorities to .6984 for females with the correlation coefficient for the total population being .6604. Similar correlations were obtained between the Nelson-Denny and the verbal I.Q. scores. Coefficients ranged from .5806 for minorities to .7098 for females. The total population correlation coefficient was .6577.

The lowest correlations were obtained between the Nelson-Denny and the nonverbal I.Q. and ranged from .3700 for whites to .5307 for minorities. The correlation coefficient for the total population was .4699.

Generally speaking, all correlation coefficients were high and therefore statistically significant. Females, for the most part, obtained the highest correlations and minorities the lowest. This pattern is broken when the Nelson-Denny is correlated with the nonverbal I.Q.

By examining Tables 3, 4, 5, and 6 it is clear that coefficients are also significant when the

TABLE 3

CORRELATION COEFFICIENTS OF THE LORGE-THORNDIKE VERBAL I.Q. WITH NONVERBAL I.Q., TOTAL I.Q., NELSON-DENNY, AND SAT FOR THE TOTAL POPULATION, WHITES, MINORITIES, MALES, AND FEMALES

	(N=154) Total	(N=132) Whites	(N=22) Minori-ties	(N=78) Males	(N=76) Females
Nonverbal I.Q.	.4909**	.3636**	.7962**	.5689**	.4062**
Total I.Q.	.8867**	.8758**	.9354**	.9027**	.8963**
Nelson-Denny	.6577**	.6238**	.5806**	.5975**	.7098**
SAT	.7002**	.6498**	.8020**	.7078**	.6925**

**Significant at the .01 level.

TABLE 4

CORRELATION COEFFICIENTS OF THE LORGE-THORNDIKE NONVERBAL I.Q. WITH VERBAL I.Q., TOTAL I.Q., NELSON-DENNY, AND SAT FOR THE TOTAL POPULATION, WHITES, MINORITIES, MALES, AND FEMALES

	(N=154) Total	(N=132) Whites	(N=22) Minori-ties	(N=78) Males	(N=76) Females
Verbal I.Q.	.4909**	.3636**	.7962**	.5689**	.4062**
Total I.Q.	.8332**	.7610**	.9580**	.8667**	.7952**
Nelson-Denny	.4669**	.3700**	.5307*	.5098**	.4326**
SAT	.5101**	.3814**	.6853**	.5581**	.4649**

**Significant at the .01 level.

*Significant at the .05 level.

TABLE 5

CORRELATION COEFFICIENTS OF THE LORGE-THORNDIKE, TOTAL I.Q. WITH VERBAL I.Q., NONVERBAL I.Q., NELSON-DENNY, AND SAT FOR THE TOTAL POPULATION, WHITES, MINORITIES, MALES, AND FEMALES

	(N=154) Total	(N=132) Whites	(N-22) Minorities	(N=78) Males	(N=76) Females
Verbal I.Q.	.8867**	.8758**	.9354**	.9027**	.8693**
Nonverbal I.Q.	.8332**	.7610**	.9580**	.8667**	.7952**
Nelson-Denny	.6604**	.6217**	.5841**	.6276**	.6984**
SAT	.7103**	.6451**	.7846**	.7185**	.7057**

**Significant at the .01 level.

TABLE 6

CORRELATION COEFFICIENTS OF THE SAT WITH THE LORGE-THORNDIKE TOTAL I.Q., VERBAL I.Q., NONVERBAL I.Q., AND NELSON-DENNY FOR THE TOTAL POPULATION, WHITES, MINORITIES, MALES, AND FEMALES

	(N=154) Total	(N-132) Whites	(N=22) Minori-ties	(N=78) Males	(N=76) Females
Total I.Q.	.7103**	.6451**	.7845**	.7185**	.7057**
Verbal I.Q.	.7002**	.6498**	.8020**	.7078**	.6952**
Nonverbal I.Q.	.5101**	.3814**	.6853**	.5581**	.4649**
Nelson-Denny	.8051**	.7893**	.6361**	.7421**	.8596**

**Significant at the .01 level.

Lorge-Thorndike I.Q. Test (total, verbal, and nonverbal scores) is correlated with the SAT and the Nelson-Denny Reading Test; the same is true when the SAT is correlated to the other two tests. All three tests share a large degree of common variance even when the population is broken down by sex and race. There is a greater risk of error in the correlations for minority students since the population sample numbers only 22.

To test the second and third hypotheses, partial-order correlations, using the Otis formula (1926), were performed on the data. This procedure was employed to determine what effect differences in reading ability or mental ability have on the correlations. This was necessary since "a statement of the correlation between two tests, therefore, without a statement such as the range of ages or mental ages, or grades, to show the heterogeneity of the group is valueless [Otis, 1926, p. 236]." The results of these analyses are presented in Tables 7 and 8.

The second hypothesis was partially rejected. When differences for reading ability are removed, correlations between the SAT and the Lorge-Thorndike total I.Q. scores drop enormously but are still statistically significant in most cases. Partial-order correlations range from .3056 for females to .6597 for minorities.

TABLE 7

CORRELATION COEFFICIENTS OF THE VERBAL SAT WITH THE LORGE-THORNDIKE TOTAL I.Q., VERBAL I.Q., NONVERBAL I.Q., FOR THE TOTAL POPULATION, WHITES, MINORITIES, MALES, AND FEMALES, HOLDING READING ABILITY (NELSON-DENNY) CONSTANT

	(N=154) Total	(N=132) Whites	(N=22) Minori-ties	(N=78) Males	(N=76) Females
Total I.Q.	.4004**	.3211**	.6597**	.4845**	.3056**
Verbal I.Q.	.3821**	.3281**	.6888**	.4920**	.2289*
Nonverbal I.Q.	.2559**	.1567^{x}	.5317*	.3118**	.2019^{x}

**Significant at the .01 level.

*Significant at the .05 level.

^{x}Not significant.

TABLE 8

CORRELATION COEFFICIENTS BETWEEN THE NELSON-DENNY READING TEST AND VERBAL SCORES ON THE SCHOLASTIC APTITUDE TEST HOLDING I.Q. CONSTANT

Group	Correlation coefficient
Total (N = 154)	r = .6359**
Whites (N = 132)	r = .6488**
Minorities (N = 22)	r = .3534[x]
Males (N = 78)	r = .5382**
Females (N = 76)	r = .7234**

**Significant at the .01 level.

[x]Not significant.

The total population had a partial-order correlation of .4004, or a common variance of approximately 16%. Without removing differences for reading ability, the two tests share a common variance of approximately 50% for the total population, or a coefficient of .7103. Similar results are obtained using the verbal I.Q. scores. Partial-order correlation coefficients drop even lower when nonverbal I.Q. scores are used. In general, when reading ability is removed as a factor, minority students are the least affected while white students are most affected. In this instance, race functions to signal a statistically significant difference in the degree of variance shared between verbal scores on the SAT and I.Q. scores.

The third hypothesis was rejected when partial-order correlations were obtained holding total I.Q. scores constant. When differences for mental ability are removed, the correlation between the two tests remains statistically significant; however, the coefficient for minority students drops the most to .3534. Females had the highest partial-order correlation of .7234 and the coefficient for the total population was .6539. Mental ability alone does not serve to interfere greatly with the area of common variance shared by the Nelson-Denny Reading Test and the verbal section of the SAT. Although differences are most pronounced for minority students,

the size of the sampling for that particular population is in question.

Discussion

Although all three tests in question correlate highly with one another, the results of the data pinpoint reading ability as the factor most likely to contribute to the similarity among the tests. This study supports previous findings about the role of reading ability, notably that of Weiner and Kay (1972), that a standardized reading test might be used to predict scores on the SAT. It has been shown statistically that the tests share a large area of common variance, and face validity appears to indicate that they all incorporate items that require general reading ability.

The factor of sex played a small role in the differences found among the correlations. Although females tended to perform better on the whole than males, the differences were not statistically significant. Traditional thought states that females achieve better scores on tasks requiring verbal skills than do males. This idea has been challenged and is not supported by the results of this study (Appendix A).

Race is a far more significant variable as a predictor of verbal ability and test score results. This study supports previous findings such as Boykin (1955),

Chandler (1966), and Farr (1969). Summarizing these findings, the problem does not lie within the child's ability to learn, or the test, but within the educational system and society that we live in. If we assume that standardized tests require verbal ability, i.e., vocabulary knowledge and comprehension, and that minority students often lack these basic verbal skills, due to poor intellectual stimulation, they will perform poorly on such tests. This study supports such conclusions based on the data gathered. However, this study only obtained results for 22 minority students, and therefore all findings for this population must be considered as tentative.

It might be said within reason that this study supports the following general conclusion based on the data analyzed: if an individual reads well, he will be capable of displaying his abilities on any group standardized test. If he cannot read well, then the opposite is true. In no way can an individual display his intelligence, verbal aptitude, or ability on a test when he cannot read and comprehend its content.

Since the tests analyzed in this study share a large area of common variance based on their verbal content (face validity) and statistically significant correlations, the following can be said with some measure of certainty: reading ability, as opposed to either

intelligence or verbal aptitude, is the factor most highly related to standardized test scores, a conclusion shared with the findings of Triggs (1943). Sex accounts for small variations that are not significant, while race accounts for a much wider range in the discrepancy of the scores. Reading ability has the most significant effect on standardized test scores.

CHAPTER V

SUMMARY AND CONCLUSIONS

Summary

The purpose of this study was to investigate if there are statistically significant correlations among standardized test scores due to general reading ability, and whether or not these correlations will be affected by the factors of sex, race, and I.Q. It was hoped that this study would contribute to the knowledge of what tests measure in general; also, how these tests can be better used as tools for enabling school personnel to identify students' problems in the areas of reading skills and academic achievement.

A population of 154 students attending Franklin High School in Somerset, New Jersey, served as subjects in this study. These students were tested at various times during their high school career with the Lorge-Thorndike Intelligence Test, Level 4, Form A, the Nelson-Denny Reading Test, Form A, and the verbal section of the Scholastic Aptitude Test. These tests were used to determine the relationship of reading ability to verbal aptitude and intelligence.

The population and four subgroups--males, females, whites, and minority students--were examined. Correlation coefficients were computed for each population group using the computer program BMD02D Correlation with Transgeneration. In addition, partial-order correlations were generated, using the Otis formula, holding reading ability and then intelligence constant to ascertain their effects on the correlation coefficients.

According to the data analyzed, all three tests correlate highly with one another. All three tests, however, purport to measure something different, either reading ability, verbal aptitude, or the intelligence of a student. Since the tests share a common variance, the question naturally arises as to what key variable determines the similarity among them.

The results of the data make it difficult to conclude definitively what the precise underlying reason is for the strong relationship among the tests. It seems likely, though, that since a group I.Q. test requires certain specific reading skills, such as knowledge of vocabulary terms, and comprehension of the written materials being tested, as do the Nelson-Denny and the SAT, that all three tests measure the same thing--general reading ability. This conclusion is further supported when the data were analyzed holding reading ability

constant. Correlation coefficients between intelligence and verbal aptitude fell significantly as a result of this analysis.

Conclusions Regarding Hypotheses

Hypothesis one, that there will be no correlation between reading ability, as measured by raw scores on the Nelson-Denny Reading Test, and either verbal scores on the SAT or Lorge-Thorndike I.Q. scores (total, verbal, and nonverbal) for the total population, males, females, whites, and minority students, respectively, was proved to be wrong.

The correlation coefficient computed between the reading test and the verbal SAT for all 154 students was .8051. Correlation coefficients for males, females, whites, and minority students were .7421, .8596, .7893, and .6361, respectively. A high positive relationship was indicated between these two tests as evidenced by the statistically significant correlations.

When reading ability was correlated with total I.Q. scores, statistically significant results were also obtained. Correlation coefficients ranged from .5841 for minorities to .6984 for females. Similar correlations were obtained for verbal I.Q. scores.

When reading ability was correlated with non-verbal I.Q. scores, the coefficients dropped. The

correlation coefficient for the total population was .4699, for whites .3700, for minorities .5307, for males .5098, and for females .4326. Results from the data show that reading ability is more highly correlated to verbal I.Q. than to nonverbal I.Q.

Thus, it has been established that reading skills as measured by the Nelson-Denny Reading Test are more highly related to verbal aptitude as measured by the SAT than to verbal skills measured by an I.Q. test.

The second hypothesis, which stated that there will be no correlation between verbal scores on the SAT and I.Q. scores (total, verbal, and nonverbal) holding reading ability constant for the total population, males, females, whites, and minority students, respectively, was proved partially incorrect.

When reading ability was held constant, partial-order correlation coefficients computed between scores on the verbal SAT with total I.Q. scores dropped significantly, especially for females who had a coefficient of .3056. The area of shared common variance dropped from approximately 49% to 9%. Minority students were least affected with a partial correlation coefficient of .6597. For this group the area of shared common variance dropped from approximately 60% to 43%. The total population had a coefficient of .4004. Similar results were obtained

using verbal I.Q. scores.

The most dramatic changes occurred when verbal SAT scores were correlated with nonverbal I.Q. scores holding reading ability constant. Partial-order correlation coefficients for the total population, males, females, whites, and minority students were .2559, .3118, .2019, .1567, and .5317, respectively. In this instance, whites were most affected by reading ability and minority students the least. Population size of the minority students might account for some of this differential. The results of this analysis point to the conclusion that reading ability serves to strengthen the area of shared common variance between a verbal aptitude test and an intelligence test.

The third hypothesis, which stated that there will be no correlation between raw scores on the Nelson-Denny Reading Test and verbal scores on the SAT holding total I.Q. scores constant for the total population, males, females, whites, and minority students, respectively, was also proved wrong.

When total I.Q. was held constant, the partial-order correlation coefficient computed between scores on the reading test and verbal aptitude test for all 154 students was .6359. Partial-order correlation coefficients for males, females, whites, and minority students

were .5382, .7234, .6488, and .3534, respectively, A high positive relationship exists between the two tests even when intelligence is held constant. This seems to indicate that I.Q. is not the variable linking the tests in their shared commonality. Although minority students are the most affected by the factor of I.Q., this might be due in part once again to the size of this population sample.

Need for Further Research

The results of this study lead to the need for further investigation in the following areas.

1. A larger sample of students should be used in order to investigate the differences in correlations between whites and minority students. An effort should be made to determine the nature of socioeconomic backgrounds of the students to ascertain the differences between the groups.

2. The study should be expanded to include samplings over several years to find out whether the results could be duplicated over a period of time. This would justify the conclusion that there exists a common variance between reading, verbal aptitude, and intelligence tests due to a general reading ability required on all three tests.

3. In addition to employing the Nelson-Denny

Reading Test, another group standardized reading test might be used to determine whether or not a relationship still exists between reading ability and standardized test scores. Another possibility is merely to use the alternate form of the Nelson-Denny.

Implications for Curriculum and Counseling

One of the objectives of this study was to show the need for a rethinking by school personnel of academic and counseling needs of high school students. Although these students are frequently tested throughout their public school careers, it is highly questionable as to whether or not test results are used properly by those who have access to them.

Standardized reading test scores are an indication of the proficiency students have in specific reading skills. Scores alone should not be used to determine if a student pursues an academic as opposed to a vocational course of study. In addition, test scores are not infallible; for example, those scores on the lower end of the Nelson-Denny are extrapolated and therefore highly suspect. By using a group survey test, educators should remember that they are gaining merely a global look of a student's reading ability. Specific reading skills can be more clearly measured and analyzed through the use of

an individually administered reading test.

Although reading ability is highly related to future academic success, it is not the sole variable involved. Chandler (1966) has stated that low scores on standardized tests should not be equated with the lack of ability to learn. Little consideration is given for an individual's motivation, academic orientation, and particular interests. More often students with low test scores are labeled synonymously as slow learners and this encourages failure and frustration on the part of many.

The Nelson-Denny Reading Test, with its high correlation to the verbal section of the SAT, could be used by school personnel as a preliminary indicator of future academic achievement. As a screening device, it can indicate to a school how well its student population is prepared in the area of verbal skills. This can be the signal for the development or adjustment of courses of study to meet student needs. When scores are used on an individual basis, they can alert students to deficiencies in the area of reading that might hinder their future plans. Some students might be in need of individualized testing and instruction to overcome their deficiencies. By having both students and educators involved in the testing process, more realistic goals for academic achievement can be set forth and accomplished.

As most schools have ready access to inexpensive and easy to administer standardized tests, such as the Nelson-Denny, it would seem that educators might be persuaded to put them to better use. Only by focusing on the true value of tests will educators be able to counsel and aid students in gaining the skills needed for academic achievement. Testing can be beneficial when it encourages all those involved in the educational process to look for ways to increase learning.

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APPENDIX A

MEANS AND STANDARD DEVIATIONS OF ALL TESTS USED IN THE STUDY

CASE I

Means and standard deviations for the Nelson-Denny for the total population, whites, minorities, males and females.

Group	Mean	S.D.
Total (N = 154)	64.7402	22.5896
Whites (N = 132)	67.8864	22.2551
Minorities (N = 22)	45.8636	13.8814
Males (N = 78)	61.6154	21.0461
Females (N = 76)	67.9474	23.7839

CASE II

Means and standard deviations for verbal I.Q. scores for all populations.

Group	Mean	S.D.
Total (154)	111.5714	16.2600
Whites (132)	113.5682	15.9120
Minorities (22)	99.5909	13.0918
Males (78)	110.2051	16.3487
Females (76)	112.9737	16.1558

CASE III

Means and standard deviations for nonverbal I.Q. scores for all population groups.

Group	Mean	S.D.
Total (154)	116.2662	14.0935
Whites (132)	118.6894	12.3214
Minorities (22)	101.7273	15.5477
Males (78)	110.2051	16.3487
Females (76)	116.5789	16.1558

CASE IV

Means and standard deviations for total I.Q. scores for the total population, whites, minorities, males, and females.

Group	Mean	S.D.
Total (154)	113.8831	13.1058
Whites (132)	116.0833	11.6985
Minorities (22)	100.6818	13.5906
Males (78)	113.1026	13.6710
Females (76)	114.6842	12.5392

CASE V

Means and standard deviations for verbal SAT scores for all populations.

Group	Mean	S.D.
Total (154)	413.9609	100.6793
Whites (132)	429.4695	96.0696
Minorities (22)	320.9089	75.4609
Males (78)	408.2051	96.1294
Females (76)	419.8684	105.4575

COURSE WORK FOR MASTER'S DEGREE IN READING

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		Instructor
Summer, 1972		
290:501	Introduction to Educational Tests and Measurement	Dr. Pascale
299:561	Foundations of Reading Instruction	Dr. Swalm
Fall, 1972-73		
290:540	Introduction to Learning	Dr. Gillooly Dr. Montare Dr. Cox
Spring, 1973		
299:564	Remedial Reading	Ms. Goldsmith
299:565	Lab in Remedial Reading	Ms. Mooney
Summer, 1973		
298:501	Introduction to Counseling and Guidance	Dr. Whiteley
290:514	Introduction to Adolescent and Young Adult Years	Dr. Montare
ID:5600	Seminar: Reading in the Content Areas (Kean College)	Dr. Leeds
Fall, 1973-74		
290:509	Emotional and Social Maladjustment	Dr. Bardon
Spring, 1974		
299:566	Seminar in Reading Research and Supervision	Dr. Swalm

		Instructor
Summer, 1974		
610:522	Reading Materials for Young Adults	Ms. Simpson
Fall, 1974-75		
299:599	Master's Thesis Research	Dr. Kling

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ABSTRACT

It was the intention of this study to investigate if there were statistically significant correlations among standardized test scores due to general reading ability, and whether or not these correlations were affected by the factors of sex, race, and I.Q.

To investigate these points, a total of 154 senior students served as subjects in this study. Scores were collected for three different tests these students had taken throughout their high school career. These tests included the Nelson-Denny Reading Test, the Lorge-Thorndike I.Q. Test, and the verbal section of the SAT.

Correlation coefficients were computed using the BMD02D computer program between the Nelson-Denny Reading Test and the other two tests for the total population, males, females, whites, and minority students, respectively.

The resulting statistics indicated that all three tests shared a large common variance. In addition, reading ability was more closely related to verbal aptitude than to intelligence.

To determine the key element most likely linking the three tests, reading ability and then intelligence were held constant for the correlations. The Otis formula was used for these calculations.

The resulting partial-order correlations pointed to reading ability, as opposed to either I.Q. or verbal aptitude, as the factor most highly related to standardized test scores. Sex accounted for insignificant differences while race is a far more significant variable as a predictor of verbal ability and test score results.

It is suggested, based on these findings, that inexpensive and easy to administer standardized reading tests can be used more efficiently by educators in the schools. They can aid in curriculum planning and the assessment of student achievement.