

AN ABSTRACT OF THE THESIS OF

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Title: Relationships Between Scores on the American College Test and the Stanford-Binet Intelligence Scale: Fourth Edition.

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This study investigated the relationships between the Stanford-Binet: Fourth Edition and the American College Test (ACT). A college sample of 30 introductory psychology students (15 males, 15 females) was administered the Stanford-Binet, and the results were compared to their ACT test scores which were already on file. The ACT composite score and its four subtest scores, along with the Stanford-Binet IV composite standard age score and its four area scores were recorded for each subject. Pearson product-moment coefficients were calculated to determine the relationships between the ACT scores and the Stanford-Binet IV scores. Correlations of up to .89 were reached. The t-test was used to determine if the differences between male and female means were significant.

This study indicates that the Binet IV may be a valid and reliable

tool for predicting ACT scores and that future studies need to be conducted to give a clearer picture of this use.

Relationships Between Scores on the American College Test and the
Stanford-Binet Intelligence Scale: Fourth Edition

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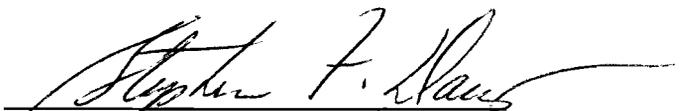
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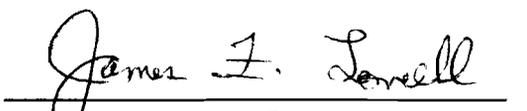
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CHAPTER 1

INTRODUCTION

Approximately half of the college-bound high school students take the American College Test (ACT). Aiken (1985) reported that approximately 1,000,000 students each year take the ACT. The scores from this test can affect the future of an individual's education in the following two ways: guidance and selection.

The guidance mode is typically provided by a high school counselor in conjunction with the ACT scores to help direct the student in making the best possible decision for his/her educational future. The ACT score is taken into consideration when a student applies for admission and/or scholarships to specific colleges which have a minimum score required for application. Also, strengths and weaknesses of the student may be indicated by the ACT scores, and the student may decide to chose his or her stronger area indicated on the ACT for his/her major area of study.

The selection mode takes place when universities examine the ACT scores in conjunction with other data to select the students who will

be admitted and/or receive scholarships. Being admitted and/or receiving a scholarship to a particular university may be contingent upon achieving a certain ACT score. Because of the way the ACT scores are used, it is advantageous for the high school counselor to start counseling and guidance in the student's junior or early part of the senior year. A major problem is that the ACT test data are not usually available at this time. For this reason the prediction of ACT scores would be extremely valuable to the counselor and the student.

In 1986, the Stanford-Binet Intelligence Scale: Fourth Edition (Binet IV) was published. This test is used in educational settings by high school counselors and psychologists and is a test which may be on file for students. The Binet IV is often administered to students in order to help evaluate them for placement in a gifted or accelerated program. This type of student is one who would most likely apply to a university which has a selective admissions policy, and he/she would benefit from early planning.

Because of the Stanford-Binet's availability and use in the educational setting, it would be most advantageous if educators and

counselors could predict ACT scores from the Stanford-Binet IV in an inexpensive and time-saving way. By doing this the counselor could help guide the student in applying to specific programs, colleges, and scholarships.

Review of the Literature

The Binet-Simon Intelligence Scale was introduced in 1905 by Alfred Binet and Theodore Simon. The test and its revisions have been widely used in a variety of clinical and educational settings since its introduction. Two revisions were completed by Binet in 1908 and 1911. In 1916 Lewis Terman, at Stanford University, revised Binet's test for use in the United States, thus giving it the name the Stanford-Binet. Revisions in 1937, 1960, and 1972 followed. The current revision was written by Robert Thordike, Elizabeth Hagen, and Jerome Sattler. This revision was completed in 1986.

The Binet IV can be administered to individuals ranging in age from 2 years to 23 years and six months. It was standardized on a sample

of 5,175 people with demographics taken into consideration based from the 1980 United States census. These demographic variables relate to occupation, education, race/ethnic group, urban/rural, gender, geographic region, and age. The Binet IV measures four broad cognitive abilities through its 15 subtests. These four areas are Verbal Reasoning, Abstract/Visual Reasoning, Quantitative Reasoning, and Short-Term Memory. Thorndike, Hagen, and Sattler (1986a) report the test takes between 60 and 90 minutes to administer.

The Stanford-Binet is a popular test. Phares (1984) stated "this steady series of revisions has combined with extensive research on the scales to make the Stanford-Binet one of the most widely used individual tests of intelligence" (p. 233). The research with the Stanford-Binet has included extensive research comparing the scores from the Stanford-Binet with multitudes of other tests; however, little has been done in comparing the Stanford-Binet with the ACT.

The American College Academic Test (ACT) was first used in 1959. The ACT is designed to help students who plan to attend a post secondary institution by gathering, processing, and reporting

information from four broad areas: English Usage, Mathematics Usage, Social Studies Reading, and Natural Sciences Reading.

The English Usage test is designed to measure the student's understanding of written English and use of expository writing, grammar, sentence structure, punctuation, diction, style, logic, and organization. This section has 75 items and a time limit of 40 minutes.

The Mathematics Usage test emphasizes quantitative reasoning ability. It has 40 items and a time limit of 50 minutes.

The Social Studies Reading test involves information from passages within the test and questions relating to general background from high school social studies courses. This section has 52 items and a time limit of 35 minutes.

The Natural Sciences Reading test focuses on ability to read, analyze, and evaluate material from the reading passages and from knowledge gained in high school science courses. This section also has 52 items and a time limit of 35 minutes.

The total test time is 2 hours and 40 minutes. These four scores and a composite score are compared to the scores of all other college-

bound students who take the test.

Since the origination of the ACT in 1959, only one study had been conducted comparing the ACT with the Stanford-Binet. This study, by Carvajal, McKnab, Gerber, Hewes, and Smith (1987), contained a sample of 30 college students. The correlation between the Binet IV composite standard age scores and the ACT composite scores was .88.

Purpose of this Study

As mentioned, only one study had been conducted comparing the Stanford-Binet with the ACT. This study by Carvajal et al. (1987) yielded a strong .88 relationship between the two composite scores; however, no comparisons were made between the Binet IV Verbal Reasoning, Abstract/Visual Reasoning, Quantitative Reasoning, Short-Term Memory and the ACT English Usage, Mathematics Usage, Social Studies Reading, Natural Sciences Reading. This study indicated that the Binet IV had potential for estimating ACT scores and that further investigation was necessary. The purpose of this study was to further explore the relationships between the subcategories and

composite scores on the two tests and determine to what extent the five scores on the ACT may be predicted from the Binet IV scores.

Significance

High school counselors have a tremendous responsibility in helping a student with his/her educational career. Since many university admissions and scholarships are contingent upon specific ACT scores, it would be helpful if ACT scores could be predicted and used in counseling prior to the time when ACT data become available. This would help the student sort out realistic options ahead of time. Also areas for improvement could be indicated in advance, and the student could improve upon his/her area of weakness to raise his/her ACT score.

Because of the Stanford-Binet's use in educational settings by school psychologists and counselors, it would be a beneficial, inexpensive, and time-saving tool for the task of predicting ACT scores. For this reason this study was designed to provide information to psychologists, counselors, and educators with correlative data to

determine if the Stanford-Binet IV could be used as an efficient, valid, and reliable tool to help guide a youth's educational goals.

CHAPTER 2

METHOD

Subjects

The basic qualifications for the subjects participating in the study were: 1) the subjects had to indicate that their ACT scores were on file at the university , and 2) the subjects could not be over 20 years old. The sample for this study consisted of 30 subjects (15 males, 15 females) enrolled in introductory psychology classes at Emporia State University. The sample included two black males and two Hispanic females. The subjects had a mean age of 18 years and 10 months and ranged in age from 18 years and 3 months to 20 years and 0 months.

Students were given extra credit toward their class grade for participating in the study. Students who did not meet the qualifications for participation in the study had the option of writing a paper for extra credit.

Confidentiality was observed in that the names of the subjects were not listed. An application for approval of the use of human subjects was submitted to Emporia State University's Review Board for Treatment of Human Subjects and permission forms releasing the data

were signed by the students participating in the study.

Variables

This study contained 10 score data variables. From the ACT each subject had an English Usage score, Mathematics Usage score, Social Studies Reading score, Natural Sciences Reading score, and a composite score. From the Binet IV each subject had a Verbal Reasoning area score, Abstract/Visual Reasoning area score, Quantitative Reasoning area score, Short-Term Memory area score, and a composite score.

Materials

The ACT and the Binet IV were used. The Binet IV was administered to each subject, and the directions specified in the test manual were followed. The ACT had already been administered to each subject, and the data were on file at the university.

Procedure

Each subject was administered the Binet IV to obtain the composite score and its four area scores. Preceding the administration of the Binet IV, each participant signed a permission form granting permission to use his/her scores from the Binet IV and access to his/her ACT scores. One examiner administered and scored all of the Binet IV tests. The administrator was a second-year school psychology graduate student who had successfully completed a course in the administration, scoring, and interpretation of the Binet IV. He followed the exact procedure for administration of the test described in the test manual. The testing was supervised by a qualified instructor from Emporia State University.

The subjects were informed about the study during class. They were told that a study using the Binet IV was being conducted and that volunteers were needed. Extra credit was given toward their class grade for participation in the study. The volunteers were traditional students aged 20 years or younger, who had their ACT scores on file at the university. The scores the volunteers received from the Binet IV,

and their scores from the ACT, were treated confidentially. Their test scores were given to them if they so desired. Students over 20 years of age, and students not desiring to be tested, were given the option of writing a paper about testing. This also earned extra credit toward their class grade.

The Binet IV tests were given between October 4, 1986 and December 12, 1986. Tests were administered in a room on the college campus specifically designed for testing.

Statistical Design

The above study produced ten scores for each subject: five scores from the ACT and five scores from the Binet IV. Group means and standard deviations were figured for males, females, and combination male/female for each score. The Pearson product-moment correlation coefficient was used to determine the relationships between each of the ACT scores with each of the Binet IV scores. A significance level of .05 was used. Also, the t -test was used to analyze the differences

between pairs of means between the two tests. A significance level of .05 was also used.

CHAPTER 3

RESULTS

Ten scores for each of the 30 subjects were recorded. Five scores from the Binet IV, and five scores from the ACT were obtained. The means, standard deviations, and ranges from the 30 subjects are presented in Table 1.

Table 1

Descriptive Statistics for the ACT and Binet IV. (Male/Female Combined).

| Test | <u>M</u> | <u>SD</u> | <u>Range</u> |
|---------------------------|----------|-----------|--------------|
| ACT | | | |
| Composite | 17.17 | 5.57 | 7-27 |
| English Usage | 16.70 | 5.69 | 5-25 |
| Mathematics Usage | 15.63 | 7.02 | 1-26 |
| Social Studies Reading | 16.37 | 7.02 | 2-31 |
| Natural Sciences Reading | 19.20 | 6.75 | 7-31 |
| Binet IV | | | |
| Composite | 101.30 | 9.13 | 86-119 |
| Verbal Reasoning | 100.63 | 11.02 | 77-124 |
| Abstract/Visual Reasoning | 103.17 | 9.76 | 86-124 |
| Quantitative Reasoning | 102.13 | 11.44 | 81-129 |
| Short-Term Memory | 98.90 | 11.38 | 77-122 |

All of the obtained ACT means in Table 1 are below the 1986 national college-bound norms of the ACT test. The national norms are composite (19.2), English Usage (18.9), Mathematics Usage (17.7), Social Studies Reading (18.2), and Natural Sciences Reading (21.7).

The obtained Binet IV means of three area scores and the composite score are slightly above, and one area score is slightly below the national norm of 100. The Short-Term Memory was below the national norm.

Table 2 lists descriptive statistics for males and females separately along with the t -values.

Table 2

Descriptive Statistics and t-Test Comparisons for Males and Females
on the ACT and the Binet IV.

| Tests | Males | | Females | | t |
|---------------------------|----------|-----------|----------|-----------|--------|
| | <u>M</u> | <u>SD</u> | <u>M</u> | <u>SD</u> | |
| ACT | | | | | |
| Composite | 18.13 | 5.26 | 16.20 | 5.87 | -.94 |
| English Usage | 15.13 | 5.22 | 18.27 | 5.87 | .06 |
| Mathematics Usage | 17.13 | 6.41 | 14.13 | 7.49 | -1.21 |
| Social Studies Reading | 17.53 | 7.00 | 15.20 | 7.09 | -.90 |
| Natural Sciences Reading | 21.80 | 5.43 | 16.60 | 7.11 | -2.25* |
| Binet IV | | | | | |
| Composite | 102.93 | 9.38 | 99.67 | 8.89 | -.98 |
| Verbal Reasoning | 102.93 | 12.03 | 98.33 | 9.77 | -1.15 |
| Abstract/Visual Reasoning | 104.13 | 9.21 | 102.20 | 10.52 | -.54 |
| Quantitative Reasoning | 104.87 | 12.05 | 99.40 | 10.49 | -1.33 |
| Short-Term Memory | 98.73 | 9.66 | 99.07 | 13.22 | .08 |

*p<.05

Females scored higher on the ACT English Usage and on the Binet IV Short-Term Memory. Males scored higher on the ACT composite, Mathematics Usage, Social Studies Reading, Natural Sciences Reading, and on the Binet IV composite, Verbal Reasoning, Abstract/Visual Reasoning, and Quantitative Reasoning. The only significant difference between the male and female scores was on the Natural Sciences Reading test.

Pearson product-moment coefficients were computed to determine the relationships of the Binet IV scores with the ACT scores. Table 3 lists this information for the combined 30 subjects.

Table 3

Correlations for Binet IV and ACT Scores. (Male/Female Combined).

| Test | r | | | | |
|-------------------|-------------|----------|------------|----------------|-------------|
| Binet IV | (Composite) | (Verbal) | (Abst/Vis) | (Quantitative) | (ST Memory) |
| ACT | | | | | |
| Composite | .88* | .75* | .68* | .66* | .50* |
| English Usage | .73* | .58* | .60* | .50* | .48* |
| Mathematics Usage | .76* | .54* | .71* | .67* | .33* |
| Social Studies | .75* | .77* | .52* | .49* | .43* |
| Natural Sciences | .71* | .63* | .44* | .50* | .50* |

*p<.05

The correlations were all significant at the .05 level. The highest correlation of .88 was with the ACT composite and the Binet IV composite. Seven other correlations exceeded .70.

Pearson product-moment coefficients were also calculated for males and females separately. Table 4 and Table 5 provide this information.

Table 4

Correlations for Binet IV and ACT Scores. (Males).

| Test | r | | | | |
|-------------------|-------------|----------|------------|----------------|-------------|
| Binet IV | (Composite) | (Verbal) | (Abst/Vis) | (Quantitative) | (ST Memory) |
| ACT | | | | | |
| Composite | .89* | .75* | .83* | .75* | .35 |
| English Usage | .87* | .85* | .78* | .64* | .39 |
| Mathematics Usage | .61* | .51* | .72* | .63* | -.02 |
| Social Studies | .86* | .80* | .70* | .65* | .44 |
| Natural Sciences | .76* | .49* | .69* | .64* | .51* |

*p<.05

Table 5

Correlations for Binet IV and ACT Scores. (Females).

| Test | r | | | | |
|-------------------|-------------|----------|------------|----------------|-------------|
| Binet IV | (Composite) | (Verbal) | (Abst/Vis) | (Quantitative) | (ST Memory) |
| ACT | | | | | |
| Composite | .87* | .75* | .56* | .55* | .62* |
| English Usage | .80* | .53* | .56* | .59* | .57* |
| Mathematics Usage | .88* | .54* | .70* | .69* | .57* |
| Social Studies | .63* | .72* | .36 | .27 | .46* |
| Natural Sciences | .68* | .76* | .28 | .31 | .57* |

*p<.05

Male results show 5 correlations from .80 to .89, and 6 significant correlations from .70 to .76. All but four of the 25 correlations were significant. The four correlations not significant were Binet IV Short-Term Memory with the ACT composite, English Usage, Mathematics Usage, and Social Studies Reading.

Female results have 3 correlations from .80 to .88 and 4 correlations from .70 to .76. All but four of the 25 correlations were statistically significant. The four correlations not significant were Binet IV Quantitative Reasoning with ACT Social Studies Reading and Natural Sciences Reading, and Binet IV Abstract/Visual Reasoning with ACT Social Studies Reading and Natural Sciences Reading.

CHAPTER 4

DISCUSSION

The Binet IV composite had the highest and most consistent correlations with the ACT and its four subtests throughout the study. The Binet IV Verbal Reasoning was second to the composite in having consistently high correlations.

For the combined male/female group the Binet IV composite, compared to other Stanford Binet IV scores, had the highest correlations ranging from .71 to .88 with the ACT composite and its four subtests. The composite to composite correlation was the highest at .88. The Binet IV Verbal Reasoning had a .75 correlation with the ACT composite and a .77 correlation with the ACT Social Studies Reading.

The Males Binet IV composite score correlated the highest with the ACT also. The correlations for the Binet IV composite with the ACT and its subtests ranged from .61 with Mathematics Usage to .89 with the ACT composite.

Females Binet IV composite score also had the highest relationship

with the ACT and its subtests. These ranged from .63 with Social Studies Reading to a .88 with Mathematics Usage. The composite to composite correlation was .87.

For predictive purposes on this sample the Binet IV composite has the most consistently high correlations with the ACT composite and its four subtests. All of the correlation coefficients are significant for the combined male/female sample of 30 subjects; however, one must take into consideration what constitutes a high enough correlation for the purpose of prediction. The ACT composite correlates highly with the Binet IV composite on all three categories; males (.89), females (.87), and combined (.88). This consistency for the three groups was only constant in the composite to composite comparisons. If one is making an inference about an ACT score from a Binet IV score and applying it toward an individual's future guidance, it should be as accurate as possible. For individual prediction, these data suggest that using the Binet IV composite to estimate the ACT composite is the only suitable possibility of the combinations.

The Binet IV composite has the highest relationship with the ACT

composite as well as with the ACT subtests. Some of the subtest correlations do reach above .80; however, they are not consistently high enough among the three groups to warrant individual prediction.

The gender of the subject need not be taken into consideration when evaluating the composite to composite comparisons as they are virtually identical. Also, there was no significant difference between male and female means on the two composite scores.

This study indicates that the Binet IV has a strong relationship with the ACT, and that estimating an ACT composite score from a Binet IV composite score is promising. One should use caution when generalizing from one sample alone. For this reason, replication of the study is necessary. More sophisticated research is necessary to develop an accurate way of estimating the ACT composite score from the Binet IV composite. Using a larger sample size could help give a clearer picture of the potential possibilities the Binet IV has in predicting the ACT scores. If this trend is consistent, the Binet IV will be a valid, reliable, and efficient tool for high school counselors guiding students who do not yet have ACT data available.

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