

ABSTRACT OF THESIS

THE RELATION OF PERSONALITY
TRAITS OF FRESHMEN MEN TO
ACADEMIC SUCCESS IN ENGINEERING

Submitted by

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In partial fulfillment of the requirements
for the Degree of Master of Education
Colorado
Agricultural and Mechanical College
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ABSTRACT

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There has been a great growth in the construction of and the experimentation with tests for measuring those qualities which are considered intangible and not subject to measurement. Most of these so-called intangible traits of personality are thought to be related in some degree to social adjustment. There have been many studies made in order to determine the validity of personality trait measurements and their relation to scholastic achievement, intelligence, and success in a vocation.

Successful performance in certain subjects should not be the only basis used in the selection of students. Many other devices have been found to be also valuable in the prediction of success in a chosen field.

The need to predict accurately the probable success of applicants for admission to engineering colleges has long been in existence. Today with engineering college facilities taxed to capacity it becomes increasingly important to select those applicants as students who have the greatest chance of being benefitted by a technical training. The present study was made to determine whether personality inventories would contribute to the selection of students applying for admittance to the engineering division in conjunction with various other psychological tests now in use in the guidance program.

The problem

The problem then, is, What are the personality traits associated with academic achievement of freshmen men in the engineering division at Colorado Agricultural and Mechanical College?

Problem analysis.--1. What are the measured personality traits of these freshmen men?

2. What is the relationship between personality traits and grade-point averages?

3. What are the differences in measured personality traits between the highest and lowest quartiles of achievement?

4. What personality traits other than test results are related to achievement in the engineering division?

Delimitations.--This study is limited to freshmen men at Colorado Agricultural and Mechanical College in the engineering division during the Fall Quarter of the school year 1948-1949. This study will not include veterans and those men who are married.

The data concerning this group were collected from the files of the Office of Student Affairs and from two personality inventories. The data gathered included the following information:

1. Raw scores made by the freshmen men on the Personality Inventories S T D C R and G A M I N of Guilford.

2. Letter grades each student achieved in each subject for which he had registered and the number of quarter hours of credit given for each subject.

The grade-point average attained by each student during the first quarter was selected as the criterion of academic success in the engineering division. The files in the Office of Student Affairs contained the letter grades each student achieved in each subject for which he had registered and the number of quarter hours of credit given for each subject. The grade-point average was computed as follows:

1. Each grade-point average was computed by multiplying

3

the number of credits by the weight assigned each letter grade.

2. The weights assigned each letter grade were: an "A" equaled 4, a "B" equaled 3, a "C" equaled 2, a "D" equaled 1, and an "F" equaled 0. "WF" (withdrawal failing) and "E" (incomplete) were counted as "F". "WP" (withdrawal passing) was disregarded.

3. The grade-point average for that quarter was computed by dividing the sum of the total letter grade-points earned by the number of credits earned.

A student at Colorado Agricultural and Mechanical College must maintain a grade-point average of 2.00 in order to be successful.

The two Personality Inventories S T D C R and G A M I N of Guilford, yielded the test scores made by these 80 students.

The personality traits are defined as follows:

S, Social Introversion-Extraversion; T, Thinking Introversion-Extraversion; D, Depression; C, Cycloid Disposition, strong emotional fluctuations; R, Rhythymia, a happy-go-lucky, care-free disposition; G, General Activity, a tendency to engage in vigorous overt action; A, Ascendance-Submission; M, Masculinity-Femininity; I, Inferiority Feelings; N, Nervousness.

Sample studied

The data collected on members of the freshman engineers commencing in September, 1948, were studied to determine the relationship between raw scores made on traits S T D C R and G A M I N as measured by Personality Inventories of Guilford.

4

For the samples, 80 engineering students were obtained by the following method:

Students enrolled in the freshmen engineering division received an announcement in the form of a request that they attend a meeting so that they might take certain personality inventories for purposes of a survey. For the first meeting 33 students appeared to take the tests. Since this was not a large enough sample, a letter was sent to the freshman engineers who did not appear for the tests. This time it was a more personalized request asking them that they kindly submit themselves for testing. The letter had been endorsed and signed by Dr. David H. Morgan, Dean of the Graduate School. This boosted the total number of students who made themselves available to 72. The remaining samples to complete the study were obtained by individual contact and tests were individually administered.

In administering these personality inventories every other student received the S T D C R Inventory and his neighbor received the G A M I N Inventory. As the student completed the one test the other was administered, thus administering both tests in the same period. The tests were interchanged so that discussion would be eliminated, consequently keeping the testing situation well under control.

Statistical methods

Various statistical methods were used in analyzing the data for 80 freshmen men entering the engineering division, Colorado Agricultural and Mechanical College in September, 1948. The statistical methods used in this study were as follows:

1. Zero-order correlations were computed to measure the

5

statistical relationship between earned grade-point average and the raw score on each personality trait S T D C R and G A M I N as measured by Personality Inventories of Guilford. These zero-order correlations were computed by constructing a scattergram for the two sets to be correlated and from it a correlation was drawn up for each of the ten personality traits.

2. The probable errors of the coefficients of correlation were computed for each personality trait to determine the reliability of the coefficients of correlation obtained.

3. From the data collected the highest and lowest quartiles were chosen by selecting the highest 20 and the lowest 20 on the basis of grade-point averages. The standard deviation (S) was computed for each of the raw scores earned on each of the ten personality traits. These computations were made separately for upper and lower quartiles.

4. A critical ratio was computed to determine whether the indicated differences between the means of the highest and lowest quartiles could be attributed to chance or whether the indicated difference was greater than could be attributed to chance.

5. A partial correlation was computed involving three variables. The purpose in doing this was to correlate two of the variables and hold the third variable constant. Partial correlations were computed by correlating grade-point averages with personality trait scores holding intelligence constant using the American Council on Education Psychological Examination as the criterion for intelligence.

Findings

Zero-order correlations were computed to measure the relationship between achieved grade-point averages and the raw scores

on each of the ten personality traits. The coefficients of correlation ranged from $-.134$ to $.152$, and the probable errors for these correlations ranged from $.074$ to $.076$.

The highest positive correlation was with trait I (Inferiority Feelings), the coefficient of correlation with grade-point average was $.152$. Masculinity-Femininity as indicated by this study was the second highest positive correlation as to the relationship to scholastic achievement. The coefficient of correlation for trait M (Masculinity-Femininity) with grade-point average was $.126$.

The standard deviation was computed for the highest and lowest quartiles for each of the ten personality traits to measure the variability of the means. After computing S for the means a critical ratio was computed to determine whether the indicated difference between the means of the highest and lowest quartiles could be attributed to chance or whether the indicated difference was greater than chance. The critical ratios ranged from $.44$ to 1.73 .

A partial correlation was computed for several of the highest coefficients of correlation involving three variables. The purpose of this was to correlate achieved grade-point average on each of the ten personality traits holding intelligence constant. The American Council on Education Psychological Examination scores were used as the criterion of intelligence. Partial correlations were computed for traits M and I (Masculinity-Femininity and Inferiority Feelings respectively). The coefficient of correlation between achieved grade-point average and intelligence was $.47$. The

coefficient of correlation between intelligence and personality trait M was .05 and the partial correlation between achieved grade-point average and trait M holding intelligence constant was .12. The coefficient of correlation between intelligence and personality trait I was .11 and the partial correlation between achieved grade-point average and personality trait I holding intelligence constant was .11. The coefficients of correlation for the other eight personality traits and grade-point averages were all lower than those for traits M and I. For this reason it was felt that further investigation of partial correlation of these personality traits was not a necessary technique.

Summary and implications

In summarizing the question as to whether or not there are valid relationships existing between personality traits and academic achievement, the results are as follows:

1. This study shows that there may be some degree of correlation between academic achievement and personality, but not great enough to be accepted as statistically significant.
2. There is not very great difference in personality trait scores between men falling in the lowest quartile of academic achievement and men in the highest quartile.
3. Men with unsatisfactory personality trait scores tend toward higher grades than do men of more satisfactory personality trait scores, but the difference is not statistically significant.
4. Freshmen men engineers with high academic achievement records are no better adjusted in personality than men of low academic achievement.

5. Men definitely on academic probation, are not very much inferior in personality trait scores to men of high college achievement or ability.

6. An analysis of men with low personality trait scores shows no significant difference in their grade-point average from those with high personality trait scores.

Personality measures should be used in counseling for the purposes of interviewing or for locating students with problems, but not for entrance qualifications. Since many of the other studies were in agreement with this study, the use of these tests in other than an immediate counseling situation is not supported by findings to date.

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T H E S I S

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I HEREBY RECOMMEND THAT THE THESIS PREPARED UNDER MY SUPERVISION BY HUMBERT CARL MANZOLILLO ENTITLED THE RELATION OF PERSONALITY TRAITS OF FRESHMEN MEN TO ACADEMIC SUCCESS IN ENGINEERING BE ACCEPTED AS FULFILLING THIS PART OF THE REQUIREMENTS FOR THE DEGREE OF MASTER OF EDUCATION MAJORING IN GUIDANCE AND COUNSELING CREDITS 3.0

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In Charge of Thesis

APPROVED *David H. Morgan*
Head of Department

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Dean of the Graduate School

Permission to publish this thesis or any part of it must be obtained from the Dean of the Graduate School.

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TABLE OF CONTENTS

<u>Chapter</u>		<u>Page</u>
I	INTRODUCTION	7
	The problem	9
	Analysis of the problem	9
	Delimitations	10
	Definitions	10
II	REVIEW OF LITERATURE	11
	Measured personality traits and college achievement.	11
	Measured personality traits and intelligence	27
	Personality and socio-economic status .	31
	Persistence tests and scholastic achievement	32
	Factors associated with vocational interests	33
	Concepts of personality traits	36
	Summary	37
III	METHODS AND MATERIALS	39
	Traits measured	40
	An analysis of the personality inventories used	41
	Sample studied	45
IV	ANALYSIS OF DATA	47
	Statistical methods	48
	Zero-order coefficients of correlation	50
	The significance of the differences of the means of highest and lowest quartiles	51
	Summary	53

TABLE OF CONTENTS.--Continued

<u>Chapter</u>		<u>Page</u>
V	DISCUSSION	54
	Relationship between freshmen grades and personality traits	55
	Differences in measured personality between the highest and lowest quartiles of achievement	57
	Personality traits other than test results which are related to achievement	59
	General implications	60
	Recommendations for further studies . .	60
VI	SUMMARY.	62
	APPENDIX	66
	BIBLIOGRAPHY	69

LIST OF TABLES

<u>Table</u>		<u>Page</u>
1	COEFFICIENTS OF CORRELATION SECURED FOR SIX HUNDRED EIGHTY-EIGHT FRESHMEN STUDENTS. . . .	13
2	RELATION OF PERSONALITY TEST SCORES TO ACADEMIC APTITUDE AND ACHIEVEMENT	19
3	PERSONALITY SCORES OF "ACHIEVERS" AND "NON-ACHIEVERS"	20
4	STATISTICAL RESULTS FOR BELL ADJUSTMENT INVENTORY	29
5	ZERO-ORDER COEFFICIENTS AND PROBABLE ERRORS OF CORRELATION BETWEEN ACHIEVED GRADE-POINT AVERAGE AND RAW SCORES ON TRAITS S T D C R AND G A M I N AS MEASURED BY PERSONALITY INVENTORIES OF GUILFORD	50
6	THE SIGNIFICANCE OF THE DIFFERENCES OF THE MEANS OF UPPER AND LOWER QUARTILES WITH RESPECT TO THE TEN PERSONALITY TRAITS	52

Chapter I
INTRODUCTION

Getting along with others is said to be social adaptation. For many occupations in life it becomes by far the most important factor of success. A need to predict accurately the probable success of applicants for admission to engineering colleges has long been in existence. With colleges today being taxed to their capacities, it has become increasingly necessary and important to try to select those applicants who will have the greatest chance of profiting by a technical education.

There has been a great growth in the construction of and the experimentation with tests for measuring those qualities which are considered intangible and not subject to measurement. Most of these so-called intangible traits of personality are thought to be related with some degree to social adjustment. There have been many studies made in order to determine the validity of personality trait measurements and their relation to scholastic achievement, intelligence, and success in a vocation. From a practical standpoint, their use should be made with caution so as not to label an individual with some negatively expressed trait.

Intelligence and achievement tests have been made relatively valid and reliable, but it is probable that tests of personality can never attain the widespread use that has been experienced by the previously mentioned tests. Since the validity of personality trait measurement has not been completely determined we must keep in mind certain limitations when interpreting the results. With these limitations in mind, the use of personality trait tests becomes altogether fitting for clinicians and counselors who may be so qualified to use these tests.

Still further, many tests of personality are highly coachable. If a pupil knows that a test is a personality test, this knowledge may change the results. Taking into consideration the situation in which the individual takes the test, it will be necessary to add another limitation. That limitation is, in the use of most of these tests, that the actual social situation is not furnished; therefore most of these tests measure social adaptation indirectly through imagined situations. The responses to such situations are probably somewhat different from the responses to the actual situation.

Selecting students on the basis of successful performance in certain subjects should not be the only measure used. Many other devices have been found to be also valuable in the prediction of success in a chosen

field. There have been several studies made at Colorado Agricultural and Mechanical College showing the use of various aptitude and achievement tests in predicting success of students in the engineering division, but none has been made on the use of personality trait measurement in predicting success.

In 1944, Gould (11), made a study of the predictive values of the battery of tests given to each student who entered Colorado Agricultural and Mechanical College. McClanahan (16), in 1947, followed with a study to determine how well the entrance battery predicted scholastic achievement of students in the engineering division. In 1948, Eyestone (7), also made a study in the use of the Pre-Engineering Inventory as an aid in counseling prospective engineering students at Colorado Agricultural and Mechanical College.

The problem

The problem, then, is, What are the personality traits associated with academic achievement of freshmen men in the engineering division at Colorado Agricultural and Mechanical College?

Analysis of the problem.--1. What are the measured personality traits of these freshmen men?

2. What is the relationship between personality test scores and grade-point averages?

3. What are the differences in measured

personality traits between the highest and lowest quartiles of achievement?

4. What personality traits other than test results are related to achievement in the engineering division?

Delimitations.--This study is limited to freshmen men at Colorado Agricultural and Mechanical College in the engineering division during the Fall Quarter of the school year 1948-1949. This study will not include veterans and those men who are married.

Definition of terms.--Quartile, as used in this study refers to one of the three points on the abscissa of a frequency distribution curve whereby the scores are divided into four equal parts.

Chapter II

REVIEW OF LITERATURE

In reviewing the literature, many studies were found concerning the use of various personality trait tests and their value in predicting academic success in college. Different studies have found varying degrees of correlation between academic success and personality traits. Some studies point out that there is a low or no correlation, while others stated that there is a relatively significant correlation between academic success and personality traits. Still others have emphasized that certain environmental factors have the greatest bearing on the personality of the individual. Such studies stress that the success of an individual in college or occupation depends mostly on the contributions of his environment. Such factors as family relationships, religion, and teachers were considered as contributing factors.

Measured personality traits and college achievement

The following studies found no relationship between measured personality traits and college achievement.

The study of Drought (6), in 1938, revealed

no relationship between either the Bell Adjustment Inventory or the Wisconsin Scale of Personality Traits scores, on the one hand, and the difference between achieved grade-point averages in college and grade-point averages predicted from rank in a high school scholastic aptitudes, on the other.

St. Clair (19), in 1939, made a study at Temple University, using the records of freshmen at Temple University. The instruments used in measurement of personality and scholastic aptitude were the Bernreuter Personality Inventory and the Thurstone Psychological Examination. The Bernreuter Personality Inventory was constructed to measure four personality traits. The measures considered in this study were the percentile rank secured by individuals for neurotic tendency, self-sufficiency, and dominance (referred to as B1-N, B2-S, and B4-D, respectively) in their relation to percentile rank in scholastic aptitude.

One method used for examining the inter-relations between these personality traits and scholastic aptitude was reported in Table 1. These zero order and partial correlations presented a view of the statistical effect of combining or subtracting trait scores.

Table 1.--COEFFICIENTS OF CORRELATION SECURED FOR SIX HUNDRED EIGHTY-EIGHT FRESHMEN STUDENTS (19:296)

	B1-N	B4-D	(SA) Scholastic Aptitude
	* -.41	-.82	.08
B1-N	(3) .00	(2) -.26	(2) .00
	(4) -.44	(4) -.83	(3) .01
	(34) .00	(24) -.28	(23) -.08
	.....	.50	.19
B2-S	.....	(1) .31	.25
	.....	(4) .32	.26
	.....	(14) .34	.29
	.....	.....	-.09
B4-D	.....	.....	(1) -.06
	.....	.....	(2) -.27
	.....	.....	(12) -.15

*(3) indicates that the coefficient of correlation is the partial correlation figure secured when B4-D is partialled out. In the same manner (34) indicates that B4-D and SA have both been partialled out. The following designations are used: (1) equals B1-N; (2) equals B2-S; (3) equals B4-D; (4) equals SA. (19:296)

(1) Scholastic Aptitude (SA) did not affect the relationships between personality traits as measured by the Bernreuter Inventory. When SA was partialled out, the correlations between B1-N, B2-S, and B4-D were practically the same as the zero order correlations.

(2) The only correlation between SA and a personality trait was the correlation with B2-S, and that was somewhat increased when either or both of the other personality traits were partialled out. The zero order correlation .19 was increased to .29 when B1-N and B4-D were partialled out.

(3) When B2-S was partialled out, the negative relationship between B4-D and SA was increased from -.09 to -.27 and the negative correlation between B4-D and B1-N was decreased from -.82 to -.26.

(4) When B1-N was partialled out, the positive correlation between B2-S and B4-D was decreased from .50 to .31.

(5) The negative relationship between B1-N and B2-S was apparently caused by B4-D because the removal of this factor resulted in $r = .00$. (19:296-7)

St. Clair stated that the above observations pointed to an interdependence of personality traits, particularly in B2-S and B4-D relationships. It was also evident that the technique of partial correlation did not reveal a significant relation between scholastic aptitude (SA) and single personality traits which had not been apparent through other methods. Although the correlation between B2-S and SA was not statistically significant, it was sufficient to indicate a need for further investigation.

St. Clair concluded that in his attempt to throw some light on the relationship between personality as measured by the Bernreuter Personality Inventory and scholastic aptitude as measured by the Thurstone Psychological Examination through various methods of correlation it was found that the conclusions reached by previous investigators were substantiated, and that there was no linear relationship between personality traits and scholastic aptitude as measured when personality was considered in separate traits. Examinations of results secured by partial correlation technique yielded convincing evidence of inter-relationship between personality

traits. When dominance was partialled out the negative correlation between neurotic tendency and self-sufficiency dropped from $-.41$ to $.00$; when self-sufficiency was partialled out the negative correlation between dominance and neurotic tendency dropped from $-.82$ to $-.26$; when neurotic tendency was partialled out the positive correlation between self-sufficiency and dominance was decreased from $.50$ to $.31$. There was a correlation of $.29$ between scholastic aptitude and self-sufficiency when neurotic tendency and dominance were held constant. While no linear relationship could be established between isolated personality traits, the evidence of the paper by St. Clair indicated that when personality was viewed as a whole or in "profile" there was a definite relationship with scholastic aptitude.

Meadow (16), in 1940, made an attempt to discover the relationship between achievement and dominance test scores and came to the following conclusions:

(1) 125 college women were tested in classroom-like situations to determine whether there was any relation between their personality and achievement. The aspect of personality chosen was "dominance feeling" as measured by the Social Personality Inventory by Maslow. The aspects of achievement chosen were a long division test, a word memory test comprised of words calculated to arouse emotion, and a control word memory test comprised of simple three-letter words. Brooklyn College Intelligence Decile Ranking Scores were correlated with the Social Personality Scores to insure that the differences found in achievement were not the result of differences in intelligence.

(2) The women with low dominance feeling were more disturbed emotionally by the test situations and were unable to memorize "emotional words" as efficiently as the women of high dominance.

(3) No significant correlations were found between dominance feeling scores in an impossible-to-compile arithmetic test, but there was a relationship between subject's report of emotional disturbance and their inefficiency in this test. It was suggested that the lack of relationship between dominance feeling score and arithmetic achievement may be due to the fact that the situation was not realistic or poignant or crucial enough, and that it should be more likely to appear in a real classroom test situation. (16:273-4)

Bryan (3), in 1942, studied four successive freshmen classes, entering the School of Fine and Applied Arts at Pratt Institute, from the Fall of 1936 to the Fall of 1939 inclusive. They were given the American Council on Education Psychological Examination and the Bernreuter Personality Inventory. Data were obtained for 1,008 students, of whom 498 were women and 510 were men. The Bernreuter Personality Inventory was scored for neurotic tendency, B1-N. The mean for the total group at Pratt was for men, 52.53 and for women, 47.41, and the total, 49.99. The mean for the total group fell at the 50th percentile of college students in general. The mean of 52.53 for the men was 5.12 percentiles above that of 47.41 for the women, with a standard deviation of the difference of 2.89, indicating a slightly higher neurotic tendency on the part of the men. The indicated difference, while reliable, was so small that it is

probably of no educational significance, particularly since the means for both men and women was so close to normality. It seemed evident that, insofar as the Bernreuter Inventory is a valid measure of neurotic tendency, the 1,008 art school students were no more and no less neurotic than college freshmen in general.

Bryan concluded that:

(1) Correlations between grades in art courses and stability of personality as measured by the Bernreuter Inventory were so low as to indicate little or no relationship.

(2) Findings in this study suggested that success of freshmen students in Pratt Institute Art School depended upon creative abilities other than those measured by paper-and-pencil tests of intelligence and personality. (3:64)

The following studies found a positive relationship between measured personality traits and college achievement.

Stagner (21), in 1933, summarized a survey of literature, and stated the following points:

(1) Objective measures of personality show no linear relationship to either academic aptitude or academic achievement.

(2) There was evidence that unstable, mal-adjusted students do less well in proportion to their intelligence than do those well-balanced, and that there was a closer correlation of capacity and achievement in stable groups.

(3) Introverts appear to earn proportionately higher marks than extroverts, in a college population.

(4) Dominance also appears to be a factor influencing grades in two groups of equal intelligence. (21:651)

Stagner made a study with the use of various objective tests of personality; the Pressey X-0 test (form A); the ABC questionnaire, a test of emotional stability developed by Stagner, which has not been standardized; Allport A-S Reaction Study; Laird C 2 Inventory; Neymann-Kohlstedt test for introversion-extroversion; Thurstone neurotic inventory; Moss Social Intelligence test; and the Bernreuter Personality Inventory. Most of his data dealt with the Bernreuter test, which gave scores for neurosis, self-sufficiency, introversion, and dominance. The others were used in preliminary investigations and presented only the correlations with grades and intelligence.

The populations used were: for the X-0 and ABC tests, 195 upperclass students at the University of Wisconsin; for the Allport, Laird, Moss, Neymann-Kohlstedt and Thurstone test, 175 upperclass students at Gustavus Adolphus College; and for the Bernreuter scale, 250 freshmen men and 150 freshmen women at the University of Wisconsin. General intelligence scores for these students were based on the American Council Psychological Examination.

The correlations of these tests of personality with academic grades and with intelligence percentiles are shown in Table 2. An inspection showed that Table 2 confirmed Stagner's previous conclusion that no

significant relation of a linear nature existed between the variables correlated. (21:652)

Table 2.--RELATION OF PERSONALITY TEST SCORES TO ACADEMIC APTITUDE AND ACHIEVEMENT.

(Beneath r is given the number of cases on which it is based. PE's ranged from .04 to .08). (21:652)

Test	r Grades	r Intelligence
X-O "affectivity"	-.049 132	-.181 60
ABC Questionnaire	-.084 153	-.254 66
Allport A-S (decile ranks)	-.111 94	*
Laird C 2	.247 174	.187 66
Neymann-Kohlstedt	-.121 172	-.107 63
Thurstone	-.102 148	-.094 59
Moss Social Intelligence	.369 166	.457 62
Bernreuter Inventory		
Neurosis (men)	.066	.147
(women)	-.127	-.106
Self-sufficiency		
(men)	.070	.120
(women)	.137	.268
Introversion		
(men)	.067	.161
(women)	**	
Dominance		
(men)	-.063	-.097
(women)	.072	.159

*Too few cases to make this correlation of value.

**The introversion score was discarded because it was decided that it lacked validity, (correlated .96 with the neurosis score.) (21:652)

Stagner reported that from the previous studies he reviewed, and from the data presented from his study, it became increasingly clear that personality influences achievement in an indirect way, by affecting the degree to which use is made of the individual's potentialities. He brought this out by making a comparison of "achievers" and "non-achievers", because it was thought possible that students achieving more than would be predicted from their aptitude score would show differences in personality from those achieving less. This was done by taking a scatter-diagram for the aptitude-achievement correlation and marking off cases in the upper right-hand and lower left-hand corners away from the "line of best fit". Personality scores were then computed for these groups. The differences found are shown in Table 3.

Table 3.--PERSONALITY SCORES OF "ACHIEVERS" AND "NON-ACHIEVERS"

		Mean	S.D.	Diff.	S.D.	C.R.
Neurosis:	A's	813.4	63.00			
	Non-A's	835.4	82.44	22.0	15.18	1.44
Self-sufficiency:	A's	898.2	42.60			
	Non-A's	921.8	47.40	23.6	9.37	2.51
Dominance:	A's	925.2	50.74			
	Non-A's	918.4	59.42	6.8	11.47	0.59

From this table the achievers were characterized

by a low emotionality score and a low self-sufficiency score. The differences according to Stagner were large enough to be considered important, if not completely reliable.

Stagner in summarizing stated that personality is an advantage in academic work while different amounts of the same personality variable may be disadvantageous, or may be operative in one direction in one case, the opposite in a similar situation. He felt that personality measures can never be used as entrance qualifications, because the students scoring high on undesirable traits were also high on aptitude, and represented the very stratum that should be developed rather than discouraged. Stagner reported that "more and more students of great promise are being allowed to go to wreck upon the reefs of personality maladjustment when a successful adaptation might be relatively simple with adequate guidance."

(21:655). Stagner's own experience with personal interviews of these students was convincingly in favor of the belief that a few hours of good advice and sympathetic listening to troubles would change the course of the students' university life decidedly for the better.

From the data Stagner concluded that:

(1) Linear correlations of intelligence, achievement and personality measures are low and are probably so as a result of the inherent nature of the relationship.

(2) Extreme personality trends seem to

counterbalance advantages in aptitude, making for equal achievement in opposed groups.

(3) Personality factors have marked influence on the correlation of aptitude and achievement.

(4) Arguments are presented for the use of these measures in improved counseling systems. (21:655)

Portenier (18), in 1935, studied 66 pupils scoring below average on intelligence tests and 80 freshmen above average in intelligence who were compared on the Stanford Achievement Test, courses pursued, grades received, teachers' ratings on several aspects of personality, Sims Scale for Socio-Economic Status, and questionnaire studies of other miscellaneous items. The results of the standardized tests, courses pursued and grades received were very inconsistent. Little difference was found between the groups in the number planning to complete high school, the Sims ratings, and certain aspects of personality.

Portenier followed the progress of the groups for five consecutive years. The pupils who graduated were then compared with those who withdrew before graduation. The results indicated home background and certain personality factors to be more significant than intelligence and achievement tests in predicting school success.

Miller (17), in 1937, made a study of 228 exceptionally able individuals in college and compared

them with the average group of college students using the college records for selecting his groups. That this study dealt with a superior group of college students was indicated by the facts that they graduated among the upper five per cent of their respective high school classes; scored at or above the 90th percentile on the American Council on Education Psychological Examination and the Ohio State University Psychological Test with the rest; earned a college quality point average of 2.28 (A = 3) as against 1.16 for the average member of the graduating class, and that over 45 per cent of the superior group completed their college work with honors. The mean age at the time of entering college for the members of this group was 17 years and two months and that of the average student 18 years and seven months. Miller stated that:

(1) While 37 per cent of the whole graduating class were members of extra-curricular organizations, over 75 per cent of the superior group held such membership.

(2) The range of interest as indicated by the number of different kinds of organizations to which an individual belonged was also greater for the superior group, the average number of different organizations that the members of this group belonged to being 2.24 as against .99 for the members of the graduating class as a whole.

(3) The members of the superior group were about twice as active in social, musical and dramatic organizations and seven times as active in debating. About an equal proportion of both groups had participated in athletic activities at some time during their college careers. (17:863-4)

Miller found that while less than 21 per cent of the membership of the whole graduating class had been elected to office at least once during the four years, over 54 per cent of the superior group had been so honored. The mean number of offices held over this period by the members of these two groups was 2.4 for the superior and 0.76 offices by the average graduate.

In concluding Miller stated that the exceptionally able college student is not socially maladjusted; rather, there tends to be a positive relationship between intelligence and social adjustment.

Soderquist (20), in 1937, made a study by obtaining ratings in "sociability" of high school pupils in 13 different schools and of all grade levels from the seventh to the 12th. The high school was chosen because it was felt that it was the only period in the individual's career which offered at once favorable conditions of mutual acquaintance, maturity of judgment, consistence of character traits, and homogeneity in age and general experience.

The total number of groups rated in sociability was 54, of which 30 were girls' groups and 24 were boys' groups. The groups ranged in size from 15 to 62, each representing only one grade in order to insure a high degree of mutual acquaintance. Boys rated boys only and girls rated girls. The method of rating used was the order-of-merit or ranking type. The list of names ranked

was arranged alphabetically.

For each of the 54 groups rated in sociability reliability coefficients were predicted from correlations between random halves of estimates with the use of the Spearman-Brown formula. The coefficients obtained ranged from .75 to .97 with only one coefficient below .86. The average was .936, the median .925, and Q_1 .829. Soderquist concluded that:

(1) In terms of the criteria set up, namely, teachers' ratings under favorable conditions and pupils' mutual ratings in friendliness, pupils' ratings in sociability appear to have a high degree of validity.

(2) The low average correlation found between scholarship marks and ratings in sociability at the 12th grade level was offered as negative validation of the latter. While in the lower grade levels the relationship rose to a considerable figure it was shown that this was not due to any appreciable halo of scholarship but most likely to the influence of pupils' personality on the teacher when marking scholarship.

(3) The study indicated that as a general rule rating by associates is to be preferred to ratings by teachers.

(4) It appeared that analyzing personality into traits for rating purposes it is not feasible except where clear distinction between traits can be made in variable situation-response terms. This study indicated that friendliness and leadership could be so treated. If a general rating of likeableness of "personality" was desired, a rating in sociability alone would probably yield as valid results as a more analytical procedure.
(20:42-3)

Soderquist believed that his study should justify high school authorities in recording percentile-standings of their pupils in traits like friendliness and

leadership obtained through the method of rating by associates. He also stated that his recommendation would apply also to colleges where acquaintance conditions are favorable, and that such records would make possible further valuable studies of the usefulness of trait ratings in guidance and in the prediction of personal and vocational success in life.

Woods (24), in 1937, made a study as to the forms of personality obstructive to progress in college. For this investigation he selected a limited group of women students at the University of Iowa, who were examined in personal conferences, and where necessary, psychiatric and various medical examinations were made. All those whose trouble was primarily due to mental or physical disease, or to poverty, were eliminated. There remained 145 students, free of disease, who were supposed to have been capable of mental training at the level of their endowment. After analyzing their records, the question was asked as to why university officers, or the individuals themselves, were led to suppose that the students in question were really cut of step, failing to develop their inherent capacities.

The reasons assigned by the authorities were:

- (1) Failure to meet academic requirements. Eighty-nine, i.e., about 70 per cent of the 145 students were referred because of inferior class work. It was noted that these 89 students were not all of low intelligence (as rated by psychometric tests).

(2) Disregard of university regulations or social conventions. 27 of the 145 students, i.e., 18 per cent, were referred for observation because of infraction of university regulations and failure to conform with standards of behavior acceptable to the community. In most of these cases the regulations and standards in question were pointed to defect in culture or personality.

(3) Disturbing others. 29 of the 145 students (20 per cent) attracted attention because their personal qualities made them unpleasant to, or aroused anxiety for them in, others. (24:413-5)

From the data collected Woods concluded that poor class work is not necessarily evidence of low intelligence. Social and emotional immaturity, lack of purpose, and possession of interests and individuality underlie poor scholarship. Students of low mental ability who remain in college, however, tend to have personality maladjustments intensified by humiliation and inferiority feeling.

Measured personality traits and intelligence

Wrenn and others (25), in 1936, found no relationship between level of ability, using the American Council Psychological Examination, and the traits of introversion, extroversion, and emotional stability as measured by the Bernreuter Inventory. The authors concluded that:

(1) Extremes of intelligence do not appear to be associated with difference in degree of emotional stability.

(2) Highly intelligent junior-college students

appear to be more "self-sufficient" and independent both mentally and socially, than junior-college students at the lower levels of stability. (25:307)

Alteneder (1), in 1940, made a study of four psychological tests which were used as part of a guidance program for college freshmen. The tests were administered to 150 men and 150 women. The tests used were: The Henmon-Nelson Test of Mental Ability for College Students, Form B; the Revised Minnesota Paper Form-Board Test, Form AA; The Adjustment Inventory, by Hugh M. Bell; and the Vocational Interest Blanks for Men and for Women Students, by Edward K. Strong, Jr.

The Adjustment Inventory for college students by Hugh M. Bell provided four separate measures--home, health, social, and emotional adjustment. The scores for these measures were combined into a total personality score. Descriptive ratings were provided as norms, such as "excellent," "good," "average," "unsatisfactory." Table 4 shows the results treated statistically, low scores being the best.

Table 4.--STATISTICAL RESULTS FOR BELL ADJUSTMENT INVENTORY. (1:453)

	Mean		SD	
	Men	Women	Men	Women
Measures of adjustment:				
Home	7.36	6.87	4.62	5.18
Health	6.60	6.38	4.00	4.04
Social	11.60	13.14	6.66	7.87
Emotional	8.18	12.40	5.31	6.42
Total	32.43	37.37	15.00	16.35

Alteneider reported that her study and one by Bell indicated that boys were better adjusted socially and emotionally, and the girls better adjusted with respect to home and health. The question arose whether the boys were more frank in answering questions relating to home and health, and more reticent regarding social and emotional problems. "If this had been true it still would have shown a personality difference." (1:452)

Alteneider stated in her study that the highest positive coefficient of correlation was between emotional adjustment and mechanical intelligence which was .23. The coefficient of correlation for health adjustment and grades for the men was -.20. Social adjustment correlated positively with intelligence and grades.

Alteneider concluded by stating that:

(1) The Bell Adjustment Inventory is a practical instrument in the guidance of college freshmen. It deals with everyday situations and uses terms understood by the student. The

Inventory serves as an excellent basis for interviewing and in locating students with problems.

(2) It is important that the scores on the Inventory be used qualitatively rather than quantitatively, and that they be interpreted in the light of each individual case. A good or excellent score in one case may be owing to fine emotional stability, while in another the lack of emotional drive. Lack of emotional drive may be caused by poor physical health, temperament, or a temporary emotional problem. In one case an excellent or aggressive social adjustment score may be an asset; in another, a hindrance. Each factor is influenced by other factors, and by the particular situation and individual in question. Because of these and other reasons scores on the Bell Adjustment Inventory should not be used as entrance requirements except in extreme cases. The Inventory is most valuable when used in connection with an orientation course after entrance. (1:459)

Cattell (4), in 1945, studied the general possibilities in the relation of personality traits to abilities, by an inquiry into the personality traits associated with (a) intelligence and (b) a special ability--drawing ability. This study used as subjects 123 adult males in the Army Specialist Training Program. The personality data consisted of carefully controlled ratings on 35 personality trait clusters. The ability measurements consisted of a measure of intelligence, on the Army Alpha Intelligence Test (Verbal and Numerical sections combined in a single total) and measures of mathematical and verbal ability on the Graduate Record Examination.

Cattell concluded that:

Intelligence appeared as a general factor B (General Ability) among personality traits, loading particularly character traits, and notably those good habits which may be consciously acquired. This factor correlated to the extent of about .3, with a distinct factor C (General Emotionality) of emotional stability and integration, and together with other factors yielded a second-order factor, which may be the genetic adhesion of intelligence and temperamental (emotional) stability produced by social stratification. Past findings fitted in well with these factorial interpretations.

Kimber (14), in 1947, summarized numerous studies and found there is a relatively low correlation between measures of personality and measures of intelligence. Findings in Kimber's study confirmed "those formerly made and also indicate that correlations between personality and the various factors established by Guilford (First Nebraska Revision of the Army Alpha Examination by Guilford) are also low." (14:417)

Personality and socio-economic status

Gough (8), in 1946, made a study to determine the effects of socio-economic status upon academic achievement and upon personality inventory scores. The population studied was that of sixth-grade public school children (N-127) in St. Cloud, Minnesota. The variables considered were: (1) socio-economic status, as measured

by the American Home Scale; (2) intelligence, as indicated by the Haggerty Delta II Intelligence Test; (3) arithmetic achievement, as measured by the Stanford Achievement Test, Intermediate Arithmetic; (4) reading ability, as indicated by the Iowa Silent Reading Test; and (5) personality adjustment, as measured by the Brown Personality Inventory for Children.

Gough in his summary stated that:

(1) Correlations between status and achievement test scores were clustered near .30, with the exception of arithmetic, where the correlation was .07.

(2) Correlations between personality inventory scores and achievement tests were all negative, ranging from $-.22$ to $-.28$. With intelligence partialled out, both sets of correlations were significantly reduced.

(3) The conclusion appears justified that in this sample, socio-economic status has a slight positive relationship to academic achievement, and the personality inventory scores have a slight negative relationship to achievement. (8:537)

Persistence tests and scholastic achievement

Howells (13), in 1933, reported that scores on a battery of persistence tests yielded a coefficient of correlation of .44 with average grades for the preceding year for 100 college students. The correlation between intelligence scores and grades for these same students was .51, and "the multiple correlation of a combination of intelligence and persistence scores with grades was .64."

Thornton (23), in 1941, stated that persistence is one of the factors determining achievement in school. "Recently experimental evidence has been presented to show that prediction of grades in college is improved by use of scores on objective tests of persistence." (23:266)

Thornton concluded that:

. . . these implications led to the hypothesis that objective personality tests will have value as devices for predicting scholastic achievement in proportion to the degree to which the tests approach in similarity the tasks and social relationships of the actual classroom. (23:273)

Factors associated with vocational interests

Berdie (2), in 1943, made a study as to what factors in an individual's background are related to his measured vocational interests and to his occupational choice. The group studied consisted of 136 men who came to the Testing Bureau of the University of Minnesota as pre-college cases in the spring and summer of 1940. Information about these students was collected from several sources. High-school percentile ranks and scores on the American Council Examination and the Cooperative English Test were obtained from the University files. Scores on the Minnesota Personality Scale and the Strong Vocational Interest Blank were obtained from the files of the Testing Bureau. Personal information, including vocational choice, was obtained from two questionnaires--one which was given to all students coming to the Bureau and another which was given

only to students included in the investigation.

Berdie reported that "family relationships are basic factors in determining personality. Vocational interests are also likely to be influenced by these same factors." (2:259). The results in his study suggested a close relationship between the occupations of the fathers and the expressed and measured interests of the sons.

Berdie stated that:

. . . personality is a product of many conditions, part of these conditions are biologically inherited, the glands for instance; part are socially inherited, religion, for instance; and part are acquired from chance contacts with environmental factors, and one's teachers. (2:274)

These are some of the results found:

(1) Sons of skilled tradesmen tend to have measured vocational interests similar to the interests of skilled tradesmen and engineers, i.e., technical interests. They do not have measured interests in social welfare nor expressed interests in business, but they tend to have expressed interests in engineering.

(2) People with technical interests tend to come from low income families.

(3) Students with measured interests in engineering have greater measured ability than others. Other vocational interests do not appear related to ability.

(4) Students with measured and expressed interests in engineering obtain low social adjustment scores, as do people with measured interests in the skilled trades.

(5) Measured and expressed vocational interests are related to masculinity-femininity and occupational level.

(6) Students with interests in engineering participate in fewer religious and cultural activities.

(7) Students with interests in engineering tend to consider their mathematics teacher as their favorite teacher. (2:274-5)

This summary suggested that these results are not independent among themselves. Interrelationships were known to exist between occupation of father, intelligence of children, economic level of family, and education of mother.

Berdie continued to state that students with measured vocational interests similar to the interests of engineers are likely to come from families with relatively low incomes. These students will most likely have superior ability, but be lacking in social interests or skills. They are likely to have masculine interests and to have interest typical of those men in lower level occupations. They will have participated in relatively few cultural and religious activities and in a few extracurricular activities in high school. They will exhibit hobbies related to engineering such as woodwork, and model planes, and claim to have related special abilities such as drawing, mechanical and mathematical. They tend to admire people in engineering and fewer of their values center about people.

Berdie continued to report that students who choose engineering as their future occupation will tend

to come from the same type of homes and families as students with measured engineering interests. Similarly, they will have fewer social interests and skills, and will have masculine interests typical of men in lower level jobs. They will tend to underline objectives which describe their personalities favorably and will participate in few cultural and religious activities. Their hobbies will also be related to engineering. Berdie concluded that "these results were determined on individuals drawn from the student body of a large state university and generalizations must be made with caution." (2:277)

Concepts of personality traits

Cattell (5), in 1945, reported that it is customary to think of abilities as powers having an existence independent of other personality traits, i.e., dynamic and temperament traits. In mathematical terms this is founded in the conception of unitary traits as factors, since even different ability factors of different modality, e.g., temperament and ability traits, are still more confidently expected to be independent. Correspondingly, in clinical and general psychological terms the usual approach conceives of functionally independent traits or powers. Abilities, for example, are the tools of dynamic traits and may be used interchangeably by the same or different drives.

In his study Cattell stated that clinically

the connection of abilities with dynamic traits is often quite striking. Inferiority overcompensations sometimes produce astonishing performances relative to the I.Q. of the individual, either in all school subjects or in some obscure field in which the individual finds he can at once jump ahead of, and avoid outright competition with, his rivals.

Cattell in concluding stated that the individual who finds himself endowed with certain good natural abilities is likely to enjoy exercising them, and, in a competitive world, to find the dynamic pattern of his self-regard increasingly shaped by these abilities.

Summary

The review of literature reported in this study provided the following conclusions:

1. Different studies have found varying degrees of correlation between academic success and personality traits. Some studies pointed out that there is a low or no correlation, while others stated that there is a relatively significant correlation between academic success and personality traits.

2. When personality is viewed as a whole or in "profile" there is a definite relationship with scholastic aptitude.

3. Objective personality tests will have value as devices for predicting scholastic achievement in

proportion to the degree to which the traits measured by the tests approach in similarity traits needed for the tasks and social relationships of the actual classroom.

4. Personality measures when used in a counseling situation should be used with caution and should not be used as entrance qualifications except in extreme cases.

5. Socio-economic status has a slight positive relationship to academic achievement.

6. Prediction of grades in college is improved by use of scores on objective tests of persistence.

7. Family relationships are basic factors in determining personality, and vocational interests are also likely to be influenced by these same factors.

Chapter III

METHODS AND MATERIALS

In determining the personality traits associated with academic achievement of freshmen men in the Division of Engineering, Colorado Agricultural and Mechanical College, data on the freshman engineering class entering the college in September, 1948, were studied. These data were collected by administering two personality inventories to each of 80 students and correlating the traits with first-quarter grade-point averages. The files of the Office of Student Affairs provided the scholastic record for each engineering student who entered the engineering division in September, 1948. The two personality inventories, Inventories S T D C R and G A M I N by Guilford, yielded the test scores made by these 80 students, (9, 10).

The grade-point average attained by each student during the first quarter of his freshman year was selected as the criterion of freshman academic success in the engineering division. The files contained the letter grade each student achieved in each subject for which he had registered and the number of quarter hours of credit given for each subject. The grade-point average was computed as follows:

1. Each grade-point average was computed by multiplying the number of credits by the weight assigned each letter grade.

2. The weights assigned each letter grade were: an "A" equaled 4, a "B" equaled 3, a "C" equaled 2, a "D" equaled 1, and an "F" equaled 0. "WF" (withdrawal failing) and "E" (incomplete) were counted as "F". "WP" (withdrawal passing) was disregarded.

3. The grade-point average for that quarter was computed by dividing the sum of the total letter grade-points earned by the number of credits earned. A student at Colorado Agricultural and Mechanical College must maintain a grade-point average of 2.0 in order to be successful.

Traits measured

These inventories were developed on the basis of factor-analysis of items in personality questionnaires. Each factor represents a descriptive dimension of personality with two opposite poles. The letter designated was adopted to stand for the more descriptive end of the scale in each case. The factors are defined as follows:

S--Social Introversion-Extraversion.--Shyness, seclusiveness, tendency to withdraw from social contacts, versus sociability, tendency to seek social contacts and to enjoy the company of others.

T--Thinking Introversion-Extraversion.--An inclination to meditative or reflective thinking, philosophizing, analysis of one's self and others, versus an extravertive orientation of thinking.

D-Depression.--Habitually gloomy, pessimistic mood, with feelings of guilt and unworthiness, versus cheerfulness and optimism.

C-Cycloid Disposition.--Strong emotional fluctuations, tendencies toward flightiness and emotional instability, versus uniformity and stability of moods, evenness of disposition.

R-Rhathymia.--A happy-go-lucky, carefree disposition, liveliness, impulsiveness, versus an inhibited, over-controlled, conscientious, serious-minded disposition. (9:1)

The following definitions of factors, unlike the foregoing definitions, are not directly quoted from the manual. They are, rather, prescribed limits to the factors, as the writer has known them and wishes to apply them for the purposes of this study.

G-General Activity.--A tendency to engage in vigorous overt action, versus a tendency to inertness and a disinclination for motor activity.

A-Ascendance-Submission.--Ascendancy in social situations as opposed to submissiveness; social leadership qualities, versus social passiveness.

M-Masculinity-Femininity.--Masculinity of attitudes and interests as opposed to femininity.

I-Inferiority Feelings.--Self-confidence and a lack of inferiority feelings, versus a lack of confidence, under evaluation of one's self, and feelings of inadequacy and inferiority.

N-Nervousness.--A tendency to be calm, unruffled, and relaxed, versus jumpiness, jitteriness, and a tendency to be easily distracted, irritated, and annoyed.

An analysis of the personality inventories used

The following discussion of the personality inventories and the references to various studies made,

have been taken directly from the manuals. (9,10)

The inventory of factors S T D C R, has 175 items which were retained after successive tests of internal consistency of the responses of 400 university students who were predominantly at the sophomore level.

The reliability of scores on an inventory of this type can only be estimated. The Spearman-Brown formula gave estimated reliabilities of .92, .89, .91, .91, and .89, for factors S, T, D, C, and R, respectively in a population of 100 men and 100 women selected at random. In an entirely new group of 100 (50 men and 50 women) similarly estimated reliabilities were: .90, .84, .94, .88, and .90, respectively. Corresponding reliabilities in the same sample by the Kuder-Richardson method were: .92, .85, .90, .87, and .91.

Intercorrelations among the scoring keys occurred. Studies revealed some actual correlation, among S, T, and D, ranging as high as .50. A small correlation of .36 between D and R was also indicated.

The inventory has been used in a wide variety of practical situations, chiefly in connection with counseling services for high school and college personnel, and in connection with a variety of research activities. Many expressions concerning the usefulness of the scores have been made in private communications. Few publications have presented data that can be quoted

to indicate validity for one purpose or another.

The inventory of factors G A M I N, measures five traits G, A, M, I, AND N. More than 300 questionnaire items were constructed which were believed to cover the areas of behavior constituting the five traits. This preliminary form of the inventory was administered to 250 men and 250 women college students between the ages of 19 and 30, ranging from sophomores to seniors.

Four hundred of the questionnaires were scored with the preliminary keys thus constructed. The highest 100 and lowest 100 cases were used as criterion groups in the item analyses for factors G, A, I, and N. For M the criterion groups consisted of 100 males for highest and 100 females of lowest on that key. The test has been shortened to 186 questions.

Intercorrelations among the five scores have been estimated on the basis of results from two samples. The intercorrelations were low enough to assure useful differences in meaning between the trait scores. They were sufficiently similar in the two studies to lend indirect evidence as to stability of function in the scores as derived from different groups under different testing conditions.

It is generally recognized that the acquiring of validity data for personality tests is difficult and the results are usually not satisfactory. Two kinds of validity should be kept in mind; factorial and practical.

The former answers the question, "What does this test measure and to what degree?" The latter answers the question, "Can we predict an individual's success any better by using this test than one could without it, and, if so, to what degree?"

The factorial validity of the five scores were vouched for on the basis of the operations by which they were derived. The fact that the scores have reliabilities far in excess of their intercorrelations was evidence that each measured something consistently and somewhat uniquely.

The norms listed in the manual are of suitable use in psychological clinics, vocational guidance bureaus, universities and colleges. Since the scores on inventories of this type are in part a function of the motivation of the persons answering the questions, the norms should be used only in highly cooperative situations.

High scores on G, A, I, and N mean generally favorable characteristics and low scores mean unfavorable characteristics. High scores on M mean masculinity, low scores mean femininity.

The administration of this inventory is best when administered to subjects individually or in small groups under supervision. All can usually finish within 30 minutes.

Sample studied

The data collected on members of the freshmen engineers commencing in September, 1948, were studied to determine the relationship between raw scores made on the Personality Inventories S T D C R and G A M I N by Guilford, and grade-point averages in the engineering division. The raw scores made on the two inventories and grade-point averages for each sample were as indicated on the master sheet. 1/

For the sample, 80 engineering students were obtained as follows:

Students enrolled in the freshmen engineering division received an announcement in the form of a request that they attend a meeting so that they might submit themselves to personality inventories for purposes of a survey. For the first meeting, 33 students appeared to take the tests. Since this was not a large enough sample, a letter was sent to the freshmen engineers who did not appear to take the tests. This time it was a more personalized request asking that they kindly submit themselves for testing. The letter had been endorsed and signed by Dr. David H. Morgan, Dean of the Graduate School. This boosted the total number of students who made themselves available to 72. The remaining samples

1/ See Appendix A

to complete the study were obtained by individual contact and tests were individually administered.

In administering these personality inventories every other student received the S T D C R Inventory, while his neighbor received the G A M I N Inventory. The purpose of interchanging these tests was so that discussion would be eliminated, thus keeping the testing situation well under control. As the student completed the inventory given him the other inventory was then administered; both tests were administered during the same period.

Chapter IV

ANALYSIS OF DATA

The problem investigated was, What are the personality traits associated with academic achievement of freshmen men in the engineering division at Colorado Agricultural and Mechanical College? Two personality inventories, Inventories S T D C R and G A M I N, by Guilford were administered. The data from the Office of Student Affairs consisted of letter grades and credits earned by freshmen engineers, and the personality inventories provided the raw test scores.

Data were collected for the freshmen engineers entering the Fall quarter of 1948. A sample of 80 was studied for the purpose of determining the relationship of first-quarter grade-point averages and personality trait scores. This sample consisted of better than half of the freshmen men enrolled in the engineering division commencing in September, 1948.

The data collected in this study were analyzed by statistical methods in order to determine the relationship between personality traits and academic achievement, as measured by first-quarter grade-point averages and the raw scores made on the personality inventories.

Statistical methods

Various statistical methods were used in analyzing the data from 80 freshmen men entering the engineering division, Colorado Agricultural and Mechanical College in September, 1948. The statistical methods used in this study were as follows:

1. Zero-order correlations were computed to measure the statistical relationship between grade-point average and the raw score on each personality trait on Personality Inventories S T D C R and G A M I N by Guilford. These zero-order correlations were computed by constructing a scattergram for the two sets to be correlated and from it a correlation was drawn up for each of the ten personality traits. The calculation of r was carried out using the following formula:

$$r = \frac{N \sum f D_x D_y - (\sum F_x D_x)(\sum F_y D_y)}{\sqrt{[N \sum F_x D_x^2 - (\sum F_x D_x)^2][N \sum F_y D_y^2 - (\sum F_y D_y)^2]}}$$

2. The probable errors of the coefficients of correlation were computed for each personality trait to determine the reliability of the coefficients of correlation obtained. The formula used was:

$$PE_r = \frac{0.6745 (1-r)^2}{\sqrt{N}}$$

3. From the data collected the highest and lowest quartiles were chosen by selecting the highest 20 and the lowest 20 on the basis of grade-point averages. The standard deviation (S) was computed for each of the raw scores earned on each of the ten personality traits. These computations were made separately for upper and lower quartiles. The formula used for computing the standard deviation or S was:

$$S = \frac{1}{N} \sqrt{N \sum x^2 - (\sum x)^2}$$

4. A critical ratio was computed to determine whether the indicated differences between the means of the highest and lowest quartiles could be attributed to chance or whether the indicated difference was greater than could be attributed to chance. The formula used was:

$$t = \frac{|\bar{X}_1 - \bar{X}_2 - 0|}{\sqrt{\frac{N_1 S_1^2 + N_2 S_2^2}{N_1 + N_2 - 2}}} \cdot \sqrt{\frac{N_1 N_2}{N_1 + N_2}} > 1.96$$

Zero-order coefficients of correlation

The zero-order coefficient of correlation was used to compute the relationship between first-quarter grade-point averages and the raw personality trait scores of each of the ten personality traits, Table 5.

Table 5.--ZERO-ORDER COEFFICIENTS AND PROBABLE ERRORS OF CORRELATION BETWEEN ACHIEVED GRADE-POINT AVERAGE AND RAW SCORES ON TRAITS S T D C R AND G A M I N AS MEASURED BY PERSONALITY INVENTORIES OF GUILDFORD.

	Traits									
	S	T	D	C	R	G	A	M	I	N*
r	.030	.020	-.113	-.093	-.134	-.059	-.126	.126	.152	.051
PE. _r	.076	.075	.074	.075	.074	.075	.074	.074	.074	.075

*Definition of each personality trait found on pages 40 and 41.

The highest correlation as shown in Table 5 was with trait I (Inferiority Feelings). The coefficient of correlation with grade-point average was .152. The correlation between I and scholastic achievement was not found to be statistically significant.

Masculinity-Femininity as indicated by this study was the second highest positive correlation as to the relationship to scholastic achievement. The coefficient of correlation for trait M (Masculinity-Femininity) with grade-point average was .126.

For the purposes of this study an r equal to four times the corresponding probable error was accepted

as significant.

The significance of the differences of the means of the highest and lowest quartiles

The standard deviation was computed for the highest and lowest quartiles for each of the ten personality traits to measure the variability of the means. After computing S for the means a critical ratio was computed to determine whether the indicated difference between the means of the highest and lowest quartiles could be attributed to chance or whether the indicated difference was greater than could be attributed to chance. The significance of the differences between the means of the highest and lowest quartiles are presented in Table 6.

Table 6.--THE SIGNIFICANCE OF THE DIFFERENCES OF THE MEANS OF UPPER AND LOWER QUANTILES WITH RESPECT TO THE TEN PERSONALITY TRAITS.

Traits*	M ₁	M ₂	Diff. _M	SE,diff. _M	t
S	24.50	25.95	1.45	8.94	.51
T	34.45	36.15	1.70	8.63	.62
D	19.10	24.35	5.25	10.32	1.60
C	22.65	28.80	6.15	11.22	1.73
R	33.25	37.70	4.45	8.82	1.59
G	9.75	10.75	1.00	4.49	.70
A	16.80	18.50	1.70	7.16	.75
M	25.60	24.15	1.45	3.56	1.28
I	31.15	28.75	2.40	8.62	.87
N	27.70	26.60	1.10	7.84	.44

*Definition of each personality trait found on pages 40 and 41.

In computing the critical ratio the "null hypothesis" was used. For each trait the hypothesis that the indicated difference was greater than could be attributed to chance was constructed. After computing the critical ratio for each trait and comparing the results as determined from the table by Fisher, the hypothesis had failed to be rejected because the indicated differences in each case were not greater than 1.96 as indicated in the table.

Summary

In summarizing the question as to whether or not there are valid relationships existing between personality traits and academic achievement, the results are as follows:

1. This study revealed no correlation between academic achievement in freshmen engineering students and personality traits as measured by the devices used.

2. No significant differences in the personality traits were found between freshmen men engineers in the highest quartile of academic achievement and those in the lowest quartile.

3. Freshmen men engineers with high academic achievement records are no better adjusted in personality than men of low academic achievement.

Chapter V
DISCUSSION

In order to aid in answering the problem question, What are the personality traits associated with academic achievement of freshmen men in the engineering division at Colorado Agricultural and Mechanical College, the study was divided into the following steps:

1. What are the measured personality traits of these freshmen men?
2. What is the relationship between personality test scores and grade-point averages?
3. What are the differences in measured personality traits between the highest and lowest quartiles of achievement?
4. What personality traits other than test results are related to achievement in the engineering division?

It was noted that in the review of literature many studies were found concerning the use of various personality trait tests and their value in predicting academic success in college. Different studies have found varying degrees of correlation between academic success and personality traits.

The instruments used in this study for the measurement of personality were Personality Inventories S T D C R and G A M I N of Guilford, and scholastic achievement was measured by achieved grade-point averages of 80 freshmen engineers.

Relationship between freshman grades and personality traits

Zero-order correlations were computed to measure the relationship between achieved grade-point averages and the raw scores on each of the ten personality traits. The coefficients of correlation ranged from .020 to .152. This study shows that there may be some degree of correlation between academic achievement and personality, but not great enough to be accepted as statistically significant. Bryan (3), made a study using the Bernreuter Personality Inventory to measure the relationship between grades in art courses and measured personality traits. Bryan concluded that correlations between grade-point averages in art courses and personality as measured by the Bernreuter Inventory were so low as to indicate little or no relationship. St. Clair (19), made a study using the Bernreuter Personality Inventory and found low correlations between the various personality traits and scholastic achievement. The coefficient of correlation between scholastic achievement and personality trait B2-S (Self-sufficiency) was .19. St. Clair

also found that the technique of partial correlation did not reveal significant relationship between scholastic achievement and personality traits. In this study partial correlations were computed for personality traits M and I which were the two highest positive coefficients of correlation with a probable error of .074. The coefficient of correlation of personality trait M (Masculinity-Femininity) was .05 and the partial correlation was .12. The coefficient of correlation of personality trait I (Inferiority Feelings) was .11 and the partial correlation was .11. These partial correlations did not reveal significant relationships between personality traits and grade-point averages; therefore it was felt that further investigation of partial correlation for the rest of the eight personality traits was not a necessary technique.

Stagner (21), concluded that from previous studies he reviewed, and from the data presented in his study, it became increasingly clear that personality influences achievement in an indirect way, by affecting the degree to which use is made of the potentialities of the individual. He brought this out by making a comparison of "achievers" and "non-achievers", because it was thought possible that students achieving more than would be predicted from their aptitude score would show differences in personality from those achieving less. From his study the achievers were characterized by a low

emotionality score and a low self-sufficiency score. The differences according to Stagner were large enough to be considered important, if not completely reliable.

Differences in measured personality traits between the highest and lowest quartiles of achievement

From the data collected the highest and lowest quartiles were chosen by selecting the highest 20 and lowest 20 on the basis of grade-point averages. The various personality trait scores showed differences between the means varying in amount as between highest and lowest quartiles, but none of the differences were found to be significant. The three greatest differences were for personality traits C (Cycloid Disposition), D (Depression), and R (Rhythymia), and the differences of these means were 6.15, 5.25, and 4.45 respectively.

Miller (17), studied a group of exceptionally able individuals who graduated among the upper five per cent of their respective high-school classes as against the average member of the graduating class. Miller concluded that the exceptionally able college student is not socially maladjusted; rather, there tends to be a positive relationship between intelligence and social adjustment. Woods (24), concluded that poor class work is not necessarily evidence of low intelligence. Social and emotional immaturity, lack of purpose, and of

interests and individuality underlie poor scholarship. In this study there was one student who rated the lowest on grade-point average while his personality trait scores were very high indicating good adjustment as to over-all personality. Still another student ranking very low on scholastic achievement had very low personality trait scores indicating poor adjustment; therefore this individual was given special counseling.

In spite of the fact that this study did not indicate an over-all relationship between academic success and personality, the tests did serve a purpose, and that was in locating students with problems. Individual counseling was given to those students who were both low in scholastic achievement and personality trait scores. These personality inventories created enough interest to a great many students who took the tests and they appealed personally for an analysis. In spite of the fact that personality inventories may not be significant in predicting academic success they still serve to some extent in counseling. Many students attend college for a short time and then drop out or graduate without ever realizing the personal conflicts which they have. These students go unnoticed and eventually become social misfits. Personality tests should be used in a counseling situation either for interviewing

or helping the students gain insight into their respective problems, but not as an entrance qualification except in very extreme cases. Alteneder (1), in her study stated that personality inventories serve as an excellent basis for interviewing and in locating students with problems. In her study she used the Bell Adjustment Inventory and concluded that it is a practical instrument in the guidance of college freshmen.

Personality traits other than test results which are related to achievement

In the problem analysis one of the steps listed to aid in the answering of the main problem was, What personality traits other than test results were related to achievement in the engineering division? Since this study indicated a very low relationship between measured personality traits and academic achievement, further study of traits other than test results was abandoned because it was not warranted. Berdie (2), made a study as to what factors in the background of an individual are related to his measured vocational interests and to his occupational choice. In his study Berdie used the Minnesota Personality Scale and the Strong Vocational Interest Blank and stated that students with measured vocational interests similar to the interests of engineers are likely to come from families with relatively low

incomes. These students will most likely have superior ability, but be lacking in social interests or skills. They are likely to have masculine interests and have interests typical of men in lower level occupations. They will have participated in relatively few cultural and religious activities and in a few extra-curricular activities in high school. They will exhibit hobbies related to engineering, woodwork, and model planes, and claim to have related special abilities such as drawing, mechanical, and mathematical. They tend to admire people in engineering and fewer of their values center about people.

General implications

Personality measures should be used in counseling for the purposes of interviewing or for locating students with problems, but not for entrance qualifications. Since many of the other studies were in agreement with this study, the use of these tests in other than an immediate counseling situation is not supported by findings to date.

Recommendations for further studies

Since this study indicated that there was no correlation which could be considered statistically significant between personality traits and scholastic achievement, it seems reasonable that when measures of personality approach more in similarity the traits needed

for the tasks of an actual situation being tested, personality inventories will have greater validity in predicting scholastic achievement.

Other studies might be made to determine the extent of socio-economic level as conditioning factors of personality, academic and vocational choice of engineers.

Relationships between intelligence and personality plus the factor of vocational interest indicate a need for more research along these lines.

Level of aspiration and persistence seem to have a definite relationship to scholastic achievement, and since statistical studies have failed to indicate any significance, the case histories technique should be used.

This study could be extended to the high school. Perhaps some of the relationships may be masked because of a selective factor existing in college students.

Chapter VI

SUMMARY

The need to predict accurately the probable success of applicants for admission to engineering colleges has long been in existence. Today with engineering college facilities taxed to capacity, it becomes increasingly important to select those applicants as students who have the greatest chance of being benefitted by a technical training. The present study was made to determine whether personality inventories would contribute to the selection of students applying for admittance to the engineering division in conjunction with various other psychological tests now in use in the guidance program.

The data for this study were gathered by various methods which consisted of ten personality traits as measured by the Personality Inventories S T D C R and G A M I N of Guilford, (9, 10), and achieved grade-point averages by 80 freshman students who enrolled in the engineering division in September, 1948, at Colorado Agricultural and Mechanical College.

Statistical methods were used to determine whether there was any correlation between personality

traits and scholastic achievement. Zero-order coefficients and probable errors of correlation were computed between each of these ten personality traits and first-quarter grade-point averages. The coefficients of correlation were found to be very low, ranging from .020 to .152, and the probable errors ranged from .074 to .076. In order to be reasonably sure that there existed some degree of correlation greater than chance, an obtained coefficient of correlation should be four times the probable error. Since none of the coefficients of correlation was four or more times greater than the probable error the coefficients of correlation cannot be considered as statistically significant.

Critical ratios were computed for the highest and lowest quartiles using grade-point averages as the criterion for selecting the quartiles. The results found ranged from .44 to 1.73; therefore the indicated differences were not greater than could be attributed to chance. It is concluded here then that there is not very great difference in personality trait scores between men falling in the highest quartile of academic achievement and men in the lowest quartile.

In summarizing the question as to whether or not there are valid relationships existing between personality traits and academic achievement, this study shows that there may be some degree of correlation but not great

enough to be accepted as statistically significant.
Freshmen men engineers with high academic achievement
records are no better adjusted in personality than men
of low academic achievement.

A P P E N D I X

Appendix A.--SAMPLE OF FRESHMAN ENGINEERING STUDENTS
USED IN THE STUDY OF SEPTEMBER, 1948.

Case Number	First- quarter grade- point average	RAW SCORES OF INVENTORY FACTORS:									
		S	T	D	C	R	G	A	M	I	N
1	3.00	15	31	5	6	33	3	20	29	47	41
2	2.81	27	27	16	16	26	6	12	28	38	31
3	1.29	15	40	16	26	57	14	28	27	38	31
4	2.15	14	19	6	7	24	9	22	22	43	36
5	2.81	10	22	3	12	68	13	28	30	39	30
6	3.52	24	27	18	20	33	14	27	27	37	37
7	3.81	36	39	32	36	25	13	13	26	16	27
8	2.00	21	23	19	16	27	10	18	28	20	26
9	2.11	12	46	24	36	56	16	30	25	38	22
10	1.68	32	41	34	35	34	11	9	25	29	28
11	3.72	14	47	23	30	34	7	20	23	34	33
12	1.61	30	42	36	35	23	11	15	26	40	28
13	1.27	18	24	25	31	54	15	23	28	30	28
14	2.62	8	11	6	11	52	7	27	30	38	35
15	.53	29	43	21	21	34	17	26	27	35	25
16	2.43	4	28	6	13	63	20	31	35	40	30
17	1.08	46	48	38	36	22	2	1	23	18	30
18	3.36	21	47	25	26	39	14	22	27	34	26
19	2.18	10	31	14	20	56	19	25	28	36	35
20	2.05	32	43	31	33	36	13	20	24	36	24
21	2.00	18	26	19	31	38	11	19	26	29	23
22	2.81	23	46	28	37	35	10	24	25	23	17
23	2.81	18	28	17	26	62	17	28	31	37	30
24	3.08	36	31	23	22	18	8	10	25	28	33
25	1.75	27	32	34	44	29	11	21	17	11	11
26	2.52	22	38	19	25	43	16	25	26	37	32
27	2.50	33	28	20	17	13	15	9	27	34	20
28	2.35	30	51	31	38	30	17	23	27	41	30
29	.88	22	19	27	32	50	11	12	21	19	14
30	1.18	30	34	32	36	33	13	9	17	18	20
31	2.69	10	31	4	8	45	10	27	21	38	38
32	1.72	19	45	33	41	40	14	25	14	19	12
33	.42	29	39	21	28	38	9	21	27	27	20
34	1.09	37	34	21	30	33	6	10	28	28	29
35	.23	13	19	9	15	56	18	32	29	47	37
36	3.02	21	32	13	22	50	15	16	24	35	30
37	2.12	26	40	27	33	28	9	26	27	36	36
38	2.81	25	22	21	31	44	7	13	24	23	23
39	1.94	9	18	18	25	53	9	20	29	25	31
40	2.43	18	45	33	40	36	13	21	24	39	28

Appendix A.--SAMPLE OF FRESHMAN ENGINEERING STUDENTS
USED IN THE STUDY OF SEPTEMBER, 1948.

Case Number	First- quarter grade- point average	RAW SCORES OF INVENTORY FACTORS:									
		S	T	D	C	R	G	A	M	I	N
41	3.00	27	49	37	38	26	14	23	20	23	17
42	1.54	25	36	20	26	44	14	21	28	29	29
43	2.40	8	41	15	23	45	12	26	25	41	38
44	3.44	34	36	28	39	28	8	12	23	15	28
45	3.41	17	32	11	11	29	4	16	20	31	30
46	2.73	15	49	17	26	52	14	21	31	42	30
47	1.87	9	33	4	13	51	13	31	30	45	37
48	.46	27	34	16	8	16	7	17	21	35	42
49	1.64	31	42	29	33	26	7	13	23	28	27
50	3.62	42	42	36	35	31	9	5	28	25	22
51	2.86	10	3	6	9	40	14	25	29	41	35
52	2.30	23	54	36	34	27	12	23	24	26	27
53	3.13	29	24	25	30	45	10	18	30	26	21
54	1.81	12	27	5	11	41	5	24	27	29	33
55	2.41	5	35	18	37	61	13	29	27	31	26
56	1.72	13	39	19	29	55	10	27	23	31	28
57	2.58	16	27	6	13	46	14	27	27	41	33
58	2.58	16	41	11	12	33	15	24	27	38	35
59	3.12	20	8	2	6	27	3	7	25	41	36
60	3.36	26	21	10	17	50	13	19	25	36	30
61	1.81	33	43	27	29	30	9	18	26	34	30
62	2.63	16	46	40	52	51	16	22	16	24	19
63	3.33	23	30	7	3	20	1	18	30	37	31
64	3.45	27	40	14	15	38	11	18	27	38	21
65	2.94	15	38	31	40	25	11	16	25	23	9
66	2.81	18	34	9	9	38	6	21	31	43	37
67	2.06	8	39	27	36	59	18	24	27	32	22
68	2.62	42	51	50	52	16	10	10	20	14	19
69	2.46	31	23	30	45	28	7	11	21	16	10
70	2.47	28	40	21	22	21	4	16	23	31	31
71	2.42	4	21	11	21	66	17	31	26	36	8
72	2.81	30	40	26	34	34	10	19	26	36	14
73	2.81	18	29	13	19	35	9	21	28	32	30
74	3.50	15	39	3	6	39	8	19	27	41	40
75	1.79	31	42	24	30	39	11	18	26	30	30
76	1.85	8	35	11	15	45	16	27	26	38	36
77	2.34	7	14	9	16	51	16	28	29	39	32
78	2.02	14	48	21	30	48	17	22	22	37	22
79	3.25	38	28	27	29	26	8	7	25	21	23
80	3.62	10	48	12	22	49	21	30	26	35	29

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