1928

Some practical results of psychological tests

Herbert Martin Emery
University of Massachusetts Amherst

Some Practical Results of Psychological Tests

Herbert M. Emery

Some Practical Results of Psychological Tests.

By

Herbert Martin Emery

Thesis submitted for the degree of Master of Science.

Massachusetts Agricultural College

Amherst, Mass.

1908

Some Practical Results of Psychological Tests.

By

Herbert Martin Emery

Thesis submitted for the degree of Master of Science.

Massachusetts Agricultural College

Amherst, Mass.

1928

TABLE OF CONTENTS

Chapter Page

PREFACE

The investigator in the field of education seldom works with perfect data; frequently these data involve errors, both constant and variable and in many cases are lacking in validity. The investigator must know his data if he is to be scientific; he must ascertain their faults. But he should not stop there; he should inquire concerning the probable effect of these faults when the dats are applied to his problem. It should also be noted that the various statistical methods applied to education are not infalliable, but the defects due to probable errors, may usually be alleviated by the application of a definite factor. Sometimes, as in the case of the present study, it may be shown that the existing faults do not seriously limit the conclusions.

CHAPTER I

INTRODUCTION

Purpose of investigation. It is the purpose of the writer to present a study and evaluation of some of the more readily available items of information which may be, and in many cases are used to predict the probable scholastic success of college students. After a survey of a number of studies illustrative of what has already been done in the field. the writer will give an account of one along this same line which he has been carrying along the last few years, using data obtained at Brown University and Rhode Island State College. Its purpose therefore, may be stated as being to show how accurately the marks of college students in their various subjects can be predicted when their ages, scores upon an intelligence test, and complete high-school marks are available.

CHAPTER II.

STATEMENT OF PROBLEM OF COLLEGE ADMISSION.

Today many of the colleges and universities of this country have more applicants for admission than they can accommodate. This situation has caused anxiety among the college officials and they have an all but insurmountable problem with which to cope. The classification elimination of applicants constitutes difficulties for the board of admissions at our schools of higher learning. Since the close of the World War, this problem has been increasingly felt. The figures in the most recent statistical summary of education issued by the United States Bureau of Education reveal this fact very clearly. " At present between three-fourths of one percent of our whole population is enrolled in college, whereas in 1890 only about one-fourth of one percent was so enrolled. The figures given also show that therefore, the last five-year period has exhibited a much greater increase than any other of similar length."*

Phillips, Frank M. "Statistical summary of education 1923-1924." U. S. Bureau of Education Bulletin, 1926 No. 19. Washington 1927. 7p.

"In January 1923 a special commission on technical and higher education, conducting a survey in the state of Massachusetts relative to the advisability of establishing a state university, reported that during the period from 1916 to 1922 there was an increase of 26% in the number of regular 'full time' students at Massachusetts universities and colleges. In this same report it is stated that for the first time in the history of these institutions it has been necessary to resort to some effective means of limiting the numbers of students in order to fit the facilities of the institutions."*

An outstanding question which has arisen in connection with the crucial situation just described, is that of whether or not institutions of higher education shall open their doors to practically all those who have completed a secondary course and wish to enter. The general tendency has been for state supported institutions to do so, whereas those deriving their support from other sources exercise varying degrees of selection among the applicants for admission. These policies are rarely based upon any thorough going study of the problem and never upon conclusive evidence as to the best practice so that what should be done may be considered still an open question. It is true

---

*Commission for an investigation relative to opportunities and methods for technical and higher education in the commonwealth. House No. 1,700, Massachusetts.

that the data available appear to warrant the statement that at present the group of those who actually enter college represents a marked selection of high-school graduates, but that it still contains many individuals who apparently cannot carry the usual type of college work successfully. On the whole, therefore, it seems desirable, perhaps even necessary, if colleges are to continue to maintain their present scholastic standards, that some degree of selection among applicants for admission should be exercised. Such a statement raises the question as to what is the most desirable basis of making this selection. In other words, do any of the data which are fairly readily obtainable concerning high-school graduates provide a satisfactory basis of foretelling scholastic success in college? If so, which of these data are most valuable for this purpose and how much confidence should be placed in their use?

Today the modern vogue or fancy is for the high-school graduates to matriculate at some college immediately after they are awarded their high school diplomas. It is a fact that many of these young college aspirants would do themselves and their community and their immediate families much more good if they would devote their time and money to some other line of endeavor. The unnecessary waste of time and

---

*Charles W. Odell, op. cit., p. 26-29

money in many instances presents a sad situation. In my research study, I have learned of many failures at colleges, a great majority of which can be classified under a division which would previously be indicated as a class deficient in certan mental capacities to do college work. Such failures involve a tremendous financial cost to both the institutions and the individual.

Because of the vast number of applications for college admission many colleges have already been forced to limit the numbers which can be enrolled each year. Some of the very prominent colleges which have been compelled to limit their enrollment are: Harvard, Yale, Princeton, Vassar, Mount Holyoke, Swarthmore, Dartmouth, and many of the smaller colleges of the East, including some of the state colleges. Of course many new colleges are being founded at the present time, but this situation does not materially help to solve the problem.

It is in indisputable fact that many men have gone through college who have inferior mental capacities. This, of course, handicapped and held back the students who would have benefitted more from the efforts of the faculties of the institution. With the ever increasing number of college applicants, the question raised is:

How can the best group be selected; that is, the group that would benefit most from the improved college education which the institutions hope to be able to offer.

Another question arising, in part at least, from the same cause of increase in college enrollment, and which has attracted much attention recently is that of definitely providing for college students of different aptitudes and abilities. This question really divides itself into two parts. In the first part, if the amount of selection at college entrance is not very great, it will undoubtedly result that many of those who are allowed to enter can not do satisfactory work in certain subjects, whereas in others they will do passing or excellent work. The college is therefore confronted with the need of providing educational guidance for such students. This requires, if possible, the determination of the subjects or courses in which the students will succeed and those in which they will fail. Even if entrance requirements are decidedly severe and many of those seeking admission are barred, educational guidance of the type I have just mentioned is still desirable. In the second part, there has recently been considerable interest in the matter of offering different types or

levels of instruction within single subjects and otherwise varying the educational opportunities given students of different abilities. An increasing number of colleges are giving this matter serious consideration.

Various College Entrance Requirements.

The prevailing method of college admission in the majority of colleges today is by the high school certificate method. Some colleges, such as Harvard, Yale and Princeton demand both a qualifying certificate record and the passing of College Entrance Board Examinations. Others use the Regent Examinations. Another method is the use of the "comprehensive examinations," or the Scholastic Aptitudes Tests. Still another method which was first prominently considered in 1918 is the "intelligence examinations." This requirement is not very satisfactory at the present time but does indicate to some degree of accuracy the probable fate of the candidate. At the present time "intelligence examinations" play a very important role in the enrollment of students at Brown University, University of New Hampshire, and Columbia University. This is a means by which the success or failure of a student is more or less determined before actually beginning college studies.

CHAPTER III.

HISTORICAL DEVELOPMENT OF INTELLIGENCE TESTING IN COLLEGES.

The developmental background of psychological tests is much longer in terms of years and much more soundly scientific in its nature than many people realize. The first definite attempt to measure general intelligence began fully fifty years ago when the French psychologist Binet with the aid of Simon, the French physician, formulated a test by the results of tests given to normal children of the ages 3, 7, 9, and 11 years. There were thirty tests. The purpose of these tests, which greatly improved during the following years, was to separate children of low mentality from those of normal ability. Within a year, Binet's study of twenty years duration crystalized itself into the form of a scale for the measurement of intelligence. About 1910 this scale, in proper form was introduced into the United States chiefly through the efforts of Goddard; and since then has gone through many revisions in this country and has been translated into many different languages. In 1890 Cattell is known to have

applied intelligence tests in his work with students at the University of Pennsylvania. In 1896 Cattell and Farrand gave out the first report of tests given to freshmen only. In 1901 Wissler presented a summary of the Columbia freshmen tests but was unable to show any prognostic value of these tests. In 1896, the American Psychological Association compiled a series of physical and mental tests for college students. In the same year and in 1907, the Association tried to get the cooperation of psychological laboratories in compiling intelligence tests. Williams and Harper of Chicago further advanced the importance of intelligence tests, and the latter emphasized the importance of determining the character, intelligence, and tastes of the college candidate. Thorndike greatly helped the development of the intelligence testing by attacking the inadequacy of the method of examinations given by the College Entrance Board of Association of Colleges and Preparatory Schools of the Middle States and Maryland.

The American Psychological Association and the National Research Council played a very important role during the World War. Tests were constructed by a committee of experts and given to about 1,700,000 men. They served untold benefits to the country by the

production of the now famous Army Alpha Tests of Intelligence for literates and the Army Beta for illiterates. Immediately after the close of the war thousands of these same tests and newly devised similar ones were given in educational institutions all over the country and, since that time, extremely valuable data have been accumulating and have been carefully studied by scientific methods.

Thorndike is largely responsible for the application of intelligence tests to college entrance. As a result Columbia University began to study the fitness of its candidates by this method in 1918. At Brown University annual intelligence tests are given in the form of Brown University Tests. It was first applied in 1918 to the S. A. T. C. and the Naval Unit.

Since 1918 an ever increasing number of colleges have instituted the application of intelligence tests. A large number have initiated this form of testing very recently. This evidences the value of this method. These institutions have studied the results of these tests and know their value.

At the present time fully two hundred and fifty colleges and universities give intelligence tests to their students. In most cases the freshman

class alone is given this test. They usually come before the actual school work begins. Two or three days are set aside for this purpose when the freshmen class assembles at some large room and the examination is then administered. The tests are marked and filed before the upper classmen report for registration. In some institutions the intelligence test is given to the entire school; all classes are subjected to it and records are kept in the college office, where they can be referred to frequently by the dean and faculty.

"Every year in all fields of educational endeavor, and industry as well, more and more use is being made of examinations of this type. State-wide surveys have been made at certain educational levels, notably of high school seniors in Indiana, Massachusetts, Pennsylvania, North Carolina, and Illinois. At the college level, the critical study and use of psychological tests has been undertaken very seriously as is shown by the activities of certain organizations and hundreds of institutions. For a number of years the Society for the Promotion of Engineering Education, the American Council on Education, and the Ohio College Association have been sponsoring cooperative programs of psychological testing in which a great many colleges

in all parts of the country are taking part. Probably the most important recent development at the college level is the fact that, in April 1925, the College Entrance Examination Board appointed a committee to prepare and direct the administration of psychological examinations. Accordingly, the College Entrance Examination Board gave, in June 1926, a "Scholastic Aptitude Test" to over eight thousand candidates for college admission. Such a test was also given in June 1927. It is significant that a number of the larger colleges in the East require all candidates to take this examination and that a number of other important eastern colleges practically require it of certain candidates and strongly recommend that many others take it."*

Psychological Testing at Brown by Andrew H. MacPhail
Reprinted from the Brown Alumni Monthly for February 1928.

CHAPTER IV.

A BRIEF REVIEW OF WHAT HAS ALREADY BEEN DONE.

The extent to which intelligence tests have been used in institutions of higher learning. Since most of the recent studies dealing with the prediction of scholastic success in college have employed intelligence test scores as the chief criterion, it seems in place to mention several studies which show something of the extent to which intelligence tests have been employed in college, both for this and other purposes. Here and later no attempt will be made to refer to all of the investigations which have been reported; only a few of the most significant or typical ones will be mentioned in each case. Bridges,* early in 1922, received answers from 42 of 70 institutions to which he had sent inquiries and found that although 31 out of the 42 had made some use of group intelligence tests only a few had done so in connection with determining admission. Apparently, in many cases, the tests were administered with no very definite purpose in mind. A year and a half later Laird and Andrews** reported

---

*Bridges, J. W. "The value of intelligence tests in universities," School and Society, 15:295-303, Mar.18,1922.

**Laird, D. A., and Andrews, A. "The status of mental testing in colleges and universities in the United States," School of Society, 18:594-600. Nov. 17, 1923.

that 26 out of 64 institutions made some use of tests as part of the routine process of determining the admission of applicants and that others used tests for such purposes as sectioning classes, determining the amount of work to be carried, giving vocational and educational guidance, deciding upon the elimination of students, and dealing with disciplinary cases. Probably the most detailed report of the use of intelligence tests in colleges is that by MacPhail,*** which appeared some three years ago. In this he summarized briefly almost every article dealing with this topic and showed that in many institutions intelligence tests played a definite part in the admission of applicants as well as in other questions of policy. A more recent study by Toops**** reported that 66 out of 110 institutions answering a questionnaire employed intelligence tests during the year 1923-24. None of these based admission entirely upon test results, but 19 used them as a partial basis. Forty-nine took them into account in determining dismissal for low scholarship, 34 in determining probation, 36 used the results in determining the amount of work students should carry,

---

***MacPhail, A. H. The Intelligence of College Studonts. Baltimore: Warwick and York, 1924. 176p.

****Toops, H. A. "The status of university intelligence tests in 1923-24," Journal of Educational Psychology, 17:23-36, 110-24, January, February, 1926.

25 in selecting and encouraging bright students to take graduate work, 42 in motivating the work of bright students, and various numbers in selecting assistants, appointing scholars and fellows, and so on.

From the studies referred to above it will be seen that intelligence testing is apparently well established in many institutions of higher learning and that the results receive large use in a number of matters having to do with guidance, instruction and other direction of students, as well as to a somewhat lesser degree with their admission. So far as the writer knows, no institution has yet based admission upon intelligence test scores alone, though for certain classes of applicants a few colleges make them the chief means of examination. (This refers chiefly to the admission or rejection of applicants who have not completed the required secondary school work and who are also above the usual age.)

Summary studies of the relationship of intelligence scores and other criteria to college marks. Several of the studies mentioned and a number of others present data showing the degree of relationship found between college marks and intelligence test scores, high-school marks, and other items of information. Before considering a few reported investigations in greater detail it seems well to give a brief picture

of general tendencies. Terman,* reporting on 25 colleges, found coefficients of correlation running from .29 to .83 between test scores and college marks, whereas those between the latter and high-school marks ranged from .38 to .74, and those between them and college entrance examination results from .25 to.62. Incidentally, he states that the Thorndike Intelligence Examination is probably the best of those available for the purpose of predicting scholastic success in college. Roberts** reports similar ones of .31 to .60, also coefficients between college and high-school marks of .53 to .69 and between the former and college entrance examinations of .25 to .62. He makes this statement, "Combining intelligence scores with all other good measures, the exceedingly high correlations of .75 to .80 are obtained between these measures and school marks." He also writes, "The intelligence scores have shown themselves our surest guide in detecting the very highest and the very lowest of intellectual ability." MacPhail*** lists about 60 correlations between test scores and college marks, ranging from .13 to .71.

---

*Terman, L. M. "Intelligence tests in colleges and universities," School and Society, 13:481-94, April 23, 1921.

**Roberts, A. C. "Objective measures of intelligence in relation to high-school and college administration," Educational Administration and Supervision, 8:530-40, Dec., 1922.

***MacPhail, op. cit., p. 29.

The use of intelligence tests at Brown University. Due to the work of Colvin, assisted by MacPhail and others, Brown University has for about ten years been among those institutions making the most extensive and careful use of intelligence tests in connection with the admission of students and also, though perhaps to a lesser degree, in connection with their guidance and direction after entrance. Not only have intelligence test played a prominent part in determining the admission of freshmen at Brown University, but also a number of articles have appeared describing their use for this purpose. Therefore it seems fitting to select this institution as the example which will be described in more detail than any other as an illustration of what is being done.

The work along this line began during the time of the World War and by 1919 Colvin* reported on the first two or three years' use of tests. At this time he stated that different intelligence tests correlated from about .40 to .60 with freshman marks, and that of the students who did unsatisfactory or unusually good work about two-thirds were indicated by the test scores. On the whole the results were con-

---

*Colvin, S. S. "Psychological tests at Brown University," School and Society, 10:27-30, July 5, 1919.

sidered sufficiently satisfactory to warrant continuing the use of tests. A year later another article* by the same writer gives about the same correlations as before, those for the Brown University Psychological Examination and the Thorndike Intelligence Examination being a number of points higher than those for Army Alpha and also being on the whole higher than the corresponding correlations for high-school marks or teachers' estimates. The test results appeared to pick out the superior and inferior students with more accuracy than the average ones. When the Brown and Thorndike scores were averaged 90 per cent of the lowest tenth were found to have failed in one or more subjects.

In 1922 Colvin and MacPhail** replied to some unfavorable criticisms of the use of intelligence tests in college and gave further data concerning their use at Brown University. Most of these merely substantiate previous statements, though in some cases they are presented in a different form. The writers state, for example, that low test scores furnish a more reliable prediction that college work in general will be poor than do low marks made during the first semester but that a combination of the two is better than either one alone. Of college honors 80 per cent went to those

---

*Colvin, S. S. "Validity of psychological tests for college entrance," Educational Review, 60:7-17, June, 1920.

**Colvin, S. S., and MacPhail, A. H. "The value of psychological tests at Brown University," School and Society, 16:113-22, July 29, 1922.

earning high test scores, 19 per cent to those with medium scores, and only 1 per cent to those with low scores.

More recently Burwell and MacPhail* have written upon the same topic. They report that the procedure has been changed somewhat by giving the Brown test to all freshmen and the Thorndike test only to the lowest fifth, in place of giving both to all freshmen as had been done for several years. Among the statements made are that "new students who will probably fail in two or more subjects in either semester during their first year in college are far more likely, roughly speaking ten to twenty times more likely, to be found among those who make low psychological scores than among those with high ratings;" that "a freshman whose psychological score places him in the lowest decile has only two chances out of five of remaining more than one year in college and only one chance out of five of graduating;" and, finally, that "the majority of honor men are to be sought among those scoring in the best psychological third; most of the remainder may be expected to come from the middle third; and a very few (about one out of twenty) from the lowest third." Forty-six has been set as a

---

*Burwell, W. R., and MacPhail, A. H. "Some practical results of psychological testing at Brown University," School and Society, 22:48-56, July 11, 1925.

critical score on the Brown University test above which a student must rate to indicate that he will probably receive no grades below "C" during the first semester.

It appears that those who have been using the tests at Brown are very firmly convinced of their value. However, they recognize and point out certain limitations and indicate that it is highly desirable to have other data to supplement the test results, but apparently regard them as the one most important criterion for predicting scholastic success in college.

The use of tests at Columbia University.

Columbia University, also, has made rather extensive use of intelligence tests in connection with admitting students. Accounts of the work have been given by Wood,* Thorndike,** and others. The experiments there appear to have begun in 1919. At that time faculty action was taken providing two possible methods of entrance, one of which was the old method based upon entrance examinations in high-school subjects, previous school records, health records, and estimates of character and personality. The second method sub-

---

*Wood, B. D. Measurement in Higher Education. New York: World Book Company, 1923, Chapters II-V.

**Thorndike, E. L. "On the new plan of admitting students at Columbia University," Journal of Educational Research, 4:95-101, September, 1921.

stituted intelligence tests for the subject-matter examinations included in the first. For purposes of record all those desiring to enter by the first plan as well as those entering by the second are given the Thorndike Intelligence Examination. Many different sets of figures are given to indicate the validity of this test as used at Columbia for forecasting success in college work. The correlations between test scores and college marks average around .65 and are distinctly higher than those of the latter with college entrance examinations, New York Regents' examinations, and still more so than those with secondary-school marks. The correlations obtained for the test results are probably increased somewhat because no applicant for admission is allowed to take the test unless the data concerning him on the other three points mentioned are satisfactory. The same is, however, true of those admitted with examinations covering high-school subjects as one of the criteria and doubtless raises the correlations there also. In conclusion it may be said that the use of intelligence tests, as one of the bases for determining admission to Columbia University, has become an integral part of the procedure and is no longer considered an experiment.

The use of intelligence test at the University of Minnesota. The reports* from this institution are not as favorable to intelligence tests as those from Brown and Columbia Universities. It appears that high-school marks, the kind of work carried in high school, and marks on three themes at the beginning of the freshman year at the University were all more reliable in indicating students whose university work was poor than were the scores made on a mental test. When the latter were combined with the former, a correlation of about .70 was obtained. It is pointed out that in most cases explanations of marked discrepancy between the work actually done and the predictions made from the combined criteria can be found when the individual cases are studied. What has been accomplished at the University of Minnesota may be summarized as follows: a threshold has been fixed such that only 1 per cent of those falling below it will prove successful in college work; the procedure can be explained to students and all others interested; students

---

*Johnston, J. B. "Predicting success or failure in college at the time of entrance," School and Society, 23:82-88, January 16, 1926.

Johnston, J. B. "Predicting success or failure in college at the time of entrance," School and Society, 19:772-76, June 28, 1924; 20:27-32, July 5, 1924.

Johnston, J. B. "Tests for ability before college entrance," School and Society, 15:345-53, April, 1922.

of unusual ability can be located; a beginning of vocational selection has been made; promising students not in college can be selected and encouraged to attend; college failures can be treated much more adequately; students who need special advice can be selected and given this advice; and finally each student guided "so far as possible into that line of effort in which his native ability will find its most complete expression."

The use of intelligence tests at other institutions. In view of the fact that there is a great similarity between the results reported from most of the institutions which have employed intelligence test scores as one of the criteria for determining admission, it seems not worth while to refer to reports from more than a few different institutions. Those which are mentioned in this section were chosen partly more or less at random and partly because the results obtained were in some way different from the general trend.

The results reported from the University of Pittsburgh* are distinctly lower than those given previously. In this case college marks correlated only .41 with Army Alpha Scores, as compared with .32 with first semester marks. These correlations were undoubtedly

---

*Ernst, J. L. "Psychological tests vs. the first semester's grades as a means of academic prediction," School and Society, 18:419-420, October 6, 1923.

lowered somewhat by the fact that the individuals included in the study were more carefully selected than those of an ordinary freshman class, and also by the fact that the Army Alpha Test seems, on the whole, not to predict scholarship as well as do the Thorndike, Brown, and several others. Differing much from this is an unusually high correlation reported from the State Normal School at Indiana, Pennsylvania.* The National and Illinois Intelligence Tests were used and the scores correlated above .70 with the educational psychology mark.

May, at Syracuse University,** secured information as to the number of hours spent in study and found that combining this with intelligence test scores gave a multiple correlation of .83, whereas test score and high-school mark gave only .64 with honor points in college. He also found that when the amount of study was held constant the correlation between test score and honor points was .81. A study at the University of Washington *** corroborates this, although it does not present its results in just the same way. Wilson, who reports it, concludes that the failures of

---

*Rich, S. G., and Skinner, C. E. "Intelligence among normal school students," Educational Administration and Supervision, 11:639-44, December, 1925.

**May, M. A. "Predicting academic success," Journal of Educational Psychology, 14:429-40, October, 1923.

***Wilson, W. R. "Mental tests and college teaching," School and Society, 15: 629-35, June 10, 1922.

intelligence tests and college marks to correspond more closely is largely accounted for by the differences in the amounts of time spent in study, especially by the fact that, on the whole, bright students study less than do dull ones.

Studies showing correlation in particular subjects with intelligence test scores and other data. Most of the many studies made have correlated the various measures with college averages, only a few, dealing with marks in particular college subjects. Of the few, two which correlated test scores with college marks and one which used high-school marks instead of test scores will be mentioned. One* of the first two was made at the University of Pittsburgh and yielded the average coefficients of correlation between score on the Thorndike test and freshman college marks for the first semester shown in Table I on the following page. The correlation of the test result with the general freshman average for the first semester was, .51. Root, who reports the study, concludes that test results are decidedly valuable for predicting academic success, but that they are only one of the needed items of information. He points out that if the criterion for admission to the university were taken as being the lower limit of the middle group upon the tests, all applicants scoring above that point being admitted and

TABLE I. COEFFICIENTS OF CORRELATION BETWEEN THORNDIKE TEST SCORE AND FIRST SEMESTER COLLEGE MARKS

Biology	.51	History	.46
Chemistry	.43	Human Progress	.69
English	.36	Mathematics	.52
French	.42	Physics	.50
German	.50	Public Speaking	.46
Graphics	.35	Spanish	.57

TABLE II. COEFFICIENTS OF CORRELATION BETWEEN HIGH-SCHOOL AND COLLEGE MARKS IN CERTAIN SUBJECTS

College Subjects	High-School Subjects						
	Eng.	Chem.	Alg.	Geom.	Lat.	Elem. Fr.	Adv. Fr.
English	.28	.20	.18	.19	.23	.25	.31
Chemistry	.21	.19	.21	.23	.23	.28	.26
Algebra	.22	.34	.41	.41	.26	.41	.33
Analytic Geom.	.28	.31	.38	.34	.30	.38	.40
Elem. French	.40	.26	.43	.14	.14	---	---
Adv. French	.39	.18	.26	.03	.32	.41	.35
German	.19	.25	.31	.28	.39	.37	.43

all below rejected, about one-third of the students would be excluded or admitted improperly, that is, excluded when they could do satisfactory work or admitted when they could not.

The other* of the two studies does not give tables of the exact coefficients of correlation, but summarizes the results found from correlating Otis test score with college marks as follows: "In all cases the correlations are positive. In all cases on the average the pupils who stand high in the test stand high in scholarship; those who stand low on the test stand low in scholarship, and those who stand in the middle on the test are in the middle in scholarship. But in some cases the relationship is quite low, while in other cases it is moderately high. In no case is there a high coefficient of correlation between the test and the marks in any subject. With German during the first year the relationship is quite respectable, but never high enough for prognosis. The coefficients are substantial (from .45 to .61), then, between the Otis test and the marks in German, English, history, geology, and French for the first year;

Root, W. T. "The freshman: Thorndike college entrance tests, first semester grades, Binet tests," Journal of Applied Psychology, 7:77-92, March 1923.

*Jordan, A. M. "Student mortality," School and Society, 22:821-24, December 26, 1925.

present but low (.32 to .39) in the case of mathematics, chemistry, Spanish, economics, engineering, and Latin. During the second year the coefficients are substantial in English and Spanish; present but low in French, history, economics, engineering, and German; and negligible in mathematics, chemistry, geology, Latin, and zoology. However, the coefficients of correlation during the second year are necessarily lower because of the contraction of the range of scores (the lowest have largely disappeared). The correlations with average and total grades are marked." Jordan also states the correlations obtained between high-school and college marks. These varied from .37 to .59 and on the average were quite similar to the coefficients between college marks and test score. The closest relationships appeared to be in economics, Spanish, and French. Using multiple correlation with combined test score and high-school average mark he obtained a coefficient of .58 with the university average for two years. The conclusion from his study is, therefore, that there is little difference in prognostic power between the score on the Otis Group Intelligence Scale, Advanced Examination, and the high-school mark, although the correlations of the former with college marks are lower than

those Root found with the Thorndike score. This latter fact is undoubtedly due, at least in part, to the fact that the Thorndike test is considerably longer than that of Otis and so yields a more satisfactory measure for the purpose here discussed.

The third study referred to* was conducted at the University of Maine and dealt with the correlation of high-school and college marks in particular subjects. The correlations found are given in Table II. These coefficients seem to warrant the conclusion that correlations between high-school marks and college freshman marks in single subjects above .40 are rare and that the central tendency of such correlations is not far from .30. This, however, is not supported by the results obtained by Jordan, whose corresponding coefficients averaged about .20 higher.

The other studies of this sort available tend to yield correlations of about .40 to .50 or .55 between test scores and marks in single college subjects and about the same between high-school and college marks. Most of them are based on smaller numbers of cases covering only a few subjects and are hardly worth mentioning separately.

---

*Gowen, J. W., and Gooch, M. "The mental attainments of college students in relation to previous training," Journal of Educational Psychology, 16:547-68, November, 1925.

The use of tests at Stanford University.

Tests were not used at Stanford University until 1921. Terman appeared before the faculty in February of that year and explained some of the benefits that other colleges were deriving from them*. He emphasized the fact that failure of students caused an enormous waste of funds and that an effort ought to be made to get a better type of student. In accordance with his suggestion the Thorndike test has been given every year since that time.

The results of this have been published by Terman and Cowdery**. During the first two years the test was given the first week in college. In 1923 a report was made of the work up to that time and this report recommended that the test be given before matriculation; no candidate whose score was below 50 was to be accepted. The selection began in 1924. In 1921 and 1922 the average score of all candidates was 71; in 1924, 75.36; in 1925, 77.1. The average score of the accepted candidates in 1924 was 78.7; in 1925, 80. Thus a better type of student seems to be attracted to Stanford and the percentage of students coming before the committee for low scholarship has dropped from 28 to 21.

---

*Terman, L. M.; The Measurement of Intelligence.--Intelligence Tests in Colleges and Universities. School and Society, Vol. 13, April 23, 1921. pp. 481-494.

**Terman & Cowdery; Stanford's Program of Personnel Research. Vol. 4 Nov.-Dec. 1925, pp.263-267. J. of P. Research.

The use of tests at Bryn Mawr College. An attempt was made by Crane* to determine which of three plans is the best for selecting students to be admitted to college. The data were gathered at Bryn Mawr College. The three plans considered were as follows: 1. Making entrance examinations competitive and excluding the lowest 10 per cent. 2. Giving the Thurstone Psychological Test and excluding the lowest 10 per cent. 3. Combining the two measures and excluding those in the lowest quarter of both. The third plan was found to be superior to the others. It would exclude the smallest number of satisfactory students and admit the smallest number of unsatisfactory ones. Other plans in which a still larger number of factors is considered might be even better than this third one.

---

*Crane, Esther; An Investigation of Three Plans for Selecting Students to be Admitted to College. Journal of Educational Psychology. May 1926, pp. 322-30.

Summary of the uses of mental tests. A questionnaire was sent to 110 colleges by Toops in order to determine the status of university intelligence tests in 1923-1924*. Sixty-six per cent of these colleges used tests, but none used them as a sole basis for admission; nineteen used them as a partial basis. The following are the eight most frequent uses in order of frequency: 1. Determining dismissal for low scholarship. 2. Encouraging extra effort in unmotivated bright students. 3. Determining amount of school work to be carried. 4. Determining probation for low scholarship. 5. Dealing with disciplinary cases. 6. Encouraging bright students to undertake graduate work. 7. Making recommendations for scholarships. 8. Partial basis for admission. Other less frequent uses are: sectioning into groups according to ability, studying teachers' marks, individual consultation, admission from non-standard schools, research purposes.

Toops estimated that in 1924-1925 about half the colleges in the country used tests for one purpose or another. It is quite likely that the number is increasing rapidly every year. His report showed that the Thorndike test was the most common and that the

---

*Toops, Herbert A.; The Status of University Intelligence Tests in 1923-1924. Journal of Educational Psychology. Volume 17, January 1926, pp. 23-26.

Army Alpha was too easy. A test must be reasonably long to be satisfactory for college students. Some small colleges have tried giving a test for a year or two and then discarding it; this may be due to the fact that the test used was too easy and too short to be of any service. We should take this into consideration when we hear adverse reports. One important thing to note in the report of Toops is that mental tests in colleges are commonly thought of as an administrative and pedagogical device; they are not designed to keep out undesirables.

From the studies referred to, it will be easily understood that many institutions of higher learning employ intelligence tests for various purposes associated with the educating of the students. As yet there is no known institution which bases admission entirely upon intelligence tests though a few colleges make them the chief criterion.

CHAPTER V

RESEARCH.

THE GENERAL PLAN OF THIS STUDY.

The initial collection of data. The data used in this investigation concerns groups of individuals admitted to Brown University in various classes from that of 1922 through 1931 and to Rhode Island State College in 1924. The data secured concerning these students consisted of the following:

(a) Transcript of secondary school work.

(b) College records through the junior year.

(c) Mental test scores.

The preparatory school marks were obtained from the offices at Brown University and Rhode Island State College and in some cases directly from the preparatory schools.

The records of the college work were obtained directly from the Registrar's office of both institutions.

The records of the mental test scores were obtained from the President of Rhode Island State College and the Committee on Educational Advice and Direction of Brown University.

The reliability of the data secured in this investigation. There is no doubt that in both intelligence test scores and high-school and college marks large variable errors are present. No group intelligence test so far devised yields highly accurate individual scores and the Miller Mental Ability Test which is used at Rhode Island State College, requiring only an hour to give, is probably less reliable than the Thorndike Intelligence Examination and the Brown University Examination which consume two or three hours. Moreover, the Miller test as given at Rhode Island State College is not administered by trained individuals and selected examiners as at Brown University. This fact undoubtedly serves to increase the errors in the scores.

The method of computing intelligence quotients, which Otis provides, introduces a constant error into many of those so determined. However, as little use will be made of the intelligence quotient in this thesis, attention is simply called to the fact that the coefficients of correlation between the I. Q. and other data are probably slightly lower than they should be and, the estimated accuracy of predictions made on the basis of the I. Q. is slightly too low.

Another fact which probably affected the significance of the mental test scores was that about half of the students had never taken an intelligence test before and it is likely that many of their scores, when compared with students who had taken such tests previously, do not fairly represent their mental ability. In some cases, because of the conditions under which the tests were given some students did not put forth maximum effort while taking the test. These and all other causes which produce variable or accidental errors in the test scores result in lowering the correlations and other predictive indices based thereon and justify the conclusion that the real relationships are somewhat closer than those actually computed. The marks from the various high schools with different systems and standards were transmuted with great care using sound statistical procedure in all cases, to be sure that the transmuted marks were really equivalent to the original ones. The effect of increasing such variable errors was to lower the coefficients of correlations and other predictive measures secured.

Statistical Methods used for interpretation of date. The methods used in this study in order to interpret the data were the three common statistical methods applied to education.

(a) Graphical.

(b) Coefficient of correlation.

(c) Quartile placement.

STUDY I.

RHODE ISLAND STATE COLLEGE

In the fall of 1924 one hundred thirty-one freshmen who entered college at that time took the mental ability test. The test used was the Miller Mental Ability Test, the author being W. S. Miller, Ph.D., Professor of Educational Psychology, University of Minnesota. The test is divided into three parts with a possible score of forty for each, making the total possible score one hundred twenty. Two students were tied for the highest mark, their score being 108. The student at the lower end of the scale had a score of 35. Sixty-five students received a score of 88 or better and the scores of the remaining sixty-six ranged from 88 down to the low score of 35.

Graphical Method. Graphical methods in general do not show specific case comparisons although they are useful in showing general trends.

The accompanying graphs are careful plots of the High School Marks, Mental Tests, and College grades of the groups of students previously mentioned. The abscissa is the scale of the mental test scores, and the ordinate scale represents the number of students.

The curves as shown are extremely irregular, due largely to the small number of cases under consideration. It will be observed, however, that the general trend or rise and fall suggests very closely a probability curve, having the usual small number who excel and also a like small number who are low, and the greater proportion concentrated in the centre position. The larger the number of cases considered the more would the irregularities tend to flatten out and the curve would more nearly approach the smooth probability curve.

RHODE ISLAND STATE COLLEGE - CLASS 1928

FIGURE 1

LEGEND

College Grades

High School Grades

Mental Test Scores

FIGURE I.

This figure shows that college grades are not as high as high-school grades. Judging from the manner of distribution of scores on the mental test it seems reasonable to suppose a somewhat more difficult test would probably be better for a group of this sort. This conclusion is based on the fact that the test quite obviously did not differentiate within its higher range of scores nearly as well as it did in its lower range of scores.

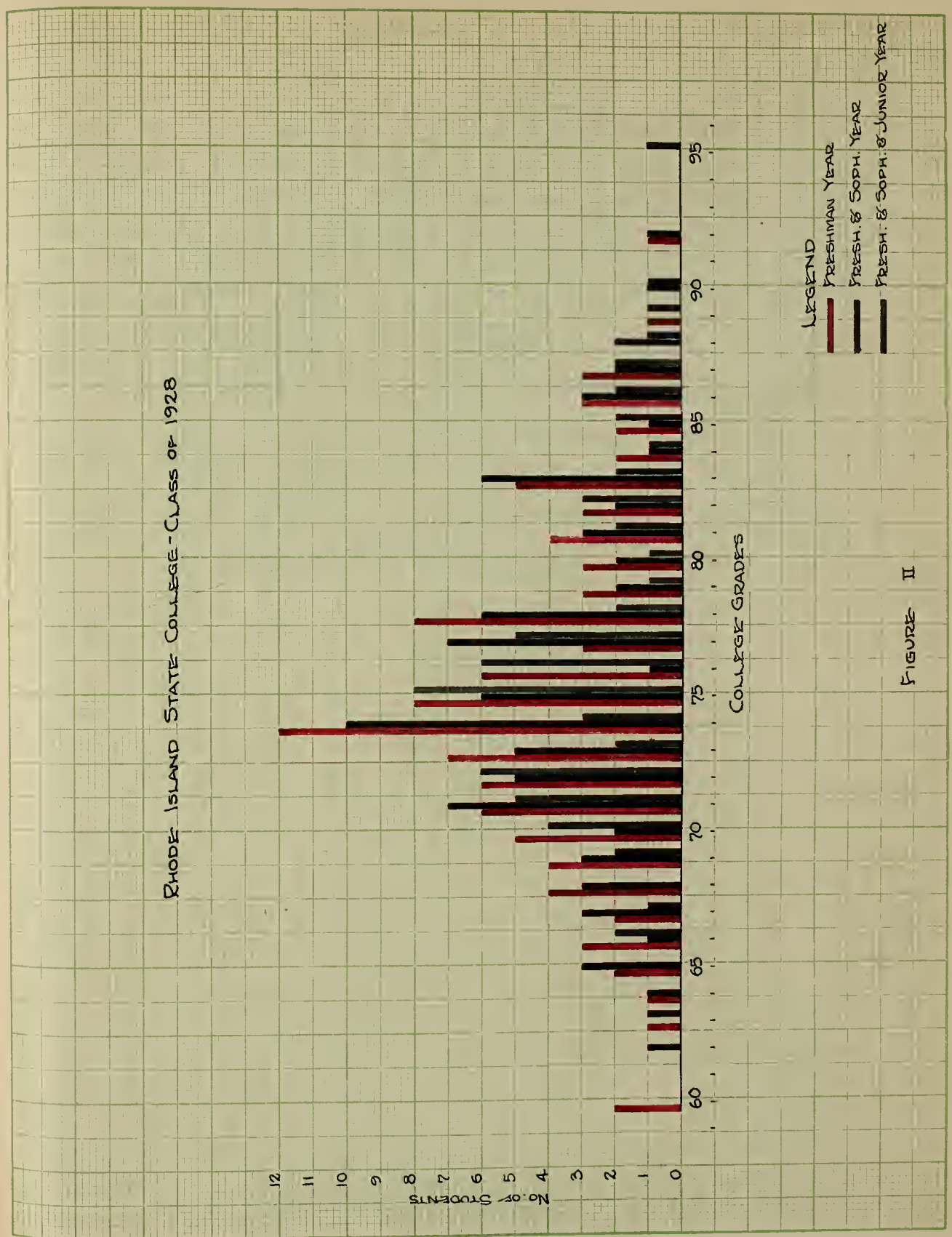


FIGURE II

FIGURE II.

This chart shows that the distribution of average grades approximates the normal distribution curve. There is a little weakness in range of 78 to 82. There is no conspicuous shifting of central tendencies from one year to another. In any one year the entire range of average grades from an average grade of 60 to 90 is covered. It is interesting to observe that only one freshman made an average grade as high as 90.

TABLE I.

The distribution of average High-school Grades of 127 students.*

High School Marks	No. of Students
60 - 62	1
63 - 65	0
66 - 68	2
69 - 71	9
72 - 74	29
75 - 77	40
78 - 80	23
81 - 83	16
84 - 86	5
87 - 89	0
90 - 92	1
93 - 95	1
96 - 98	0
Total . .	127

An examination of Table I shows that in high school eighty-five per cent of the one hundred and twenty seven students received marks between 72 and 83, inclusive. There were only seven students who received grades higher than 83 in comparison with twelve students who received grades lower than 72. A comparison of modal intervals shows the high school average mark to be slightly higher than the average college mark.

*Based on all grades obtained during the usual four years and presented for college entrance.

TABLE II.

The distribution of scores made by 131 students on the Miller Mental Ability Test.

Mental Test Scores	No. of Students
35 - 50	5
51 - 55	3
56 - 60	3
61 - 65	0
66 - 70	8
71 - 75	9
76 - 80	12
81 - 85	18
86 -90	23
91 - 95	15
96 - 100	16
101 - 105	13
106 - 110	6
111 - 115	0
116 - 120	0
Total . .	131

An examination of Table II shows that a greater number of students (23) received mental test scores between 86 and 90 than in any other five-point interval. Only six students had very high mental test scores, while a larger number, eleven, had low scores.

TABLE III.

The distribution of the average grades (Freshman year) of 109 students. The college marks are grouped into three-point intervals.

Average Grades	No. of Students
60 - 62	2
63 - 65	4
66 -68	9
69 - 71	15
72 - 74	24
75 - 77	18
78 - 80	14
81 - 83	12
84 - 86	6
87 - 89	4
90 - 92	1
93 - 95	0
96 - 98	0
Total . .	109

An examination of TableIIIof the freshman marks in college shows that a greater number of students (24) received an average grade of between 72 and 74 than in any other three-point interval. It is noted that only one student out of one hundred and nine made a record of ninety or above. There were 55 students who received average grades higher than those in the modal interval in comparison to 30 who received grades below it.

RHODE ISLAND STATE COLLEGE

Correlation - Freshman, Sept. 1924 — Academic Average Sem. I vs. Score on Miller M.A. Test

Acad. Av. Sem. I Fr. Yr. (x)

Score on Miller M.A. Test	30-	35-	40-	45-	50-	55-	60-	65-	70-	75-	80-	85-	90	f	Mean x (Acad.)	dy	fdy	fd^2y
105-						-15 1 -15		-5 1 -5		5 1 5	10 2 20	15 2 30		7		5	35	175
100-					-16 1 -16			-4 2 -8	5	4 5 20	8 1 8	12 3 36		17		4	68	272
95								-3 1 -3	2	3 4 12	6 3 18	9 2 18		12		3	36	108
90					-8 1 -8	-6 2 -12		-2 1 -2	2	2 8 16	4 3 12	6 1 6		18		2	36	72
85-						-3 1 -3	-2 3 -6	-1 2 -2	7	1 6 6	2 4 8		4 1 4	24		1	24	24
80	1		1		24 32	-30 1 23	-6 30	-20 2 7	3	59 2 -19	66 3 -18	40 2		15		0	199 -103 0	0
75					4 1 4	3 1 3		1 2 2	3	-1 1 -1				8		-1	-8	8
70					8 1 8				2	2 5 -10	4 3 -12			11		-2	-22	44
65									3		-6 1 -6			4		-3	-12	36
60																-4		
55					20 1 20			5 1 5	1					3		-5	-15	75
50							12 1 12		1					2		-6	-12	72
45																-7		
40									1	-8 1 -8				2		-8	-16	128
35-		63 1 63					18 1 18							2		-9	-18	162
f	1	1	1		5	6	5	12	30	33	20	10	1	125	73.5		96	1176
Mean y (Psych.)														86.3				
dx	-8	-7	-6	-5	-4	-3	-2	-1	0	1	2	3	4					
fdx	-8	-7	-6		-20	-18	-10	-12	-81 0 107	33	40	30	4	26				
fd^2x	64	49	36		80	54	20	12	0	33	80	90	16	534				
Sum Products	0	63	0	0	8	-27	24	-13	0	40	48	90	4	237				

TABLE IV

r = .284

$\sigma x = 10.3$; mean x = 73.5

$\sigma y = 14.8$; mean y = 86.3

P.E. = ±.05

COMPUTATION

Mean X (Acad.)

$$\begin{array}{r} 107 \\ -81 \\ \hline 26 \div 125 = .208 \\ \times \quad 5 \\ \hline 1.040 \\ 72.5 \\ \hline 73.5 \end{array}$$

Mean y (Psych.)

$$\begin{array}{r} 199 \\ -103 \\ \hline 96 \div 125 = .768 \\ \times \quad 5 \\ \hline 3.840 \\ 82.5 \\ \hline 86.3 \end{array}$$

$$\sigma x = 5\sqrt{\frac{534}{125} - (.208)^2}$$

$$= 5\sqrt{4.272 - .0433}$$

$$= 5\sqrt{4.2287}$$

$$= 5(2.0563)$$

σx = 2.06 in steps of 5

= 10.3 in units

$$\sigma y = 5\sqrt{\frac{1176}{125} - (.768)^2}$$

$$= 5\sqrt{9.4081 - .5898}$$

$$= 5\sqrt{8.8183}$$

$$= 5(2.9695)$$

σy = 2.97 steps of 5

= 14.8 in units

$$P = \frac{237}{125} - (.208)(.768)$$

$$= 1.896 - .1597$$

$$= 1.7363$$

$$r = \frac{1.7363}{(2.06)(2.97)} = \frac{1.7363}{6.1182} = .28379 = .284$$

RHODE ISLAND STATE COLLEGE

Correlation - Freshman, Sept. 1924 — Academic Average Freshman Year vs. Score on Miller M.A. Test. - Class of 1928

Acad. Av. Year I (X)

Score on Miller M.A. Test (y)

	50-54.9	55-	60-	65-	70-	75-	80-	85-	90-	f	Mean X (Acad.)	dy	fdy	fd^2y
105-		-18 1 -18		-6 1 -6		6 2 12	12 2 24	18 1 18		7		6	42	252
100-		-15 1 -15		-5 1 -5	7	5 3 15	10 2 20	15 2 30		16		5	80	400
95-				-4 1 -4	2	4 6 24	8 2 16	12 1 12		12		4	48	192
90-		-9 1 -9		-3 1 -3	6	3 3 9	6 1 6	9 2 18		14		3	52	156
85-			-4 3 -12	-2 3 -6	7	2 5 10	4 16	6	8 1 8	23		2	46	92
80-	-4 1 -4			-1 2 -2	3	1 4 4	0 1 2	3 2 6		13		1	13	13
75-			1	1	4	1				7		0	28 0 59	0
70-		3 1 3		1 1 1	3	-1 3 -3	-2 3 -6			11		-1	-11	11
65-				2 1 2	2		-1 1 -4			4		-2	-8	16
60-												-3		
55-				4 2 8						2		-4	-8	32
50-		15 1 15			1					2		-5	-10	50
45-												-6		
40-					1	-7 1 -7				2		-7	-14	98
35-39.9		24 1 24								1		-8	-8	64
f	1	6	4	14	36	28	16	8	1	114	74.4		222	1376
Mean y (Psych.)										87.2				
dx	-4	-3	-2	-1	0	1	2	3	4					
fdx	-4	-18	-8	-14	-44 0 -22	28	32	24	4	44				
fd^2x	16	54	16	14	0	28	64	72	16	280				
Sum Products	-4	0	-12	-15	0	64	74	84	8	199				

TABLE V

$r = .287 = .221$

$\sigma x = 7.6$

$\sigma y = 14.4$

P.E. $= \pm .05$

COMPUTATION

Mean X (Acad.)

$$\begin{array}{r} 88 \\ -\,44 \\ \hline 44 \div 114 = .386 \end{array}$$

$$\begin{array}{r} .386 \\ \times\ \ 5 \\ \hline 1.93 \\ 72.5 \\ \hline 74.4 \end{array}$$

$$\sigma X = 5\sqrt{\frac{280}{114} - (.386)^2}$$

$$= 5\sqrt{2.4561 - .1490}$$

$$= 5\sqrt{2.3071}$$

$$= 5(1.5189)$$

$$\sigma X = 1.52$$

$$= 7.60 \text{ in units}$$

Mean y (Psych.)

$$\begin{array}{r} 281 \\ -\,59 \\ \hline 222 \div 114 = 1.947 \end{array}$$

$$\begin{array}{r} 1.947 \\ \times\ \ 5 \\ \hline 9.735 \\ 77.5 \\ \hline 87.2 \end{array}$$

$$\sigma y = 5\sqrt{\frac{1376}{114} - (1.947)^2}$$

$$= 5\sqrt{12.070 - 3.791}$$

$$= 5\sqrt{8.279}$$

$$= 5(2.8773)$$

$$\sigma y = 2.88$$

$$= 14.4 \text{ in units}$$

$$D = \frac{199}{114} - (.386)(1.947)$$

$$= 1.7456 - .7515$$

$$= .9941$$

$$r = \frac{.9941}{(1.52)(2.88)} = \frac{.9941}{4.3776} = .221$$

TABLE VI.

This table shows the arrangement of the students of the present senior class of Rhode Island State College according to the scores recorded on the Miller Mental Ability Test at entrance, the highest first and then in descending order. The next column shows the high-school average, the next the average of the first semester in college and the last column the average for the whole freshman year in college.

STUDENT NUMBER	MENTAL TEST SCORE	HIGH SCHOOL AVERAGE	COLLEGE AVERAGE FIRST SEMESTER	COLLEGE AVERAGE FRESHMAN YEAR
1	108	82.00	80.50	79.18
2	108	76.19	86.83	84.92
3	107	74.21	57.80	55.44
4	107	81.30	79.33	81.54
5	106	76.58	65.50	66.75
6	106	79.41	81.33	77.72
7	105	78.50	88.66	87.90
8	104	73.68	72.50	74.50
9	104	75.55	73.00	72.61
10	104	72.10	72.16	66.63

STUDENT NUMBER	MENTAL TEST SCORE	HIGH SCHOOL AVERAGE	COLLEGE AVERAGE FIRST SEMESTER	COLLEGE AVERAGE FRESHMAN YEAR
11	103	81.77	89.00	87.18
12	103	73.91	69.60	78.41
13	102	81.89	74.00	70.81
14	102	90.76	87.33	86.63
15	101	72.66	83.00	74.30
16	101	76.84	74.33	74.45
17	101	75.00	65.83	57.30
18	101	77.89	75.66	74.90
19	101	***	75.00	76.21
20	100	86.05	79.50	80.54
21	100	76.50	75.16	73.09
22	100	68.09	51.66	xxxxx
23	100	74.73	78.20	75.70
24	100	76.50	86.00	83.64
25	99	77.89	80.33	78.09
26	99	81.82	82.85	78.84
27	99	76.00	78.83	79.46
28	99	80.21	83.00	81.61
29	98	74.11	67.16	69.54
30	98	75.83	72.50	71.54
31	98	79.55	75.83	75.54
32	97	84.28	85.14	83.91
33	97	81.05	85.00	85.73
34	96	***	xxxxx	xxxxx

**** No record
xxxx No record

STUDENT NUMBER	MENTAL TEST SCORE	HIGH SCHOOL AVERAGE	COLLEGE AVERAGE FIRST SEMESTER	COLLEGE AVERAGE FRESHMAN YEAR
35	96	79.15	78.83	78.66
36	95	76.50	79.50	77.09
37	95	76.17	72.33	72.08
38	94	76.31	80.33	75.72
39	94	76.00	74.66	68.72
40	93	74.70	75.00	72.09
41	93	75.60	79.66	79.90
42	92	81.00	68.33	xxxxx
43	91	74.34	77.33	74.10
44	91	73.00	71.00	71.90
45	91	xxxxx	89.83	89.90
46	91	83.55	76.83	71.20
47	91	73.91	75.42	73.61
48	91	75.00	58.33	xxxxx
49	91	xxxxx	57.00	xxxxx
50	91	80.10	78.75	76.13
51	90	78.05	84.83	85.91
52	90	75.00	78.28	82.00
53	90	77.64	75.50	74.45
54	90	77.33	50.57	59.69
55	90	77.00	81.66	xxxxx
56	89	74.11	81.33	80.09
57	89	79.66	55.00	xxxxxx
58	89	77.55	81.42	80.88

xxxxx No record

STUDENT NUMBER	MENTAL TEST SCORE	HIGH SCHOOL AVERAGE	COLLEGE AVERAGE FIRST SEMESTER	COLLEGE AVERAGE FRESHMAN YEAR
59	89	80.06	65.66	60.72
60	89	86.19	90.83	92.00
61	89	74.31	81.00	78.90
62	88	82.00	74.16	74.18
63	88	82.52	71.00	71.23
64	88	75.55	68.16	64.10
65	88	77.50	74.16	74.58
66	88	60.00	62.42	65.27
67	88	78.00	74.80	73.30
68	87	70.00	74.16	75.00
69	87	74.75	71.85	71.92
70	86	70.71	62.50	67.00
71	86	82.76	74.66	72.58
72	86	78.16	77.17	66.54
73	86	80.86	83.00	81.54
74	85	80.11	79.83	79.27
75	85	74.09	63.50	63.16
76	85	80.00	xxxxx	xxxxx
77	85	77.36	77.16	73.63
78	85	73.88	79.57	78.15
79	85	75.23	77.85	75.58
80	85	72.56	78.71	83.61
81	84	75.72	70.00	70.72

xxxxx No record

STUDENT NUMBER	MENTAL TEST SCORE	HIGH SCHOOL AVERAGE	COLLEGE AVERAGE FIRST SEMESTER	COLLEGE AVERAGE FRESHMAN YEAR
82	84	73.30	67.17	68.66
83	84	78.50	84.83	82.45
84	83	76.66	80.83	76.45
85	83	82.47	87.57	87.23
86	83	81.17	67.66	69.00
87	83	72.40	73.00	70.81
88	83	77.50	76.50	75.00
89	82	70.00	58.80	54.10
90	81	80.00	75.00	76.09
91	81	95.00	87.28	86.76
92	80	70.00	31.20	xxxxx
93	80	73.75	44.83	xxxxx
94	80	74.80	73.71	74.07
95	80	78.31	80.16	78.63
96	79	75.04	xxxxx	xxxxx
97	78	71.90	73.83	73.16
98	78	80.55	71.83	72.30
99	77	72.22	56.50	60.66
100	77	77.36	75.14	74.66
101	76	80.70	69.66	67.18
102	76	75.00	65.33	70.75
103	76	83.88	73.00	75.27
104	75	78.50	54.75	xxxxx

xxxxx No record

STUDENT NUMBER	MENTAL TEST SCORE	HIGH SCHOOL AVERAGE	COLLEGE AVERAGE FIRST SEMESTER	COLLEGE AVERAGE FRESHMAN YEAR
105	74	75.00	70.50	73.27
106	73	75.55	75.28	76.83
107	73	78.33	78.16	76.72
108	73	74.23	74.66	73.27
109	73	85.56	75.33	68.27
110	72	73.85	52.85	59.27
111	71	66.00	75.42	74.16
112	71	71.36	84.66	84.25
113	70	78.60	82.50	82.27
114	70	73.91	83.16	83.09
115	70	79.94	77.14	75.61
116	69	71.61	73.20	72.50
117	68	73.33	xxxxx	xxxxx
118	68	76.87	74.72	74.16
119	66	77.39	82.57	83.53
120	66	79.65	72.83	65.90
121	58	77.36	68.66	69.50
122	56	73.52	70.83	69.00
123	56	71.30	52.66	xxxxx
124	54	72.25	70.28	70.41
125	53	71.42	60.00	56.23
126	51	83.85	xxxxx	xxxxx
127	43	72.38	72.28	71.25
128	40	84.50	xxxxx	xxxxx

xxxxx No record

STUDENT NUMBER	MENTAL TEST SCORE	HIGH SCHOOL AVERAGE	COLLEGE AVERAGE FIRST SEMESTER	COLLEGE AVERAGE FRESHMAN YEAR
129	40	82.50	79.50	78.27
130	39	75.11	37.60	xxxxx
131	35	75.33	63.16	55.00

xxxxx No record

TABLE VII.

The following tables show the records of the class of 1928 at Rhode Island State College at the present time. The headings are sufficient explanation. Conclusions derived from a study of this table will follow.

STUDENT NUMBER.	MENTAL TEST SCORE	HIGH SCHOOL AVERAGE	COLLEGE AVERAGES		
			FRESHMAN YEAR	FRESH. AND SOPH. YRS.	FRESHMAN, SOPHOMORE AND JUNIOR YRS.
1	108	82.00	79.18	78.82	81.11
2	108	76.19	86.15	84.92	*****
3	107	74.21	55.44	xxxxx	
4	107	81.30	81.54	83.04	81.29
5	106	76.58	66.75	71.18	#####
6	106	79.41	77.72	78.20	77.02
7	105	78.50	87.90	88.54	90.62
8	104	73.68	74.50	78.29	80.61
9	104	75.55	72.61	74.84	77.28
10	104	72.10	66.63	67.43	-----

***** Transferred to another institution.

xxxxx Dropped from college on account of scholarship.

----- Left college because of ill health.

Left college with no reason given.

STUDENT NUMBER	MENTAL TEST SCORE	HIGH SCHOOL AVERAGE	COLLEGE AVERAGES		
			FRESHMAN YEAR	FRESH. AND SOPHOMORE YEARS	FRESHMAN, SOPHOMORE AND JUNIOR YRS.
11	103	81.77	87.18	85.91	83.75
12	103	73.91	78.41	82.86	85.00
13	102	81.89	70.81	72.40	-----
14	102	90.76	86.63	88.13	87.12
15	101	72.66	74.30	*****	
16	101	76.84	74.45	71.77	#####
17	101	75.00	57.30	xxxxx	
18	101	77.89	74.90	74.30	75.94
19	101		76.21	*****	
20	100	86.05	80.54	81.95	#####
21	100	76.50	73.09	74.47	74.24
22	100	68.09	51.66	xxxxx	
23	100	74.73	75.70	69.13	xxxxx
24	100	76.50	83.64	77.00	77.81
25	99	77.89	78.09	74.60	75.06
26	99	81.82	78.84	75.25	76.54
27	99	76.00	79.46	83.76	85.73
28	99	80.21	81.61	81.58	81.75
29	98	74.11	69.54	68.41	66.25
30	98	75.83	71.54	72.26	71.05
31	98	79.55	75.45	75.21	71.50

***** Transferred to another institution.

xxxxxDropped from college on account of scholarship.

----- Left college because of ill health.

Left college with no reason given.

STUDENT NUMBER	MENTAL TEST SCORE	HIGH SCHOOL AVERAGE	COLLEGE AVERAGES		
			FRESHMAN YEAR	FRESH. AND SOPHOMORE YEARS	FRESHMAN, SOPHOMORE AND JUNIOR YRS.
32	97	84.28	83.91	83.30	84.33
33	97	81.05	85.73	87.48	87.92
34	96		#####		
35	96	79.15	78.86	77.29	#####
36	95	76.50	77.09	77.68	74.20
37	95	76.17	72.08	*****	
38	94	76.31	75.72	78.75	78.32
39	93	76.00	68.72	68.66	#####
40	93	74.70	72.09	72.16	70.93
41	93	75.60	77.90	77.45	75.46
42	92	81.00	68.63	-----	
43	91	74.34	74.10	65.54	xxxxx
44	91	73.00	71.90	68.68	#####
45	91		89.90	90.77	89.00
46	91	83.55	71.20	71.60	#####
47	91	73.91	73.61	74.58	75.67
48	91	75.00	58.33	#####	
49	91		57.00	xxxxx	
50	91	80.10	76.13	77.34	79.00
51	90	78.05	85.91	83.45	#####
52	90	75.00	82.00	83.00	83.37

***** Transferred to another institution.

xxxxx Dropped from college on account of scholarship.

----- Left college because of ill health.

Left college with reason given. (Reason did not pertain to scholarship or health.)

STUDENT NUMBER	MENTAL TEST SCORE	HIGH SCHOOL AVERAGE	COLLEGE AVERAGES		
			FRESHMAN YEAR	FRESH. AND SOPHOMORE YEARS	FRESHMAN, SOPHOMORE AND JUNIOR YRS.
53	90	77.64	74.45	73.91	72.09
54	90	77.30	59.69	*****	
55	90	77.00	81.66	#####	
56	89	74.11	80.09	80.91	76.25
57	89	79.66	55.00	xxxxx	
58	89	79.55	80.88	*****	
59	89	80.06	60.72	xxxxx	
60	89	86.19	92.00	92.77	95.09
61	89	74.31	78.90	*****	
62	88	82.00	74.18	75.82	76.21
63	88	82.52	71.23	69.57	70.09
64	88	75.55	64.10	xxxxx	
65	88	77.50	74.58	65.60	xxxxx
66	88	60.00	65.27	66.47	63.93
67	88	78.00	73.30	74.36	74.53
68	87	70.00	75.00	74.82	75.25
69	87	74.75	71.92	73.56	75.50
70	86	70.71	67.00	#####	
71	86	82.76	72.58	72.08	71.48
72	86	77.17	66.54	#####	
73	86	80.86	81.54	78.95	#####
74	85	80.11	79.27	79.08	77.61
75	85	74.09	63.16	65.50	66.93

***** Transferred to another institution

xxxxx Dropped from college on account of scholarship.

Left college with no reason given.

STUDENT NUMBER	MENTAL TEST SCORE	HIGH SCHOOL AVERAGE	COLLEGE AVERAGES		
			FRESHMAN YEAR	FRESH. AND SOPHOMORE YEARS	FRESHMAN, SOPHOMORE AND JUNIOR YRS.
76	85	80.00	#####		
77	85	77.36	73.63	71.73	72.00
78	85	73.88	78.15	77.08	78.74
79	85	75.23	75.58	74.26	76.50
80	85	72.50	83.61	75.62	76.97
81	84	75.72	70.72	71.21	69.31
82	84	73.50	68.66	67.91	69.42
83	84	78.50	82.45	79.30	77.00
84	83	76.66	76.45	78.82	75.90
85	83	82.47	87.23	87.87	88.24
86	83	81.17	69.00	70.56	70.73
87	83	72.40	70.81	69.75	xxxxx
88	83	77.50	75.00	75.14	72.93
89	82	70.00	54.10	xxxxx	
90	81	80.00	76.09	73.68	71.71
91	81	95.00	86.76	86.79	86.79
92	80	70.00	31.20	xxxxx	
93	80	73.75	44.83	xxxxx	
94	80	78.31	78.63	77.38	#####
95	80	74.80	74.07	*****	
96	79	75.04	#####		
97	78	71.90	73.16	71.09	71.90
98	78	80.55	72.30	*****	
99	77	72.22	60.66	xxxxx	
100	77	77.36	74.66	76.62	75.80
101	76	80.70	67.18	70.13	72.94

STUDENT NUMBER	MENTAL TEST SCORE	HIGH SCHOOL AVERAGE	COLLEGE AVERAGES		
			FRESHMAN YEAR	FRESH. AND SOPHOMORE YEARS	FRESHMAN, SOPHOMORE AND JUNIOR YRS.
102	76	75.00	70.55	*****	
103	76	83.88	75.27	80.90	83.40
104	75	78.50	54.75	xxxxx	
105	74	75.00	73.27	74.47	73.79
106	73	75.55	76.83	82.95	*****
107	73	78.33	76.72	75.08	#####
108	73	74.23	73.27	73.29	72.42
109	73	85.56	68.27	#####	
110	72	73.85	59.27	58.55	xxxxx
111	71	66.00	74.16	71.73	73.94
112	71	71.36	84.25	83.88	82.71
113	70	78.60	82.27	*****	
114	70	73.91	83.09	86.00	86.47
115	70	79.94	75.61	73.95	76.02
116	69	71.61	72.50	72.04	70.06
117	68	73.33	#####		
118	68	76.87	74.72	74.50	72.70
119	66	77.39	83.53	84.87	83.94
120	66	79.65	65.90	62.90	""""""
121	58	77.36	69.50	*****	
122	56	73.52	69.00	-----	

***** Transferred to another institution.

xxxxx Dropped out of college on account of scholarship.

Left college with no reason given.

"""""" Suspended from college and did not return.

----- Left college because of ill health.

STUDENT NUMBER	MENTAL TEST SCORE	HIGH SCHOOL AVERAGE	COLLEGE AVERAGES		
			FRESHMAN YEAR	FRESH. AND SOPHOMORE YEARS	FRESHMAN, SOPHOMORE AND JUNIOR YRS.
123	56	71.30	52.66	xxxxx	
124	54	72.25	70.41	67.83	67.73
125	53	71.42	52.63	xxxxx	
126	51	83.85	#####		
127	43	72.38	71.25	64.86	xxxxx
128	40	84.50	#####		
129	40	82.50	78.27	#####	
130	39	75.11	37.60	xxxxx	
131	35	75.33	55.00	xxxxx	

xxxxx Dropped from college on account of scholarship.

Left college with no reason given.

QUARTILE PLACEMENT METHOD

The quartile placement method of interpretation of the data* is less technical than the other method. The total number of cases in each group is divided into fourths, each fourth called a quartile. It shows how many of those students who scored in a certain quartile in high school marks remain in the same quartile in the mental test scores, in the college markd for the freshman and sophomore years, and the college marks for the freshman, sophomore and junior years.

A very interesting observation has been noted. It is as follows: Over fifty per cent remained in the same quartile except in certain cases with a displacement of plus or minus one quartile. The highest quartile showed twenty-five per cent perfect correspondence.***

*The data used in the quartile placement method included only those students who completed three years of college study. By referring to the original data of the Rhode Island State College students, from which the information for this grouping was secured, it will be noted that fully sixty per cent of those who scored in the last quartile of the mental test score (the lowest thirty-two scores, 99 to 131) did not complete the junior year of academic study. Only one man of the lowest eleven mental scores (120-131) was

able to complete his junior year in college. It may also be interesting to note that but one other man in this last mentioned group, i. e., those ranking in the eleven lowest psychological scores, was allowed registration at the beginning of the junior year.

TABLE VIII.

Quartile arrangement of high school marks.	Quartile arrangement of mental test scores.	Quartile arrangement of college marks. Fresh. yr.	Quartile arrangement of college marks. Fr. and Soph. yrs.	Quartile arrangement of college marks. Fr., Soph. and Junior yrs.
I	III	I	I	I
I	I	I	I	I
I	I	I	I	I
I	II	I	I	I
I	I	I	I	I
I	IV	II	II	I
I	III	III	III	IV
I	II	III	IV	IV
I	III	I	I	I
I	I	I	II	II
I	II	III	II	II
I	I	II	II	II
I	I	I	I	I
I	I	I	I	II
I	III	III	III	IV
I	I	I	I	I
I	IV	IV	IV	III

Quartile arrangement of high school marks.	Quartile arrangement of mental test scores.	Quartile arrangement of college marks. Fresh. yr.	Quartile arrangement of college marks. Fr. and Soph. yrs.	Quartile arrangement of college marks. Fr., Soph. and Junior yrs.
II	I	I	I	II
II	III	I	II	II
II	II	II	II	II
II	III	II	III	IV
II	IV	II	III	II
II	I	II	II	IV
II	I	II	II	II
II	III	I	I	II
II	I	I	I	I
II	III	IV	IV	III
II	I	II	III	III
II	I	II	III	III
II	II	II	III	IV
II	IV	I	I	I
II	III	III	III	IV
II	IV	II	II	III
II	III	II	II	III

Quartile arrangement of high school marks.	Quartile arrangement of mental test scores.	Quartile arrangement of college marks. Fresh. yr.	Quartile arrangement of college marks. Fr. and Soph. yrs.	Quartile arrangement of college marks. Fr., Soph. and Junior yrs.
III	IV	II	III	III
III	III	II	II	III
III	I	I	II	II
III	II	II	II	III
III	I	III	III	III
III	II	II	II	II
III	I	I	I	I
III	I	III	III	IV
III	III	III	IV	IV
III	II	II	II	III
III	I	III	III	II
III	III	II	III	II
III	II	I	I	I
III	IV	III	III	III
III	III	III	III	III
III	II	III	III	IV
III	IV	III	III	III

Quartile arrangement of high school marks.	Quartile arrangement of mental test scores.	Quartile arrangement of college marks. Fresh. yr.	Quartile arrangement of college marks. Fr. and Soph. yrs.	Quartile arrangement of college marks. Fr., Soph. and Junior yrs.
IV	I	III	IV	IV
IV	II	I	I	II
IV	III	IV	IV	IV
IV	I	II	I	I
IV	II	III	III	III
IV	IV	I	I	I
IV	IV	II	II	II
IV	I	II	II	II
IV	III	IV	IV	IV
IV	III	I	II	II
IV	IV	III	IV	IV
IV	III	III	IV	IV
IV	IV	III	III	IV
IV	III	I	I	I
IV	III	II	III	III
IV	IV	III	IV	III
IV	II	IV	IV	IV

CHAPTER VI.

SUMMARY AND CONCLUSIONS

Summary and conclusions for Rhode Island State College. An analysis of the data from Rhode Island State College shows that a score of about 60 on the Miller Mental Ability Test seems to be a "critical score," i.e., students scoring below 60 probably have very little chance of doing very successful work in college. It so happens that a score of 60 has a percentile rank of 10 according to the percentile data presented in the Miller Mental Ability Test manual of directions, page 13.

Several coefficients of correlation by the Pearsonian Method were studied including the following:

(a) High-school average vs. Psychological score.

(b) High-school average vs. Semester I, Freshman year.

(c) High-school average vs. Freshman year.

(d) Psychological score vs. Freshman year.

The results of such studies assign a value to r of from .30 - .40.

A comparison of psychological test scores shows that academic averages at Rhode Island State College are somewhat less than averages in institutions the country over. Yet the figures obtained here are as good or better than results obtained at many institutions of high learning.

For purposes of predicting freshman grades in college the high-school average is somewhat better

but not conspicuously better than psychological scores made on tests at entrance. A proper combination of these two criteria, high-school averages and psychological scores would be decidedly better for predictive purposes than either one taken by itself.

CHAPTER VII.

SECTION II.

RESEARCH AT BROWN UNIVERSITY.

Much has been done in the past and is being done at present at Brown University to discover to what an extent phsychological scores are related to the quality of academic work done in college. The coefficient of correlation between psychological scores and academic averages is about .40-.45 as a central tendency. Interest usually is directed to freshmen classes as mortality is highest during the first year. The purpose of the present investigation by the writer is to compare results obtained at Brown University with those obtained at Rhode Island State College and other institutions.

Some of the reasons why psychological tests are considered extremely valuable as one of the means of predicting college success or failure at Brown are as follows: Two-thirds of the freshmen who "flunk out" at the middle of the year score in the lowest fifth on the psychological test. Of the freshmen who fail in two or more subjects in either semester, eight times as many score in the lowest psychological fifth as in the highest and twenty-two times as many in the lowest tenth as in the highest. Studies of the careers of students making very low scores show that out of five freshmen who enter with psychological

scores in the lowest tenth only two remain in college more than one year and only one graduates. The extent to which good risks are identified by the test scores is shown by the fact that almost without exception no freshman whose grades are all C's or better makes a very low test score. The facts concerning students whose work has been of such high grade as to win recognition in terms of various academic honors are also very convincing. For example a study of the records of men of three classes who took honors during their four years at college shows that only one student, who had taken one honor, scored in the lowest fifth on the psychological test though not in the lowest tenth.* This study was based on the records of three classes so that this one individual is a striking exception. Nineteen out of twenty who take honors during their college course score in the highest two-thirds and the majority rank in the highest third. It is clear that the limits within which to seek potentially good risks and potential honors men are pretty well defined.

How much relationship is indicated by a coefficient of about .40 can best be illustrated by actual data. The accompanying correlation table, based upon records obtained from the class of 1926,

* A similar striking example occurred in the survey of the study made at Rhode Island State College.

is typical and represents a correlation of .40. The table shows that all the nine students who made psychological scores of 80 or more had academic averages of C or better for the first semester. Eighty per cent of those scoring from 70 to 79 had averages of C or better. In the lower ranges it is shown that 35 per cent of those who scored below 50 had academic averages of E and that the proportion of E averages decreases substantially as the psychological scores increase, i. e., to 17 per cent of the 50-59 group and 7 per cent of the 60-69 group. Moreover, the table shows that only 7 per cent of those scoring from 50 to 59 had academic averages above C, and none of these were A. Of those who scored below 50, four fifths had academic averages below C and the remaining fifth received C averages, i. e., no averages were as high as B or A. These same facts are illustrated graphically in such a way as to make very striking the manner in which the proportion of high academic averages increases and that of the low ones decreases as one passes from the low psychological groups to the higher.

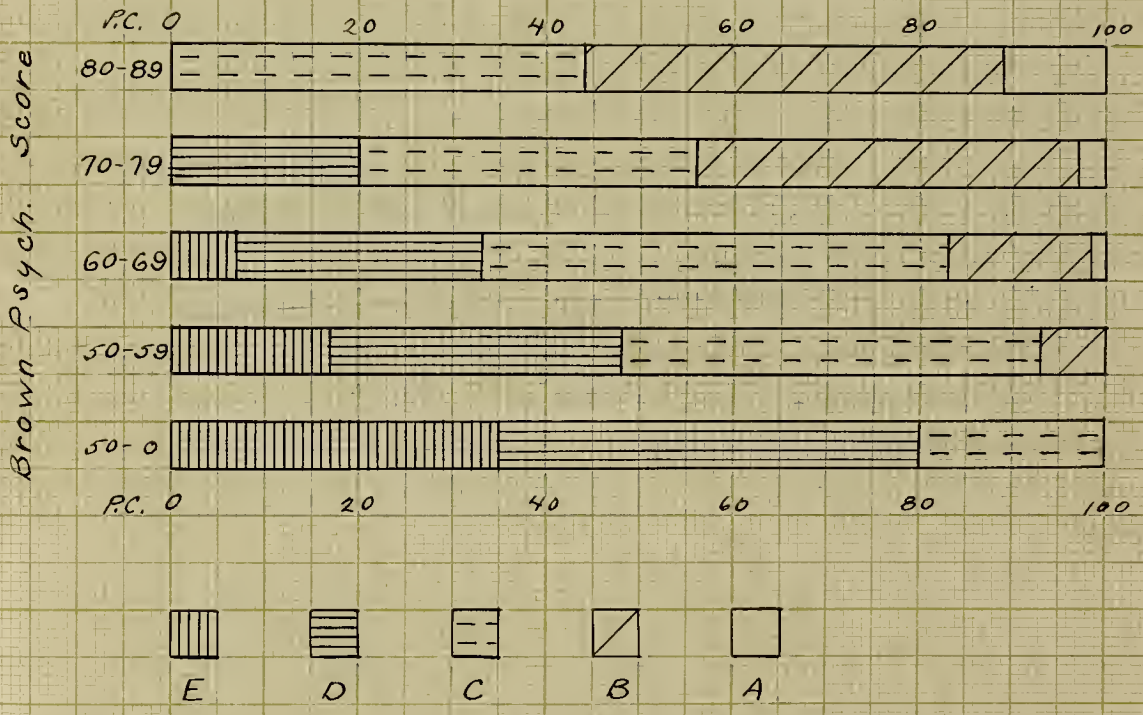
How psychological scores are related to academic achievement is shown in another interesting and convincing way by comparing the percentages of A's, B's, C's, D's, and E's received by various psychological groups in the first semester courses. To demonstrate

this type of relationship it is necessary to tabulate each grade secured by any one student in each of the several courses taken by him during the first semester. Interest here centers about the several specific grades received by each student and not the average academic grade obtainable by combining them, as was the case in the comparisons made in the immediately preceding paragraphs.

This new form of relationship can be very well illustrated by using the data already employed from the class of 1926. Instead of 372 averages there are now 1,674 specific course grades involved, as shown in the accompanying table. The arrangement of the data has also been slightly changed by grouping the students into psychological quintiles or fifths. The table shows, for example, that 12 per cent of the course grades received by those in the highest psychological quintile were A's, while only 3 per cent of those received by the lowest quintile students were A's. In other words, students in the highest psychological quintile received, proportionately, four times as many A's as did those in the lowest quintile. Furthermore, 12 per cent of the grades received by the lowest quintile men were E's, as against four per cent of E's received by the highest quintile men. If grades below C and

above C be considered, a pronounced difference is found to exist between the academic performances of the various psychological groups, as shown on the table of the following page.

FIGURE I.



Key to academic averages

Psychological scores related to academic averages for semester one. Based on 372 cases from the class of 1926. Pearson r = .40.

TABLE I

PSYCHOLOGICAL SCORES RELATED TO ACADEMIC AVERAGES FOR SEMESTER ONE

Based on 372 cases from the class of 1926.

Pearson r = .40

B. U. Score	No. of Cases (372)	E	D	C	B	A	Total per cent.
80-89.....	9			44	44	12	100
70-79.....	84		20	37	41	2	100
60-69.....	121	7	26	49	17	1	100
50-59.....	118	17	30	46	7		100
Below 50*....	40	35	45	20			100

*Psychs. below 40 as follows:
B. U. 30-39
3 cases acad. av. of 60-69
2 cases acad. av. of 70-79
B. U. 20-29
1 case acad. av. of. 60-69

Psych. Quintile	Percentage of Grades Below C	Above C
Highest	16	54
2	24	34
3	33	27
4	40	20
Lowest	45	14

TABLE II

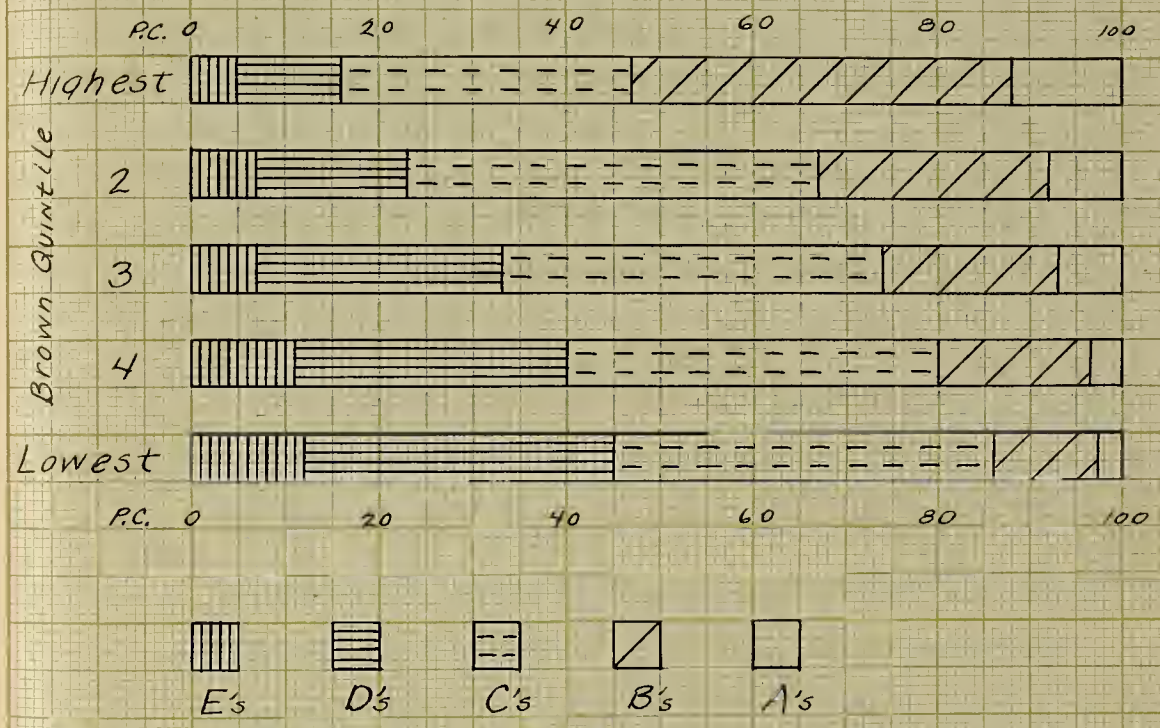
FIRST SEMESTER MARKS RELATED TO PSYCHO-LOGICAL QUINTILES

1,674 marks received by class of 1926.

Brown Quintile**	Academic Course Grades E's	D's	C's	B's	A's	Total Per cent.
Highest	4	12	30	42	12	100
2	6	18	42	27	7	100
3	6	27	40	21	6	100
4	11	29	40	17	3	100
Lowest	12	33	41	11	3	100

**Unless otherwise stated, psychological deciles, etc., referred to are based upon over 2,000 scores, i.e., all the scores made on the Brown University Psychological Examination by new students entering Brown up to date.

FIGURE II.



Keys to course grades

First semester marks related to psychological quintiles. Based upon 1,674 marks received by the class of 1926.

Significance of Psychological Scores with reference to warnings, failures, refusal of registration and mortality. During the freshman year various students receive faculty "warnings" in each course in which their standing is not satisfactory. The psychological scores arranged in groups as mentioned previously show a striking relationship. Table III on the following page shows that the 38 men in the class of 1926, who composed the highest psychological tenth of that class received 14 warnings during the first semester and 3 failing grades at the end of the semester, as compared with 136 warnings and 52 failures received by the 42 men in the lowest tenth. The records of the warned students for successive months also bear out some significant features of the psychological groupings. Figure III illustrates a distinct progressive improvement for the highest tenth but little if any improvement for the lowest.

A very interesting study results in forming two goups of the class of 1926, one which will be included in the highest tenth of all men who have taken the test at Brown University and the other to represent the members of the lowest class or tenth of the same classification. Table IV shows that the 27 men in the highest group received 17 warnings and one failure,

TABLE III

PSYCHOLOGICAL STATUS RELATED TO FIRST SEMESTER WARNINGS AND FAILURES

(Data from class of 1926)

Psych. Group (Class deciles)	Number of men	Number of warnings. Oct.	Nov.	Dec.	Total	No. of courses failed end of Sem. I.
Highest 10th.....	38	9	3	2	14	3
Lowest 10th.....	42	49	44	43	136	52

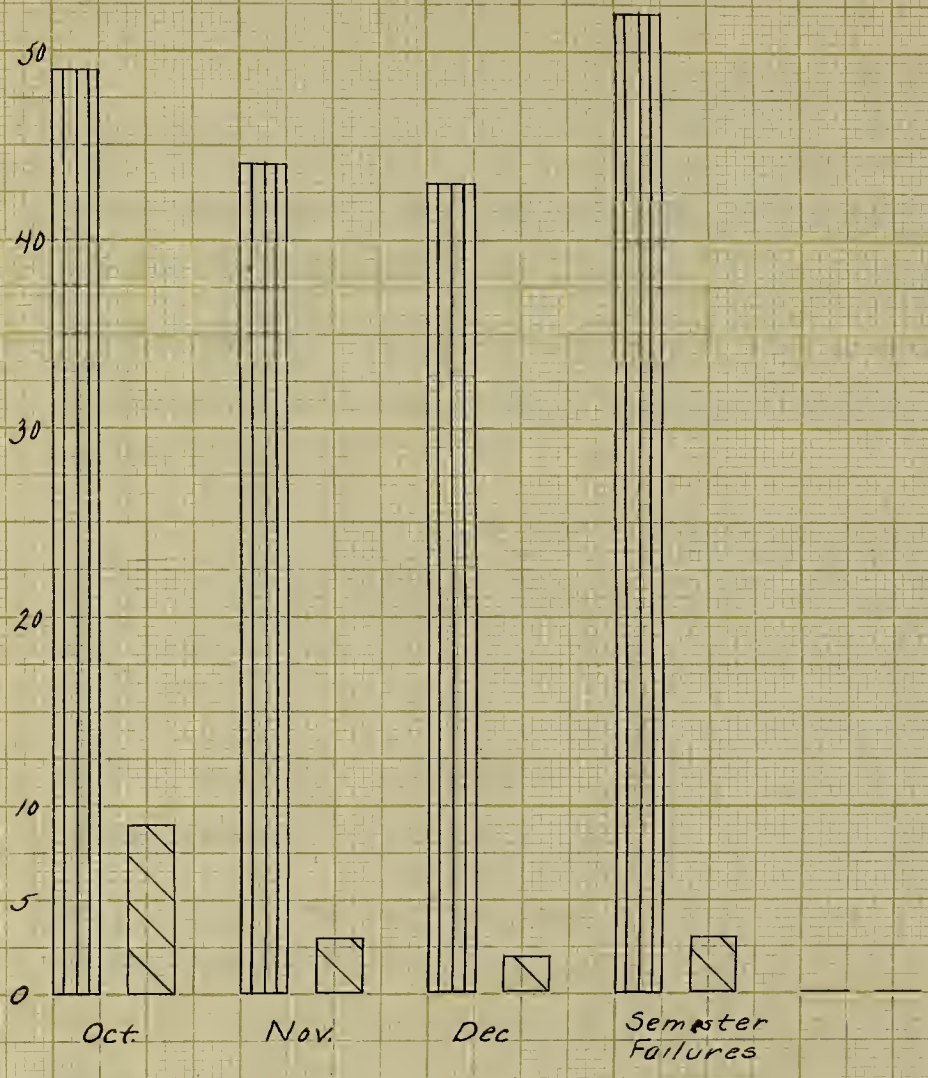
TABLE IV

PSYCHOLOGICAL STATUS RELATED TO FIRST SEMESTER WARNINGS AND FAILURES

(Data from class of 1926)

Psyc. Group	Number of men	Number of warnings. Oct.	Nov.	Dec.	Total	No. of courses failed end of Sem. I
Highest 10th.....	27	11	3	3	17	1
Lowest 10th.....	30	26	18	19	63	23

FIGURE III.



Psychological status related to first semester warnings and failures.

while the 30 men in the lowest group received 63 warnings and 23 failures.

Table V illustrates a similar study of two like groups for the class of 1927, formed in the same manner as described in the preceding paragraphs. The 20 men ranking the highest tenth group received but 6 warnings and one failure as compared with the 48 men in the lowest group who received 142 warnings and 74 failures.

The inevitable conclusion reached in the study of Tables III, Iv, and V is that a freshman who makes a very low grade in the psychological test is more likely to do poor work in his courses and fail in some of his courses than is a freshman who makes a high grade. Students making a high psychological score who do receive warnings are very quick to profit by them and seldom fail in their courses.

Another very important point of information which low psychological scores provides is shown in the records of persons who have done so poorly during the first semester as to warrant refusal of registration for the second semester. A specific case is shown in records of the class of 1926. 41 members of this class were refused further registration at the end

TABLE V

PSYCHOLOGICAL STATUS RELATED TO FIRST SEMESTER WARNINGS AND FAILURES
(Data from class of 1927)

Psych. Group	Number of men	No. of warnings Oct.	Nov.	Dec.	Total	No. of courses failed in Sem. I.
Highest 10th...	20	4	2	0	6	1
Lowest 10th....	48	55	54	33	142	74

TABLE VI

PSYCHOLOGICAL STATUS OF MEN REFUSED REGISTRATION IN SEMESTER II.
(Data from class of 1926)

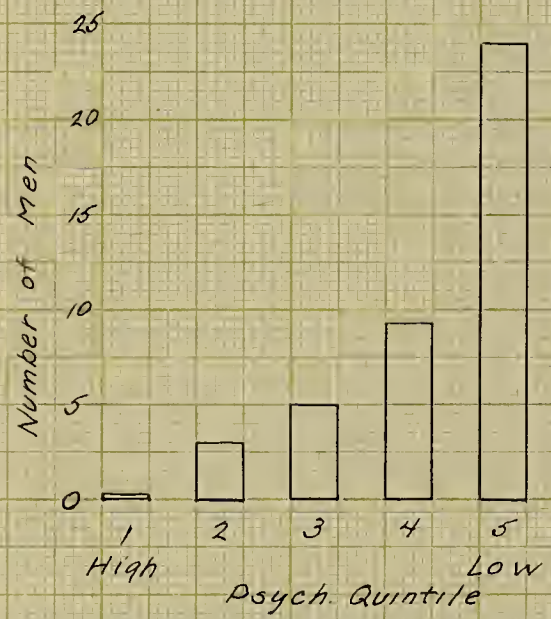
Psych. Fifth	Number of men	Percentage of men
High 1	0	0
2	3	7
3	5	12
4	9	22
Low 5	24	59
	41	100

TABLE VI

PSYCHOLOGICAL STATUS OF MEN REFUSED REGISTRATION IN SEMESTER II.
(Data from class of 1927)

Psych. Fifth	Number of men	Percentage of men
High 1	0	0
2	0	0
3	1	4
4	8	28
Low 5	19	68
	28	100

FIGURE IV.



Psychological status of men refused registration semester two. 41 cases from the class of 1926.

TABLE VII

PSYCHOLOGICAL STATUS OF MEN REFUSED REGISTRATION SEMESTER II

(Data from class of 1927)

Psych. Fifth		Number of men	Percentage of men
High	1	0	0
	2	0	0
	3	1	4
	4	8	28
Low	5	19/28	68/100

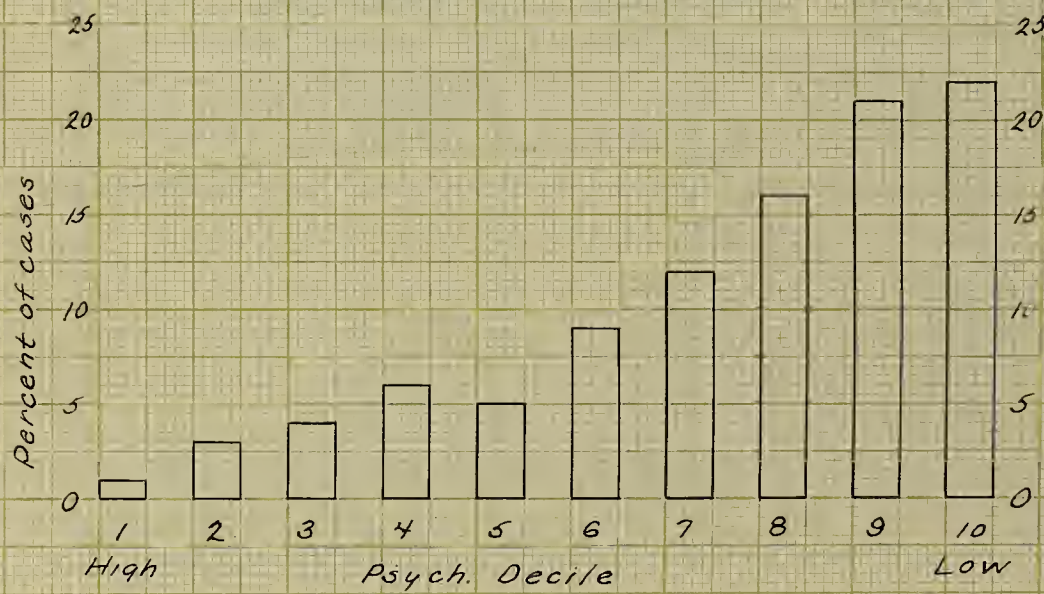
of the first semester of the freshman year because of low scholastic standing. Table VI and Figure IV show the distribution of these men into psychological fifths and show that almost 60 per cent of the men made psychological scores which ranked them in the lowest fifth group and none made very high scores.

Table VII represents a similar study for the 28 men of the class of 1927 who were refused registration at the end of the first semester of their freshman year. The indications of this table are more striking than those of the previous chart, for only one person out of the twenty-eight made an average rating. The other twenty-seven made very low psychological scores.

Tables VI and VII show a scholastic study of two entering classes at Brown University in reference to the matter of refusal of registration in the second semester of the freshman year. The data presented indicates that approximately sixty or seventy per cent of the students refused registration for the second semester are those who have made scores which grouped them in the lowest psychological fifth. No individual making a very high psychological score was refused registration. Very rarely have persons of average capacity been in such predicaments.

As a result of the study of a group of students who were doing academic work below the desired standard, it was found that very few men who received a failing grade (E) in two or more subjects in either semester of their freshman year made a high psychological score. The group was composed of 109 member of the class of 1926 and 72 from the class of 1927. An examination of Table VIII illustrating this fact reveals that about 80 per cent of these men scored less than what has been found to be the average performance of new students entering Brown University. The significance of the psychological scores is shown by the fact that 40 per cent scored in the lowest psychological fifth, while less than 5 per cent scored in the highest fifth. More striking than this is the fact that over one fifth of the failures scored in the lowest psychological tenth, whereas only 1 per cent scored in the highest tenth. The net results of this particular study seem to indicate that new students who will probably fail in two or more subjects in either semester of their freshman year are ten to twenty times likely to be found among those who make low psychological scores than among those who make high scores.

FIGURE V.



Psychological rating of men failing in two or more subjects in either semester of the freshman year. Based upon 181 cases; 109 from the class of 1926 and 72 from the class of 1927.

TABLE VIII

PSYCHOLOGICAL RATING OF MEN FAILING IN TWO OR MORE SUBJECTS IN EITHER SEMESTER OF THE FRESHMAN YEAR
(Based on combined data from the classes of 1926 (109) and 1927 (72))

Psychological Decile (Tenth)	Percentage of cases	Cumulative Percentage
(High) 1	1	100
2	3.5	99
3	4.5	99.5
4	6	91
5	5.5	85
6	9	79.5
7	12	70,5
8	15.5	58.5
9	21	43
(Low) 10	22	22
	100	

The psychological scores are very significant in identifying students who are not very likely to remain long in college and also those who are not very likely to graduate. Table IX and Figure VI illustrates the high degree of mortality that exists among students whose psychological scores place them in the lowest decile. They also show how many of the students in the lowest decile groups drop out of college and when. The study is one of the classes of 1924, 1925, 1926 and 1927.

A careful examination of part A of Table IX reveal some significant facts regarding the mortality in the lowest Psychological decile. A complete study of the class of 1924 from the beginning to graduation shows that 52 men were ranked in the lowest psychological decile and that 46 per cent of them had left college before the beginning of their sophomore year, 67 per cent or two thirds before their junior year, 71 per cent before their senior year and but 25 per cent or one out of four remained to graduate. The other classes show a much higher degree of mortality. This is especially striking of the class of 1925 where the figures indicate that three out of ten began their sophomore year and only two out of ten entered upon their senior year. The statistics for the classes seem to indicate that if elimination continues as it

TABLE IX

ELIMINATION FROM THE LOWEST PSYCHOLOGICAL DECILE

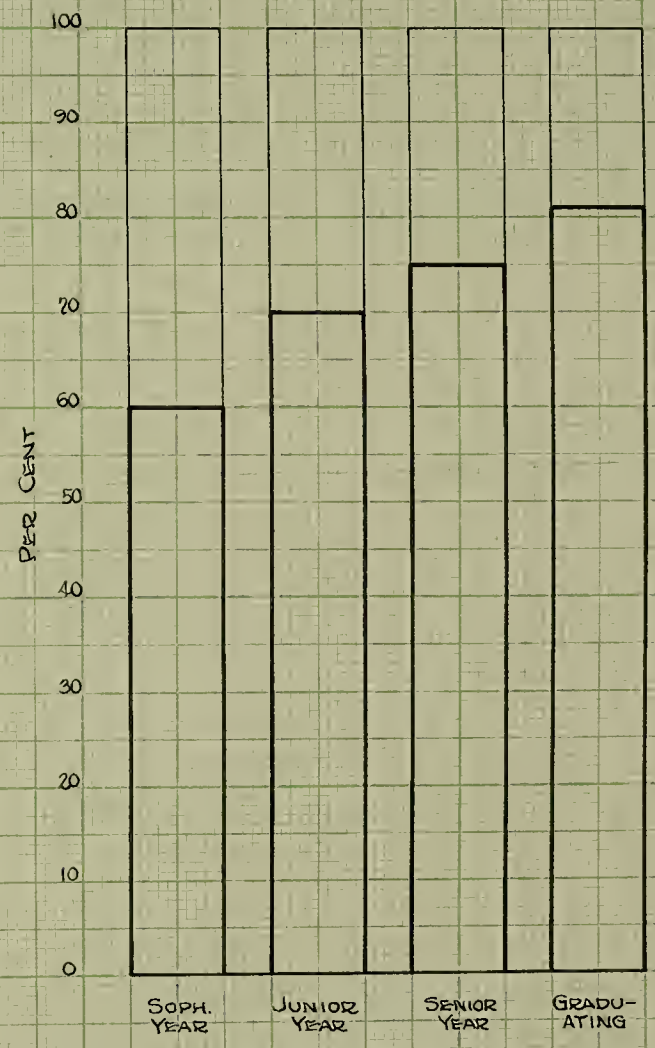
A: Data from Four Separate Classes.

Class	No. in lowest decile	Percentage leaving college. Before soph. year	Before junior year	Before senior year	Before graduating
1924	52	46	67	71	75
1925	38	71	76	79	
1926	51	59	75		
1927	50	64			

B: Combined Data from Several Classes.

Time of leaving	Percentage leaving	Based on data from classes of	No. in lowest decile
Before Soph. year	59	1924, 5, 6, 7	191
" Junior "	72	1924, 5, 6	141
" Senior "	74	1924, 5	90
" Graduating	75	1924	52

FIGURE VI.



Mortality in the lowest psychological decile. Prominent divisions show percentage leaving college before the time indicated. Approximated on the basis of data from the classes of 1924-1927, inclusive.

has begun in the classes of 1926 and 1927 the result will mean that not more than one out of five original tenth decile men will remain to graduate. From the study of these facts it seems justified to conclude that a freshman whose psychological score groups him in the lowest decile has but two chances out of five of remaining in college more than one year and only one chance out of five of graduating.

Significance of Psychological Scores With Reference to High Academic Achievement. Thus far attention has been directed only to students doing poor scholastic work. However, interest has been placed upon students doing acceptable work and the following tables and figures are made to demonstrate the significance of psychological scores in indicating students who are most likely to do well in their college courses.

Table X represents a study of psychological records of those students in the classes of 1926 and 1927 whose course grades during the first semester were all C or better. This group was made up of 195 students (84 from the class of 1926 and 111 from the class of 1927). This chart reveals the fact that more than nine out of every ten students, 93 per cent, belonging to this study group made scores which placed them in the upper four quintiles, i. e., scored 53 or more on the Brown Test. Only 7 per cent scored in the lowest quintile and only 2 per cent were ranked in the lowest psychological decile (below a score of 46). Basing justification upon the combined data of the two classes it might be concluded that with the possible exception of very few cases, freshmen who are expected to receive no grade lower than a C in all their courses during the first semester are to be sought in groups above the ninth psychological decile, i. e., are at least 46 on the Brown Test.

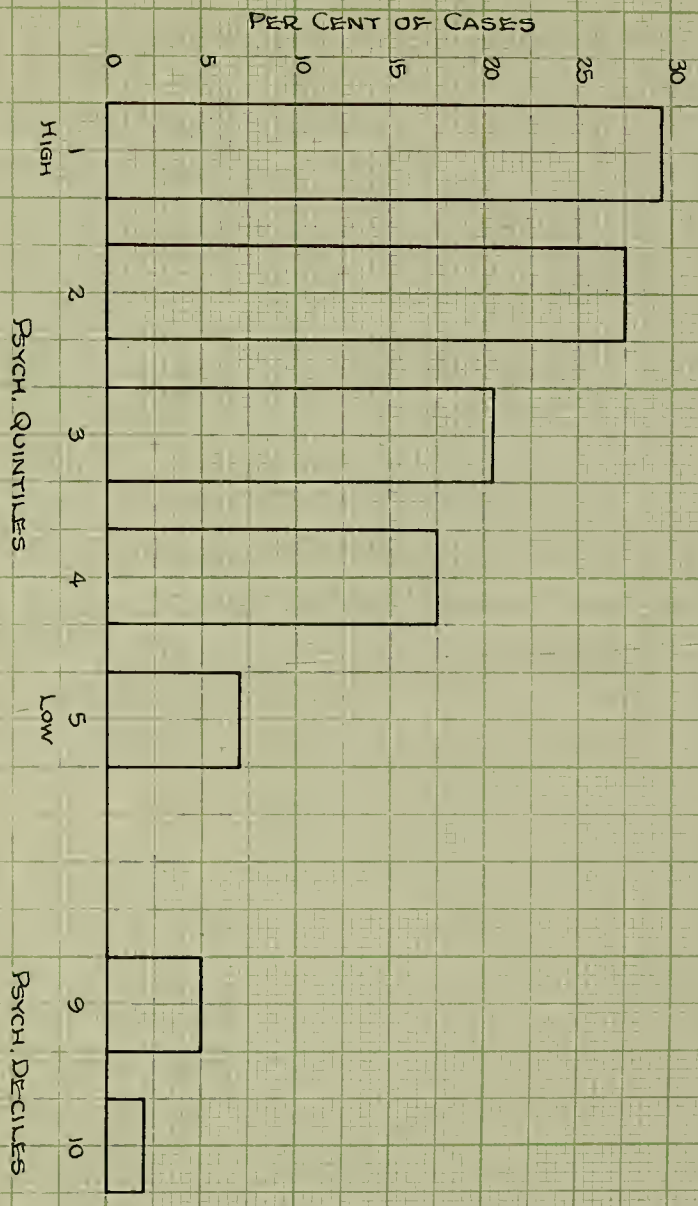
TABLE X

PSYCHOLOGICAL STATUS OF FRESHMEN RECEIVING GRADES OF C OR BETTER DURING THE FIRST SEMESTER

(Based on 195 Cases: 84 from the Class of 1926 and 111 from the Class of 1927.)

Psychological Decile		Cumulative Percentage	
High	1	15	100
	2	29	85
	3	40	71
	4	56	60
	5	68	44
	6	76	32
	7	81	24
	8	93	19
	9	98	7
Low	10	100	2

FIGURE VII.



Psychological status of freshmen receiving grades of C or better during the first semester. Based on 195 cases from the classes of 1926 and 1927.

The study of the significance of psychological scores has resulted in the finding of a pronounced relationship existing between psychological rankings and the achievement of academic honors.* Table XI shows a careful study of men in the classes of 1922, 1923, and 1924 who had achieved one or more academic honors during their entire college course of four years and to note their respective ratings on the Brown University psychological examination. This table does not include students who took honors but did not have a Brown test score. There were about a half dozen in this classification but it is not at all likely that the results would have been materially changed if it had been possible to include them.

A careful analysis of this table will reveal some very interesting facts relating honor achievements and psychological groupings. A very striking fact brought out is that only one student ranked in the lowest psychological fifth, that his score placed him in the ninth decile and that he had only one honor to his credit. Over half of the men taking honors ranked in the highest three deciles psychologically and more than nine tenths of them ranked in

---

*Such as Phi Beta Kappa, Sigma Xi, Honorary Scholarships, prizes for excellence in various branches, final honors, etc.

TABLE XI

PSYCHOLOGICAL RANKING OF HONOR MEN IN COLLEGE

Arranged by Psychological Deciles and Number of Honors Achieved During Four Years Data from Classes of 1922, 1923, 1924 (Combined)

B. U. PSYCH. decile	Number of honors 1	2	3	4	5	6	7	8	9	10	No. of cases	Cumulative Total	Cumulative Percentage
High: 1	8	6	3	3	-	3	1	1	1	1	27	27	28
2	4	1	2	-	-	2	1	-	1	-	11	38	40
3	4	6	4	-	1	-	-	1	-	-	16	54	57
4	5	3	-	-	-	-	-	1	-	-	9	63	66
5	5	5	3	1	-	-	-	-	-	-	14	77	81
6	2	1	-	1	-	1	1	-	1	-	7	84	88
7	2	2	-	1	-	-	-	-	-	-	5	89	93
8	4	1	-	-	-	-	-	-	-	-	5	94	99
9	1	-	-	-	-	-	-	-	-	-	1	95	100
Low: 10	-	-	-	-	-	-	-	-	-	-			
Totals....	35	25	12	6	1	6	3	3	3	1	95		

FIGURE VII.

Psychological ranks related to achieving academic honors. Based on 95 cases from the classes of 1922-1924, inclusive.

in the highest seven deciles. Some interesting facts may be noted concerning students who took more than one honor. All men taking more than one honor ranked in the first four quintiles. Five-sixths of those taking more than one honor had psychological scores above the median and all of them ranked in the highest four deciles. The data presented in this table may suggest a possible means of identifying prospective honor students. However, it is well known that a high degree of achievement is not attained by all who are capable of doing so. Nevertheless, on the basis of this data it may be concluded that the majority of honor men are to be sought among those scoring in the best psychological third; most of the remainder in the middle third; and very few (possibly one out of twenty) in the lowest third, Any individual scoring in the lowest fifth has practically no chance of achieving "honors".

CONCLUSIONS

The writer wishes to emphasize the results obtained by intelligence tests for use of advice and guidance. The college freshman frequently enters a very different atmosphere and environment than that to which he has been accustomed. He must work much more independently and with comparatively little guidance. It is frequently more difficult to locate and secure the material to be studied. Distractions and opportunities for activities other than study are much more numerous. In view of these and other similar fact such qualities as fixedness of purpose, determination, perserverance and so on, would seem to determine the quality of work done to a much greater degree than in high-school work, This fact or apparent fact emphasizes the need for minimizing the break between high school and college and for providing by means of "freshman week" or other similar procedures an efficient advisory system for the better orientation and guidance of those entering college.

Results obtained at Brown University and Rhode Island State College correspond rather closely to those obtained at other institutions. The tests are not designed to determine the intelligence of freshmen but to serve as a rough scale to measure the ability to successfully complete the college work.

A P P E N D I X

CORRELATION - BROWN UNIV. PSYCHOLOGICAL SCORE VS. ACADEMIC AVERAGE FRESHMAN YEAR

CLASS OF 1930

Academic Average Freshman Year (x)

Brown University Psychological Score (y)

	60	65	70	75	80	85	90	f	Mean X (Acad.)	dy	fdy	fd^2y
80			1		10 / 1 / 10		20 / 1 / 20	3		5	15	75
75			5	4 / 7 / 28	8	12 / 6 / 72	16 / 1 / 16	19		4	76	304
70		-3 / 3 / -9	4	3 / 9 / 27	6 / 3 / 18	9 / 4 / 36	12 / 2 / 24	25		3	75	225
65		-2 / 7 / -14	11	2 / 12 / 24	4 / 12 / 48	6 / 8 / 48	8 / 1 / 8	51		2	102	204
60	-2 / 1 / -2	-1 / 6 / -6	16	1 / 13 / 13	2 / 12 / 24	3 / 9 / 27	4 / 1 / 4	58		1	58	58
55	-2 / 5 / 28	-29 / 13 / 49	15	42 / 13 / -26	100 / 8 / -30	183 / 6	72 / 1	61		0	327 / 0 / -143	0
50	2 / 3 / 6	1 / 11 / 11	11	-1 / 7 / -7	-2 / 5 / -10			37		-1	-37	37
45	4	2 / 7 / 14	5	-2 / 6 / -12	-4 / 5 / -20			23		-2	-46	92
40	6 / 1 / 6	3 / 5 / 15	3	-3 / 1 / -3				10		-3	-30	90
35	8 / 2 / 16	4 / 1 / 4	1	-4 / 1 / -4				5		-4	-20	80
30		5 / 1 / 5	1					2		-5	-10	50
f	12	54	73	69	46	33	7	294	75.7		183	1215
Mean y (Psych.)								61.07				
dx	-2	-1	0	1	2	3	4					
fd x	-24	-54	-78 / 0 / 288	69	92	99	28	210				
fd^2x	48	54	0	69	184	297	112	764				
Sum Products	26	20	0	66	70	183	72	437				

r=.368
P.E.=±.03

TABLE XII.

COMPUTATION

Mean x (Acad.)

$$\begin{array}{r} 326 \\ -143 \\ \hline 183 \div 294 = .622 \\ \times\ 5 \\ \hline 3.210 \\ 72.5 \\ \hline 75.7 \end{array}$$

Mean y (Psych.)

$$\begin{array}{r} 288 \\ -\ 78 \\ \hline 210 \div 294 = .714 \\ \times\ 5 \\ \hline 3.570 \\ 57.5 \\ \hline 61.07 \end{array}$$

$$\sigma x = 5\sqrt{\frac{764}{294} - (.622)^2}$$

$$= 5\sqrt{2.5986 - .3869}$$

$$= 5\sqrt{2.2117}$$

$$= 5(1.49)$$

σx = 1.49 in steps of 5
7.45 in units

$$\sigma y = 5\sqrt{\frac{1215}{294} - (.714)^2}$$

$$= 5\sqrt{4.1326 - .5098}$$

$$= 5\sqrt{3.6228}$$

$$= 5(1.9033)$$

σy = 1.90 in steps of 5
9.52 in units

$$P = \frac{437}{294} - (.622)(.714)$$

$$= 1.4863 - .4441$$

$$= 1.0422$$

$$r = \frac{1.0422}{(1.49)(1.9)} = \frac{1.0422}{2.831}$$

$$= .368$$

Class of 1931 - Brown University - Correlation; Age of Entrance vs. Academic Average Semester I Freshman Year

Academic Av. Sem. I Fr. Yr.

Age of Entrance, Sept. 1927	55-	60-	65-	70-	75-	80-	85-	90-	95-	Total
25yrs.						1				1
24-				1						1
23-					2					2
22-				1	1					2
21-	1	2	3	3	6	1				16
20-		1	10	8	13	1	2			35
19-	1	4	17	22	25	15	7			91
18-	3	9	19	28	41	22	19			141
17-	1	2	8	12	36	18	15	5		97
16-		2	2	1	10	6	3	3		27
15-									1	1
Total	6	20	59	76	134	64	46	8	1	414

$r = -.28$

Mean(Acad.) = 76.4

∴ (Age) = 18yrs. 9mos.

Sigma(Acad.) = 7.4

∴ (Age) = 1 yr. 4 mos.

TABLE XIII.

CLASS OF 1931 - BROWN UNIVERSITY - CORRELATION ; AGE OF ENTRANCE VS. SCORE ON B.U. PSYCHOLOGICAL TEST (Forms E & F)

B.U. Psych. Score (x)

Age of Entrance (y)	30-	40-	50-	60-	70-	80-	Total
25yrs				1			1
24			1				1
23		1			1		2
22	1	1		1			3
21		4	5	6			15
20	1	7	17	6	3		34
19	2	13	34	30	12	1	92
18	2	13	45	67	22	1	150
17	1	6	29	39	24	2	101
16			6	16	5		27
15					1		1
Total	7	45	137	166	68	4	427

Mean (Age) = 18yrs. 9mos.
" (I.Q.) = 61.0
Sigma (Age) = 1yr. 4 mos
" (I.Q) = 9.5 units
r = -.071

TABLE XIV.

CLASS OF 1931 - BROWN UNIVERSITY - CORRELATION; AGE OF ENTRANCE VS. OTIS I.Q.*

TABLE XV.

Otis I.Q.

Age of Entrance - 6mos. spans	85	90	95	100	105	110	115	120	125	130	Total
25-0						1					1
24-6						1					1
24-0									1		1
23-6					1						1
23-0								1			1
22-6											
22-0						2					2
21-6				1		1			1		3
21-0		1		1	4	1	4	1			12
20-6			1	3	1	2	4	3		1	15
20-0				2	1	6	6	1			16
19-6			2	3	4	13	14	5	4	2	47
19-0			1	4	3	7	9	13	7	1	45
18-6				8	7	10	19	15	11	2	72
18-0	1	1		2	8	10	17	20	15	2	76
17-6			1	2	11	8	12	13	19	4	70
17-0				2	3	2	8	3	11	1	30
16-6						1	4	4	9	2	20
16-0						1	1		2	1	5
15-6										1	1
Total	1	2	5	28	43	66	98	79	80	17	419

$r = -.27$

Mean (Age) = 18 yrs. 9 mos.

" (I.Q.) = 117.7

Sigma (Age) = 1 yr. 4 mos.

" (I.Q.) = 8.45

* Otis Self-Administering Test of Mental Ability - Higher Exam.

PREDICTION FOR MORE THAN ONE YEAR. **

r	Number of years (together)	
.60	1	
.46	2	Class of 1922.
.45	3	
.37	1	
.38	2	Class of 1923.
---	3	

r	Number of years. (cumulative)	Women's College
.58	1	
.57	2	Class of 1927.
.47	3	
.43	4	
.54	1	
.52	2	Class of 1928.
.49	3	
---	4	

**Furnished through the courtesy of Dr. Andrew H. MacPhail of Brown University.

BIBLIOGRAPHY

1. Alexander, C.

School Statistics and Publicity.

Silver, Burdett and Company, N. Y., 1919.

2. Allen, W. O.

"College Admissions," Lafayette College, Sch. and Soc., Vol. XIV, No. 353, Oct. 1, 1921, pp. 235-240.

3. Anderson, L. D.

The Value of an adaptation of the Downey Will Temperament Test as a supplement to the Thurstone College Entrance Tests in predicting freshman scholarship. Carnegie Inst. of Tech., 1921.

4. Beatley, B.

Harvard University, "The Relative Standing of Students in Secondary Schools on Comprehensive Examinations and in College," School Review, Vol. XXX, No., 2, Feb. 1922.

5. Bell, J. C.

"Mental Tests and College Freshmen," Jr. of Ed. Psych., Sept., 1921, Vol. VII, pp. 381-399.

6. Bingham, W. V.

"Some Norms of Dartmouth Freshmen," Jr. of Ed. Psych., 1916, No. 7, pp. 129-143.

7. Bingham, W. V.

"The Use of the Army Intelligence Examination in University Administration," Proc. 9th annual meeting, Am. Assoc. Collegiate Registrars, 1919, pp. 133-141.

8. Bode, B. H.

"Educational Significance of Mental Tests," Jr. of Ed. Research, Vol. VII, No. 2, Feb. 1923.

9. Breed, F. S.

"Shall We Classify Pupils by Intelligence Tests?" Sch. and Soc., Vol. 15, pp. 406-409, April 15, 1922.

10. Breitwieser, J. V.

"The Thorndike College Entrance Tests in the University of California," Univ. of Cal. Press, Berkeley, Cal., June 1922.

11. Bridges, J. W. University of Toronto

"The Value of Intelligence Tests in Universities," Sch. and Soc., Vol. 15, No. 377, March 18, 1922, p. 295.

12. Bridges, J. W. and Dollinger, V. M.

"The Correlation between Interests and Abilities in College Courses," Psych. Review, 27: 308-314, 1920.

13. Briggs, T. H.

"The New Columbia University Admissions Plan," Education, 39: 474-480, April 1919.

14. Brooks, M. S.

Grouping by Abilities, The Psychological Clinic, March-April, 1925.

15. Brown, William

The Essentials of Mental Measurement." Cambridge University Press, 1911.

16. Burr, Emily

Intellectual Levels of Accomplishment. Jr. of Personnel Research, Vol 3, Oct. 1924, pp. 207-212.

17. Burwell and MacPhail

Some Practical Results of Psychological Testing at Brown University. Sch. and Soc., Vol. 22, July 11, 1925, pp. 48-56.

18. Calfee, M. University of Texas.

"College Freshmen and Four General Intelligence Tests," Jr. of Ed. Psych., Vol. IV, pp. 222-231, 1913.

19. Chambers, G. G. University of Pennsylvania.

"Intelligence Tests for Admissions," Am. Assoc. Collegiate Registrars, Proc. 10th Annual Meeting, 1920, pp. 206-213.

20. Chambers, G. G.

"Intelligence Examinations and Admission to College," Ed. Review, Vol. 51, pp. 128-237, 1921.

21. Chambers, G. G.

"Intelligence Examinations and Admission to College," Ed. Review. Feb. 1921.

22. Clement, J. A.

"Use of Mental Tests as a Supplementary Method of Making School Adjustments in Colleges," Ed. Admin. and Supervision, 6: 433-444, Nov. 1920.

23. Cohn, Stephon

The Purposes and Methods of Psychological Tests in Schools and Colleges. Education, Vo. XL. Feb., 1920.

24. College Entrance Certificate Board of New England, Annual reports of

25. Colleges and Universities. Sch. and Soc., Vol. 13, April 23, 1921. pp. 481-494.

26. Colvin, S. S.

The Present Status of Mental Testing, Ed. Review, Vol. 64, Nox. 3 and 4, pp. 196-206, 320-337, Oct. and Nov., 1922.

27. Colvin, S. S.

Methods and Results of Psychological Tests Given at Brown University.

28. Colvin, Stephen, S.

"Psychological Tests at Brown University," Sch. and Soc., Vol. X, No. 236, pp. 27-30, July 5, 1919.

29. Colvin, S. S.

"The Purpose and Methods of Psychological Tests in Schools and Colleges," Education, Vol. XL. No. 7, pp. 404-416, March, 1920.

30. Colvin, S. S.

"The Validity of Psychological Tests for College Entrance," Ed. Review, Vol. 60, No. 1, pp. 7-17, June 1920.

31. Colvin, S. S.

"Educational Guidance and Tests in College," Jr. of Ap. Psych., Vol. V., pp. 32-38, Mar. 1921.

32. Colvin, S. S.

"The Use of Intelligence Tests," Ed. Review, Vol. 62, No. 2, pp. 134-148, Sept. 1921.

33. Colvin, S. S.

"Educational Advice and Direction of College Students," Christian Education, Vol. V, No. 6, pp. 18-34, Mar. 1922.

34. Colvin, S. S. and MacPhail, A. H.

"The Value of Psychological Tests at Brown University," Sch. and Soc., Vol. XVI, No. 396, pp. 1-10, July 29, 1922.

35. Colvin, S. S. and Allen, W. O.

"Mental Tests and Linguistic Ability," Jr. of Ed. Psych., Vol. 15, Jan. 1923.

36. Columbia University

"Psychological Tests at Columbia University," Sch. and Soc. 13, 166, Feb. 5, 1921.

37. Crane, Esther

"An Investigation of Three Plans for Selecting Students to be Admitted to College," Jr. of Ed. Psych., May, 1926, pp. 322-330.

38. Dagney, S.

"Intelligence Tests and Collegiate Selection," Sch. and Soc., Vol. 15, pp. 593-595, May 27, 1922.

39. Dickson, V. E.

Mental Tests and the Classroom Teacher. World Book Co.

40. Ditmars, Thomas

"Intelligence Tests as a Basis for Classification and Grading," Education, Vol. 44, Sept. 1923, p. 33.

41. Dodge, Raymond

"The Educational Significance of the Army Intelligence Tests," Education Vol, XL., Feb. 1920.

42. Downey, J. E.

"Testing the Will-Temperament Tests," Sch. and Soc., Vol. XVI, No. 397, August 5, 1922.

43. Dwight, C. A. S.

"What is Reasonable in Testing?" Jr. of Ed. Method, Vol. 5, Oct. 1925, pp.60-62.

44. Faunce, W. H. P. President of Brown University.

"Winnowing the Freshmen," Brown Alumni Monthly, Vol. XXIII, No. 2, July, 1922.

45. Flinner, Ira, A.

"Intelligence of Successful College Board Candidates in Mathematics," Vocational Guidance Magazine, May 1926, pp. 361-363.

46. Garrett

Statistics in Psychology and Education.
Longman.

47. Garrison and Tippett

Comparison of the Binet-Simon and Otis Tests.
Jr. of Ed. Research. June 1922.

48. Gray, President Clifton D., of Bates College.

(quoted in) Sch. and Soc., Vol. XVI, No. 407,
Oct. 14, 1922., "Weeding Out College Incompetents."

49. Intelligence of Seniors in the High Schools of
Massachusetts, Bulletin, March 1924, No. 9,
Bureau of Education, Dept. of the Interior.

50. Intelligence Tests and Their Use.

Public School Publishing Co., Bloomington, Ill.,
1922, 21st year book.

51. Jacob, P.

"Intelligence Tests for College Entrance,"
Results from college students of Georgia,
High School Quarterly, 8: 174-180, Apr. 1920.

52. Jones, A. L.

"Psychological Tests for College Admission,"
Ed. Review, 1919, No. 58, pp. 271-276.

53. King, W. I.

The Elements of Statistical Method.
The Macmillan Co., N. Y., 1912.

54. Langfeld, H. S.

"Mental Tests for College Entrance," Harvard Alumni Bulletin, 21, 464-466, Mar. 13, 1919.

55. Koos, L. V.

"Research Problems in Collegiate Education," Sch. and Soc., Vol. 17, No. 425, p. 169., Feb. 17, 1923.

56. Leman, H. B.

"Forecasting Failures in College Classes," Sch. Review, Vol. 30, pp. 382-387, May 1922.

57. MacCaughey, V.

"The California Survey of Mental and Educational Tests," Sch. and Soc., Vol. 22, Aug. 15, 1925.

58. MacPhail, A. H.

"The Intelligence of College Students." Warwick and York, Baltimore, Md., Fall of 1923.

59. MacPhail, A. H.

"Classification of Freshmen at Brown University," Jr. of Ed. Research, Vol. XIV, No. 5, pp. 365-369, Dec. 1926.

60. MacPhail, A. H. and Burwell, W. R.

"Some Practical Results of Psychological Testing at Brown University," Sch. and Soc., 22:48-56, July 11, 1925.

61. McDonnell, Anna, H.

"Comparative Validity of High School Marks and Mental Test Records in Predicting College Success.

61. Miller, W. S. University of Minnesota.

"The Administrative Use of Intelligence Tests in the High School." 21st Year-book of N. S. for the Study of Education, Ch. 7.

62. History and Theory and Early Practice in Mental and Educational Testing. Part II. National Society for the Study of Ed., 17th Year-book. Public School Publishing Co., Bloomington, Ill.

63. Otis Statistical Methods. page 21.

64. Proctor, W. M.

"Psychological Tests as a Means of Measuring the Probable Success of High School Pupils," Jr. of Ed. Research, Vol. 1, May 1920.

65. Davidson, Margaret R. and MacPhail, A. H.

"Psychological Testing in a Women's College,"

66. Rice, E. A.

"A Study of the Correlation Between Scholastic Success and Scores Made in Intelligence Tests." Indiana University, 1921.

67. Rugg, H. O.

"Statistical Methods Applied to Education." Houghton Mifflin Co., Chicago, 1917.

68. Rugg, Harold O.

"A Primer of Graphics and Statistics for Teachers." Houghton Mifflin Co., Boston, Mass.

69. Seashore, C. E. University of Iowa.

"Comments on the Plan for Sectioning Classes on the Basis of Ability," Sch. and Soc., Vol. XVI, No. 410, Nov. 4, 1922.

70. Seashore, C. E.

"Progressive Adjustment vs. Entrance Elimination in a State University," Sch. and Soc., Vol. 17, No. 420, Jan. 13, 1923.

71. Secrist, Horace

"An Introduction to Statistical Methods."
The MacMillan Co., 1925.

72. Society for Study of Education

21st Year-book. Public School Publishing Co., Bloomington, Ill.

73. Symonds-

Measurement in Secondary Education.

74. Terman, L. M.

"Intelligence of School Children."
Houghton Mifflin.

75. Terman, L. M.

"Intelligence Tests in Colleges and Universities." Sch. and Soc., Vol. 13, pp. 481-494. 1921.

76. Terman, L. M.

"The Measurement of Intelligence."
Houghton Mifflin. 1916.

77. Thorndike, E. L.

"An Introduction to the Theory of Mental and Social Measurements." Second ed. Teachers' College Ser. New York, 1916.

78. Thurstone, L. L.

"Mental Tests for College Entrance." Jr. of Ed. Psych. 1919, Vol. 10, pp. 129-42.

79. Thurstone, L. L.

"The Predictive Value of Mental Tests," Ed. Review, 63:11-22, Jan. 1922.

80. Toops, Herbert A.

"The Status of University Intelligence Tests in 1923-1924." Jr. of Ed. Psych. Vol. 17, Jan. 1926., pp. 23-26.

81. Trabue-

"Measuring Resorts in Education." American Book Co., N. Y.

82. Wood, B. D.

"Measurement in Higher Education." World Book Co.

ACKNOWLEDGEMENTS

It is a pleasure for the writer to record his indebtedness to many persons who have assisted in this study. His greatest obligation is to Dr. A. H. MacPhail of Brown University who has followed the study with interest, has read the manuscript more than once, has offered valuable criticism and suggestions, and has now and then given a word of encouragement which is much appreciated by the writer. He is also expecially indebted to Professors H. N. Glick and W. S. Welles of Massachusetts Agricultural College and to Dr. Charles Carrol of Rhode Island College of Education for many valuable suggestions which have been incorporated in the body of this thesis. He is also under obligation to Professor Ralph E. Brown and to Dr. A. J. Newman of Rhode Island State College for assistance with the statistical manipulations involved in the study. To Dr. Howard Edwards, President of Rhode Island State College, to the Registrar of the same institution, and to the Committee on Educational Advice and Direction of Brown University, the writer owes much. He appreciates their aid in making the records available.