

University of Montana

ScholarWorks at University of Montana

Graduate Student Theses, Dissertations, &
Professional Papers

Graduate School

1955

An investigation to determine whether the L-score on the A. C. E. Psychological examination is more significantly indicative of academic success in college than is the Q-score

Thelma Lucilla Ware
The University of Montana

Follow this and additional works at: <https://scholarworks.umt.edu/etd>

Let us know how access to this document benefits you.

Recommended Citation

Ware, Thelma Lucilla, "An investigation to determine whether the L-score on the A. C. E. Psychological examination is more significantly indicative of academic success in college than is the Q-score" (1955). *Graduate Student Theses, Dissertations, & Professional Papers*. 7891.
<https://scholarworks.umt.edu/etd/7891>

This Thesis is brought to you for free and open access by the Graduate School at ScholarWorks at University of Montana. It has been accepted for inclusion in Graduate Student Theses, Dissertations, & Professional Papers by an authorized administrator of ScholarWorks at University of Montana. For more information, please contact scholarworks@mso.umt.edu.

AN INVESTIGATION TO DETERMINE WHETHER THE L-SCORE
ON THE A. C. E. PSYCHOLOGICAL EXAMINATION IS MORE
SIGNIFICANTLY INDICATIVE OF ACADEMIC SUCCESS IN
COLLEGE THAN IS THE Q-SCORE

by

Thelma L. Ware

B. A. Polytechnic Institute of Puerto Rico, 1952

Presented in Partial Fulfillment of the
Requirements for the Degree of
Master of Arts

Montana State University

1955

Approved:

Warren K. Burlington
Chairman, Board of Examiners

Adon D. Castle
Dean, Graduate School

Aug 15 1955
Date

UMI Number: EP38692

All rights reserved

INFORMATION TO ALL USERS

The quality of this reproduction is dependent upon the quality of the copy submitted.

In the unlikely event that the author did not send a complete manuscript and there are missing pages, these will be noted. Also, if material had to be removed, a note will indicate the deletion.



UMI EP38692

Published by ProQuest LLC (2013). Copyright in the Dissertation held by the Author.

Microform Edition © ProQuest LLC.

All rights reserved. This work is protected against
unauthorized copying under Title 17, United States Code



ProQuest LLC.
789 East Eisenhower Parkway
P.O. Box 1346
Ann Arbor, MI 48106 - 1346

TABLE OF CONTENTS

Chapter	Page
I. THE PROBLEM AND DEFINITION OF TERMS.	1
The Problem	
Statement of the Problem	
Importance of the Study	
Hypotheses	
Definitions of Terms	
Successful	
Unsuccessful	
II. PREVIEW OF THE LITERATURE.	5
Differential Prediction from A. C. E.	
Quantitative and Linguistic Scores	
Limitations of Previous Studies	
III. METHODOLOGY AND SOURCES OF DATA.	10
Description of the A. C. E. Psychological Examination	
Grades as the Criterion of Academic Success	
Gathering and Organizing of Data	
Statistical Techniques Employed	
IV. PRESENTATION AND ANALYSIS OF DATA.	13
Data on the A. C. E. Q-score and L-score	
Application of the Critical Score	
V. DISCUSSION OF RESULTS.	26
VI. SUMMARY AND CONCLUSION	28
Summary	
Conclusions	
Need for Further Study	
APPENDIX.	31
BIBLIOGRAPHY.	44

LIST OF TABLES

Table	Page
1. Basic Data for the Discriminant. Analysis	17
2. Calculation of the Correlation Coefficients and the Standard. . . . Deviations Within Two Groups	18
3. Analysis of Variance of d Between. . and Within the Successful and. . . . Unsuccessful Groups.	20
4. ACE Q and L Scores and Grade Point . Averages for Successful Group. . . .	31
5. ACE Q and L Scores and Grade Point . Averages for Unsuccessful Group. . .	39

CHAPTER I
THE PROBLEM AND DEFINITION OF TERMS

CHAPTER I

THE PROBLEM AND DEFINITION OF TERMS

At present the testing services in many colleges and universities use the total score obtained on the American Council on Education Psychological Examination (hereafter referred to as the A. C. E. Psychological Examination) to appraise what is called scholastic aptitude or general intelligence. The A. C. E. Psychological Examination forms are used also in handling those problems in which it is advisable to distinguish a student's mental abilities from his high-school preparation and his knowledge gained by work experience.¹

In addition to the use of the total A. C. E. Psychological Examination score for these purposes, the Quantitative (Q-score) and Linguistic (L-score) sub-test scores are frequently utilized in making differential predictions of college success.² Most of the courses in the liberal arts colleges seem

¹L. L. Thurstone and T. G. Thurstone, "A. C. E. Psychological Examination for College Freshmen," Manual of Instructions, (1947 Edition), 1-23.

²Ibid, p. 2.

to depend more upon linguistic abilities than upon the abilities involved in quantitative thinking. Thus, the considerably greater importance placed upon verbal ability in most college curricula tends to favor the L-score as the more significant of the two sub-scores in evaluating scholastic aptitude. This is, however, a priori reasoning from practical experience and the assumption involved has never been substantiated by experimentation.

THE PROBLEM

Statement of the problem.-- The purpose of this study was to determine which of two sub-scale scores of the A. C. E. Psychological Examination was more valid as a predictive instrument in prognosticating success in college.

Importance of the study.-- The A. C. E. Psychological Examination, in its various editions, is widely used among colleges to measure aptitude for college study. In this long-continued use the test has been administered mainly for the purposes of student guidance, but it is used also for purposes of placement, class sectioning, selection of scholarship winners and, less frequently, admission to

college.³

This particular test is used more widely in testing entering freshmen classes than any other instrument of its kind.⁴ Its wide acceptance and continued use through successive editions suggests that it has been found useful in differentiating potentially weak and strong students. Aside from the use of the total score for the purposes mentioned above, the Q-score and L-score are frequently utilized in attempts to make differential predictions of success in college.

Thus, in order to better evaluate the A. C. E. Psychological Examination as a predictive instrument of college success, there is need of a restatement of the assumption involved in the form of a testable hypothesis.

Hypotheses.-- 1. It is possible on the basis of the A. C. E. Psychological Examination to predict academic success in college.

2. The L-score on the A. C. E. Psychological Examination is more significantly indicative of aca-

³"A. C. E. Psychological Examination for College Freshmen," Norms Bulletin, (1952 Edition), Foreward.

⁴Thurstone and Thurstone, op. cit., p. 1-23.

demio success in college than is the Q-score.

3. It is possible to establish cut-off points on the Q and L score scales such as to differentiate between successful and unsuccessful students.

DEFINITIONS OF TERMS

Successful.-- Those students were placed in the Successful group who continued at the university to the point of obtaining a degree, or who had a grade point average of 2.0 or higher at the time of their withdrawal from the university.

Unsuccessful.-- Those students were placed in the Unsuccessful group who were officially dropped from the university or who voluntarily discontinued, but who had at the time of their withdrawal from the university a grade point deficiency, that is, a grade point average of 1.99 or lower.

CHAPTER II
REVIEW OF THE LITERATURE

CHAPTER II

REVIEW OF THE LITERATURE

The purpose of the Psychological Examination of the American Council on Education, according to the manual,¹ is to appraise what has been called scholastic aptitude or general intelligence, with special reference to the requirements of most college curricula.

Thurstone and Thurstone, in their manual, state that it is not what is commonly referred to as an intelligence test, but rather a test of certain intellectual abilities that have been shown to be closely related to scholastic success.

This test is given annually to college freshmen all over the country. It may be administered in an hour's time and may be scored conveniently through the use of stencils or by machine. Each test is preceded by a practice exercise of the same kind. This is not only desirable on general grounds but is definitely reassuring to the giver of the test if he has doubts about the

¹L. L. Thurstone and T. G. Thurstone, "A. C. E. Psychological Examination for College Freshmen," Manual of Instructions, (1947 Edition), p. 1-23.

homogeneity of his group.²

DIFFERENTIAL PREDICTION FROM A. C. E.

QUANTITATIVE AND LINGUISTIC SCORES

Studies made on the A. C. E. Psychological Examination Q-score seem to indicate that prediction of success in college courses is seldom possible from this score. Smith³ concluded that the level of the linguistic score affects the extent to which students can apply the abilities measured by the Q-score.

Martin's⁴ research done on the Q-score of the A. C. E. Psychological Examination indicates that prediction of success in college courses is difficult to make from this score. He concluded, in agreement with Smith, that the level of the L-score affects the extent to which the student can use the abilities measured by the Q-score and this level varies with types of courses.

It is the popular belief that superiority

²W. D. Cummins, in The Third Mental Measurements Yearbook, O. K. Buros, Editor, New Brunswick: Rutgers University Press, 297.

³D. D. Smith and T. O. Triggs, "Educational Successes and Failures of Students with High Q and Low L on the A. C. E. Psychological Examination," American Psychologist, 5, (1950), 353-354.

⁴F. M. Martin, "The Prognostic Value of Significantly Different Q and L Scores of the A. C. E. Psychological Examination at the College Level," American Psychologist, 5, (1950), 471.

in either the Q or L sections indicates that the student should pursue the appropriate curriculum, for example, either mathematical sciences or literature. The lack of any marked differences between the predictive values of these two parts in most typical university freshmen courses indicates that considerable caution should be exercised in the interpretation of the Q - L-score differential for purposes of educational guidance.⁵

From the results of a study by Brown⁶ it would appear that the L-score predicts grade point averages in linguistic subjects with a degree of accuracy which compares favorably with other measuring instruments. The total score on the test was a better predictor of grades in quantitative subjects than was the Q-score itself. For prediction in quantitative subjects there was no significant difference between Q and L-scores.

Various studies have been made in an attempt to predict success in different fields of study. For example, Dorothy M. Barrett⁷ tried to predict

⁵W. L. Wallace, "Differential Predictive Value of the A. C. E. Psychological Examination," School and Society, (1949), 23.

⁶H. S. Brown, "Differential Prediction by the A. C. E.," Journal of Educational Research, 44 (1950), 116.

⁷D. M. Barrett, "Differential Value of Q and L Scores on the A. C. E. for Predicting Achievement in College Mathematics," Journal of Psychology, 33 (1952), 205-207.

achievement in college mathematics by the A. C. E. Psychological Examination Q and L-scores. In agreement with Brown, Barrett concluded that the Q-score did not predict achievement in general mathematics any better than did the L-score, the best predictor being the total score.

Crowley⁸ attempted to predict academic success in divisions of the College of Arts and Science from the percentile ranks on the Q-score, L-score and total score. His study gave indications that counselors and advisers could not with any reasonable degree of confidence attempt such predictions.

Osborne⁹ reports that when success is measured in terms of average quarter and year marks it is found that the L-score consistently tends to give better predictions than the Q-score, however, none of the correlations were reliable at the .05 level.

LIMITATIONS OF PREVIOUS STUDIES

No studies closely similar to the present

⁸J. R. Crowley, An Evaluation of the A. C. E. Psychological Examination and the Cooperative English Test as Guidance Instruments at Montana State University, (1951), 1-64.

⁹R. T. Osborne, et al. "The Differential Prediction of College Marks by A. C. E. Scores," Journal of Educational Research, 44, (1950), 107-115.

one were found in the review of research. Brown's study dealt with first year students, Crowley's study ran correlations between the various scores and grade point averages in divisions and departments of the college where the study was conducted, while others ran a correlation between specific courses and the test scores in question.

CHAPTER III
METHODOLOGY AND SOURCES OF DATA

CHAPTER III

METHODOLOGY AND SOURCES OF DATA

This chapter will present an account of the materials to be used and the methodology of the study.

Description of the A. C. E. Psychological Examination.-- The A. C. E. Psychological Examination is used annually in over six hundred colleges and universities. Beginning with the 1938 edition, the one hour examination was so constructed as to yield, in addition to a total T-score, two separate sub-scores: the Q-score and the L-score. These sub-scores do not represent primary mental abilities. They are said to represent two groups of abilities significant for the successful completion of college curricula that are predominately technical and linguistic.

Grades as the criterion of academic success.--

Grade point averages were the criterion used to determine a student's success or failure at the University. Because the grading system at Montana State University does not consider a grade of "F" in calculating the grade point average until the

junior year, each student's grade point average was computed in this study to include all "F" grades without consideration of the school year in which they were completed. Computed by the University's system, a freshman student who completed five credits of "F" work and five credits of "B" work would have a grade point average of 3.0. As computed by the system used by the author of this study, this student's grade point average would be 1.5. Grade points range - in both the University's system and in the system used by the author - from "A" (4 grade points), "B" (3 grade points), "C/" (2½ grade points), "C" (2 grade points), "D" (1 grade point) to "F" (0 grade points).

Gathering and organizing of data.-- Grade point averages were computed as shown above for all freshmen students of all ages and sex - transfer students were not included - entering the University fall quarter, 1949: a total of 563 students. Grade point averages were computed up to the date of withdrawal or graduation. If the students were currently enrolled at the University, grade point averages were computed up to fall quarter, 1954.

These students were then divided into two groups. The group into which students were placed was determined by their grade point averages. The

groups were designated Successful and Unsuccessful. A student with a grade point average of below 2.0 was placed in the Unsuccessful group. A student with a grade point average of 2.0 or above was placed in the Successful group. The Q and L-scores of the A. C. E. Psychological Examination were then obtained for each individual from records available in the University Counseling Center, Montana State University.

Statistical techniques employed.-- The particular statistical technique used was Fisher's Discriminant Function.¹ This function deals with the statistical techniques employed in dealing with multiple measurements for differentiating between two or more groups. In this study the two groups to be differentiated were the Successful and the Unsuccessful. For each of these groups there were two sets of measurements - the Q and the L sub-test scores of the A. C. E. Psychological Examination.

The usual way of treating individuals with several measurements who are to be classified into groups is to take each measurement separately and compute the significance of the difference between the means of the groups.²

¹Palmer O. Johnson, Statistical Methods in Research, New York: Prentice-Hall, Inc., (1949), 344.

²Ibid., p. 344.

This method is inefficient in that it does not combine the information, taking the interrelations between the measurements dealt with into account.³

The advantage in using Fisher's Discriminant Function is that it corrects the above discrepancies by showing the relative significance of the sub-scores by inspection of weights in the regression equation. The difference between the weighted Q and L scores were then tested for significance.

The Discriminant Function uses the F test to determine the significance of the difference between the Q and L scores.

The essential property of this function, which is a linear function of the observations, is that it will distinguish better than any other linear function between the specified groups on whom common measurements are available. The principle upon which the discriminant function rests is that the linear functions of the measurements will maximize the ratio of the difference between the specific means to the standard deviations within classes.⁴

³Ibid., p. 344.

⁴Ibid., p. 344.

CHAPTER IV
PRESENTATION AND ANALYSIS OF DATA

CHAPTER IV

PRESENTATION AND ANALYSIS OF DATA

In this chapter the results and interpretation of the study is presented. For purposes of clarity and also in order to render the inherent difficulties of the study into acceptable hypotheses which could be treated experimentally, it was necessary to consider and treat the study in two distinct parts. As previously stated it was thought to be expedient to first determine which of the two sub-scores of the A. C. E. Psychological Examination, the Q-score or the L-score, was more indicative of academic success. The second phase of the study was concerned with the establishment of an appropriate cut-off point which would allow test users to make certain predictions within the scope of the information with which this study deals as to the probability of academic success or academic failure.

Data on the A. C. E. Q-score and L-score.-- In the search for a statistical method for the most adequate treatment of the data the author selected and employed the Discriminant Function. The general and complete mathematical development of the Discrimi-

nant Function was made by Fisher.¹ In its original form the development is rather complex. Because of the need for a simplified version of this function Johnson² has introduced a simplified proof and computational example which may be more readily followed and understood than the original and more technical statistical development. The author has used Johnson's simplified form.

The Discriminant Function is particularly applicable to the operations of predicting membership in a class or group from several variables as was the case in this study. The variables in this study were the Q and L scores of the A. C. E. Psychological Examination.

A regression equation maximizes the ratio of the differences of the means of the variables. Then prediction can be made as to membership into the Successful and Unsuccessful groups.

The basic data of the study from which subsequent calculations were made are presented in Table 1. This Table shows the data used in the

¹R. A. Fisher, "The use of Multiple Measurements in Taxonomic Problems," Annals of Eugenics, Vol. VII (1936), pp. 376-386.

²Palmer O. Johnson, Statistical Methods in Research, New York: Prentice-Hall, Inc., (1949), p. 344.

analysis of the disparity between the Successful and the Unsuccessful groups. Table 2 presents the calculated correlation coefficients and the standard deviations within the groups.

The general form of the regression equation is

$$d = k_1 Q + k_2 L \quad (1)$$

where,

d = the linear function of the measurements Q and L which maximizes the ratio of the differences between the means of the Successful and Unsuccessful groups to the standard deviation within classes.

k_1, k_2 = the regression for Q and L scores respectively.

Q, L = A. C. E. Psychological Examination sub-scores.

The form of equation (1) for a particular individual, i , obtained in this study is

$$d_i = Q_i + L_i \quad (2)$$

where,

d = the previous definition.

Q_i, L_i = an individual's raw scores on the A. C. E. Psychological Examination.

In determining whether relation (2) differ-

TABLE 1
BASIC DATA FOR THE DISCRIMINANT ANALYSIS
OR
CALCULATED MEASURES FOR TWO GROUPS

	Unsuccessful	Successful
N	211	352
ΣQ	8287	16289
\bar{Q}	39.27488152	46.27556818
ΣL	12020	23979
\bar{L}	56.96682464	68.12215909
ΣQ^2	347171	786457
ΣL^2	725978	1696303
ΣQL	483633	1130623
d_1	7.00068666	
d_2	11.15533445	

TABLE 2

CALCULATION OF THE CORRELATION COEFFICIENTS AND
THE STANDARD DEVIATIONS WITHIN TWO GROUPS

	Q_U	L_U
Total.....	1133628	1614256
Groups.....	<u>1079253.67324160</u>	<u>1581725.92526120</u>
$Q_{\text{Within Groups}}$	$S_{11} = 54374.32675840$	$S_{12} = 32530.07473880$
	$\sqrt{S_{11}} = 233.18303274$	$\sqrt{S_{11}} \sqrt{S_{22}} = 75213.19170372$
	$S_1 = 9.84499537$	$r_{12} = .43250491$
Total.....	2422281	
Groups.....	<u>2318242.48506840</u>	
$L_{\text{Within Groups}}$	$S_{22} = 104038.51493160$	
	$\sqrt{S_{22}} = 322.55001927$	
	$S_2 = 13.61807249$	

entiate the Successful from the Unsuccessful group on the variable Q , the significance between the two groups on the variable Q was tested through the analysis of variance in Table 3. The hypothesis tested was

$$F > 1 \quad (3)$$

where,

F = the F statistic calculated from the data and

1 = the null F value.

Since $F < .01$ the hypothesis of homogeneous groups was rejected. Therefore, it was concluded that the relation (2) permits the prediction of future membership in the academically Successful and Unsuccessful groups.

The maximum difference between the two groups was derived by the relation

$$C = \frac{\bar{Q}_U}{2} + \frac{\bar{Q}_S}{2} \quad (4)$$

where,

C = the criterion or cut-off value which maximizes the discrimination between the two groups.

\bar{Q}_U = the calculation arrived at by entering the mean raw Q and L scores of the Unsuccessful group in relation (1).

TABLE 3

ANALYSIS OF VARIANCE OF α BETWEEN AND WITHIN
THE SUCCESSFUL AND UNSUCCESSFUL GROUPS

Source of Variation	D.F.	S.S.	M.S.	F	P
Within Groups	559	.00147523	.00000264	54.47	.01
Between Groups	2	.00028759	.00014379		

$\bar{\alpha}_s$ = a similar calculation for the Successful group.

The final hypothesis to be tested was that the L-score would prove to be a better instrument of prediction of academic success than the Q-score. The statistical statement of this hypothesis was

$$\lambda_1 < \lambda_2 \quad (5)$$

where,

$$\lambda_1 = .000079$$

$$\lambda_2 = .000082$$

A decision as to whether this hypothesis was right as stated could have been reached by inspecting the difference between the two λ coefficients. The difference between them was .000003. Inspection indicated that this difference was so small as to be insignificant. The investigator decided to use another and more meaningful method of arriving at a decision regarding the above hypothesis. The biserial correlation coefficients, r_b , was selected.

There are two reasons why the biserial correlation coefficient was selected. By calculating

$$r_b (QC) \text{ and } r_b (LC) \quad (6)$$

which are the biserial correlations between the Q scores and the criterion and the L scores and the criterion, respectively.

The difference

$$r_b (LC) - r_b (QC) \quad (7)$$

could then be tested for significance. Or, in other words, it was hoped to test the null hypothesis

$$r_b (LC) - r_b (QC) = 0 \quad (8)$$

The decision could then be made regarding the relative merits of L and Q scores as indicators of academic success. This could be roughly equivalent to testing the significance of the difference between the two regression coefficients. Second, the use of the biserial coefficient would give more information because it would also show the estimated correlation between each kind of score and the criterion.

For the data

$$r_b (LC) = .46$$

$$r_b (QC) = .42$$

A test of the null hypothesis regarding these two coefficients was made by

$$t = \frac{z_L - z_Q}{\sqrt{z_L^2 - z_Q^2}} \quad (9)$$

where,

t = Fisher's t statistic.

z_L, z_Q = Fisher's Z transformations of the correlation coefficients in relation (8).

$\sqrt{Z_L - Z_Q}$ = the standard error of the difference between the two Z values.

For the data $t = .56$. The P obtained was .29 for a directional one tailed test of the null hypothesis, relation (8), and a .58 for a two tailed test of the same hypothesis. Although the L-score was found to be a better predictive instrument in forecasting success in college, the difference in predictive value of the two sub-scores was statistically insignificant. Therefore, the Q and L scores would seem to be equally good predictors of academic success.

Application of the critical score.-- The equation which permits the prediction of membership in the Successful and Unsuccessful groups was

$$d_i = .000079 Q_1 + .000082 L_1 \quad (10)$$

where,

Q_1, L_1 = a particular individual's Q and L scores.

.000079, .000082 = the empirical λ -coefficients.

d_1 = an individual's d -measure.

When

$$d_i < c$$

or

$$d_i < .008551,$$

which is the criterion, the prediction is made that individual 1 will be unsuccessful in college.

When

$$d_i \geq c$$

or

$$d_i \geq .008551$$

the prediction is made that individual 1 will be successful in college.

An illustration of a successful individual follows:

$$\begin{aligned} d_a &= .000079 \times 64 + .000082 \times 70 \\ &= .005056 + .005640 \\ &= .010696 \end{aligned}$$

Since d_a was greater than the criterion, that is, .010696 was greater than .008551, this individual would be placed in the successful group.

An example of an unsuccessful individual would be as follows:

$$\begin{aligned} d_b &= .000079 \times 23 + .000082 \times 48 \\ &= .001817 + .004136 \\ &= .005953 \end{aligned}$$

Since individual b's score was less than the criterion, that is, .005953 being less than .008551, this individual would be placed in the unsuccessful group.

CHAPTER V
DISCUSSION OF RESULTS

CHAPTER V

DISCUSSION OF RESULTS

Although the L-score was found to be higher statistically than the Q-score, it was not significantly higher.

The fact that the subjects consisted of an aggregation of students irrespective of their major fields would tend to cancel out the predictive value of the sub-tests. For example, the L-score is primarily indicative of linguistic abilities and the Q-score is an indicator of quantitative assets. Two successful students, the one possessing a high L and a low Q-score; the other having a low L and a high Q-score, would show no differential predictive preference for either the Q or L-score.

However, if two groups which are clearly dependent upon linguistic and quantitative knowledge, respectively, were selected and statistically treated by the Discriminant Function, the tendency of cancellation of the one group by the other would be greatly reduced if not completely suppressed and the probability of finding a greater and

more representative difference between the Q and L-score would be increased.

An example of this procedure would be the selection of two groups of students composed of physics (Q factor) and English (L factor) majors. The Q and L scores of these groups would then be statistically treated by Fisher's Function to determine the relative degree to which the A. C. E. Psychological Examination sub-scores are predictive instruments of success in college.

Such dichotomized groups would afford a reduction of overlap insofar as discrete quantitative and linguistic variables are concerned. The absence of qualitative overlap between the major fields of the subjects would facilitate the desired distinction between the sub-scores and maximize the ratio of the difference between the groups. In this way a more precise indication of the value of each of the sub-scores as predictive instruments of academic success could be obtained.

This contention is substantiated by Brown's¹ study. He concluded that the L-score was a better predictor in the linguistic field than the Q-score was in the quantitative subjects.

¹H. S. Brown, "Differential Prediction by the A. C. E.," Journal of Educational Research, 44 (1950), 116.

CHAPTER VI
SUMMARY AND CONCLUSION

CHAPTER VI

SUMMARY AND CONCLUSION

Summary.-- In many colleges and universities the testing services use the total score on the A. C. E. Psychological Examination in appraising students as to their aptitude for college. Aside from the use of the total score, the Q and L sub-test scores are frequently utilized in making differential predictions as to academic success in college. The considerable greater weight which verbal ability has in most college curricula would tend to make the L-score the more important of the two for these purposes.

The A. C. E. Psychological Examination Q and L scores and grade point average were collected for students entering college fall quarter, 1949. These data were treated by Fisher's Discriminant Function in an effort to discover whether the Q or L score was more predictive of academic success. It was hoped that a decision to this effect could be reached by inspecting the weights in the regression equation of Fisher's function. However, the difference was found to be too small for

differentiation. Therefore, the biserial correlation coefficient was used in an attempt to arrive at a decision. Before this was done a critical score, $C = .008551$, was obtained. Using the biserial correlation coefficient the following information was obtained: $r_b (LC) = .46$ and $r_b (QC) = .42$. A test of the null hypothesis regarding these two coefficients gave a P of .29 in a directional one-tailed test and a P of .58 in a two-tailed test.

Conclusion.-- On the basis of this information it was concluded that the L-score was a slightly better predictor of academic success than the Q-score. However, the difference between the two sub-scores as predictive instruments was found not to be significant.

The cut-off point obtained was $C = .008551$. Any student's A. C. E. Psychological Examination Q and L scores, when treated in the equation $Q = .000078 \times Q + .000082 \times L$, which fall below C would be designated as a possible unsuccessful student. But if the student's Q and L scores should fall above C the student would be designated as a possible successful student.

Need for further study.-- Although the statistical treatment of the basic data maximized the differences between the two groups and thereby made it possible

to assess the particular value of the Q and L subscores in terms of their respective validity as predictive instruments, it becomes increasingly apparent when the source of the basic data is considered that need exists for further research before any reliable cut-off point can be established which may be used as a criterion for success in future cases.

The investigator would advise against the use of the C obtained from the present study as an absolute criterion of success in connection with future counseling; though some counselors and perhaps some testers may find various uses of the information contained in this study. In the final analysis the information contained herein pertains only to freshmen who entered Montana State University fall quarter, 1949 and should not be generalized to other classes or individuals without further research on the problem. It is suggested that a number of C points be obtained from further investigations and the mean of the individual means noted. This investigator believes such an extended analysis of data would avail a more reliable cut-off point than does a single investigation of a single class.

APPENDIX

TABLE 4

A. C. E. Q AND L SCORES AND GRADE POINT AVERAGES
FOR SUCCESSFUL GROUP

	Grade Point Average	A. C. E.	
		Q	L
1.	2.6569	46	78
2.	2.5294	41	67
3.	2.0000	49	54
4.	2.2643	35	67
5.	3.4158	64	79
6.	2.6368	55	58
7.	2.2222	38	70
8.	2.8737	42	66
9.	3.3819	40	58
10.	2.0109	48	58
11.	2.5922	54	53
12.	2.1692	49	50
13.	2.5349	37	62
14.	3.1670	50	74
15.	2.2816	62	55
16.	3.0784	27	67
17.	2.4123	43	78
18.	2.1727	31	72
19.	2.5596	46	76
20.	3.0205	49	53
21.	2.2552	41	53
22.	2.6494	56	75
23.	2.0052	30	60
24.	3.2831	35	79
25.	2.1453	62	70
26.	2.1000	34	41
27.	2.3533	54	73
28.	2.5294	47	63
29.	3.1386	49	81
30.	2.5229	66	74
31.	2.1017	52	71
32.	2.2063	33	60
33.	2.4000	44	56
34.	2.9794	51	71
35.	2.3808	65	61

TABLE 4--Continued

36.	2.5768	48	88
37.	2.3012	38	70
38.	2.3181	42	57
39.	2.6625	55	70
40.	2.3980	38	45
41.	2.1250	46	72
42.	3.1428	43	57
43.	2.4523	37	64
44.	2.1454	57	61
45.	2.3288	35	46
46.	3.3621	56	69
47.	2.3043	49	63
48.	2.9041	43	67
49.	2.6666	42	90
50.	2.1330	46	66
51.	2.4162	45	73
52.	2.5728	53	44
53.	2.6931	37	52
54.	2.9354	40	75
55.	2.6262	43	83
56.	2.5645	49	69
57.	2.5921	51	63
58.	2.3449	37	61
59.	2.2113	48	66
60.	2.0223	42	65
61.	2.0000	28	69
62.	2.2586	63	73
63.	2.1739	42	51
64.	2.5257	53	79
65.	2.6862	52	84
66.	2.3678	43	64
67.	2.2058	46	52
68.	2.4130	57	44
69.	2.8339	40	64
70.	2.7037	49	68
71.	2.2201	36	55
72.	3.3725	37	71
73.	2.2883	46	65
74.	2.1713	44	60
75.	2.0000	48	62
76.	2.1875	55	72
77.	2.3263	47	72
78.	3.3000	46	71
79.	2.1000	40	59
80.	2.3316	39	51
81.	2.2545	62	99
82.	3.1143	57	70

TABLE 4--Continued

83.	2.6250	41	61
84.	2.2678	33	55
85.	2.1229	46	72
86.	2.1250	41	44
87.	2.3574	55	76
88.	2.6736	34	79
89.	2.4130	32	55
90.	2.1250	47	72
91.	3.5323	55	79
92.	2.1224	45	72
93.	2.3283	42	83
94.	2.2176	50	103
95.	2.1358	52	78
96.	2.2513	34	40
97.	2.5026	46	78
98.	2.9795	57	62
99.	2.8954	48	61
100.	2.2169	41	65
101.	2.3750	31	68
102.	3.4051	52	69
103.	2.1827	45	59
104.	2.1197	53	42
105.	2.4079	48	77
106.	2.2326	53	73
107.	2.5319	43	78
108.	2.7050	65	66
109.	2.5632	22	48
110.	2.1255	37	58
111.	2.3450	50	87
112.	2.3450	61	80
113.	3.0102	51	76
114.	2.0665	59	59
115.	2.0050	53	69
116.	2.2959	49	82
117.	3.3974	55	87
118.	2.0767	51	42
119.	2.0625	59	101
120.	2.8118	70	87
121.	2.5666	46	61
122.	2.2010	48	78
123.	2.7727	41	64
124.	2.4639	48	80
125.	2.8205	50	93
126.	2.0857	51	69
127.	2.6356	51	80
128.	2.4232	45	50

TABLE 4--Continued

129.	2.9902	49	86
130.	2.0945	46	65
131.	2.6010	41	95
132.	2.1666	54	77
133.	2.2512	56	69
134.	2.4593	34	69
135.	2.5454	56	82
136.	2.4104	44	63
137.	2.6266	44	55
138.	3.1636	65	86
139.	2.4401	56	66
140.	3.0890	47	57
141.	2.5329	40	43
142.	2.2962	51	77
143.	2.3926	38	84
144.	2.7575	47	60
145.	2.3921	49	55
146.	2.3398	57	66
147.	2.3193	31	69
148.	3.4946	54	82
149.	2.8468	30	33
150.	2.2522	41	56
151.	2.8870	54	93
152.	2.8750	33	89
153.	2.2941	55	77
154.	2.2553	35	64
155.	2.6037	43	72
156.	2.3191	51	64
157.	3.1888	56	81
158.	2.5679	45	69
159.	2.1587	42	71
160.	2.3265	33	34
161.	2.6336	44	75
162.	2.7513	50	66
163.	2.5000	45	67
164.	2.5967	39	64
165.	2.3674	52	68
166.	2.4285	36	66
167.	2.1478	53	68
168.	2.7346	59	62
169.	2.0000	55	90
170.	2.6136	57	84
171.	2.6858	44	55
172.	2.9303	40	73
173.	2.2061	29	76
174.	2.4924	42	59
175.	2.2127	43	73

TABLE 4--Continued

176.	2.4972	47	51
177.	3.3877	36	85
178.	2.2973	54	80
179.	2.3844	47	70
180.	2.1718	42	68
181.	3.3703	66	89
182.	2.5855	57	67
183.	2.7835	46	52
184.	2.7079	51	65
185.	2.6641	29	54
186.	2.9609	55	80
187.	2.6391	54	68
188.	2.5396	43	68
189.	2.1730	42	66
190.	2.8131	43	71
191.	2.2202	30	50
192.	2.8125	52	82
193.	2.4526	49	72
194.	2.1043	32	52
195.	2.7522	62	99
196.	2.3449	63	74
197.	2.6827	57	71
198.	3.3106	41	69
199.	2.0606	37	60
200.	2.7792	50	72
201.	2.0487	48	40
202.	2.6283	42	86
203.	3.0098	65	80
204.	2.4813	41	67
205.	2.6182	41	61
206.	2.4230	44	83
207.	2.0408	33	63
208.	3.5521	50	86
209.	2.0204	46	59
210.	2.8144	46	76
211.	2.5427	43	72
212.	2.3050	63	83
213.	3.6802	60	80
214.	3.0000	54	76
215.	2.6770	53	90
216.	2.0050	29	65
217.	2.2901	46	66
218.	2.7757	42	68
219.	2.4361	43	51
220.	2.0268	55	57
221.	2.5660	34	83

TABLE 4--Continued

222.	2.1770	48	61
223.	2.1022	45	58
224.	2.7068	46	89
225.	2.4596	52	71
226.	3.0396	59	66
227.	2.0769	51	69
228.	2.1381	48	71
229.	3.8510	64	95
230.	2.3326	44	52
231.	3.8348	40	87
232.	2.1717	52	66
233.	2.8333	42	61
234.	2.2727	42	57
235.	2.9059	42	60
236.	2.0408	56	87
237.	2.3225	54	72
238.	2.8279	33	57
239.	2.3305	43	88
240.	2.7234	36	57
241.	2.0666	52	72
242.	2.5675	45	78
243.	2.0236	47	44
244.	2.9818	62	77
245.	2.2887	55	63
246.	2.5555	59	88
247.	2.1666	67	78
248.	2.2461	38	67
249.	3.2167	54	68
250.	2.6083	45	73
251.	2.6451	57	67
252.	2.5681	57	82
253.	2.5390	15	26
254.	2.1721	46	74
255.	3.0482	60	96
256.	2.2051	49	81
257.	3.1753	44	64
258.	2.3478	35	63
259.	2.0833	42	65
260.	2.7673	55	76
261.	3.0860	57	69
262.	3.7625	46	67
263.	3.2857	40	50
264.	2.0628	44	40
265.	2.3455	54	51
266.	2.0239	4	42
267.	2.2010	45	79
268.	2.6304	46	73

TABLE 4--Continued

269.	2.5319	46	83
270.	2.2025	64	95
271.	2.7828	37	61
272.	2.4081	60	92
273.	2.2307	31	54
274.	2.1094	46	64
275.	2.5631	33	59
276.	2.4590	43	53
277.	2.4868	46	98
278.	2.1904	45	70
279.	3.0815	42	58
280.	2.1484	48	79
281.	2.3125	50	66
282.	3.3094	66	77
283.	2.2131	45	74
284.	3.1198	41	82
285.	2.4633	61	88
286.	2.3478	42	74
287.	3.2207	63	78
288.	2.1800	38	37
289.	2.1791	44	67
290.	2.0952	17	56
291.	2.0884	41	52
292.	2.4892	53	70
293.	2.6908	51	80
294.	2.1366	53	85
295.	2.2000	41	68
296.	2.8200	37	72
297.	2.0000	40	72
298.	2.4736	38	73
299.	2.0252	46	62
300.	2.0476	38	39
301.	2.0637	47	55
302.	2.8840	47	67
303.	2.8243	51	82
304.	2.2068	37	62
305.	2.2307	48	68
306.	2.3645	37	54
307.	2.2180	56	63
308.	2.0538	50	71
309.	3.5227	51	91
310.	2.4776	44	74
311.	2.5769	51	64
312.	2.3430	43	72
313.	2.4247	48	58
314.	2.4232	45	81
315.	2.4378	52	65

TABLE 4--Continued

316.	2.1613	45	39
317.	2.0000	56	64
318.	2.0000	59	91
319.	2.0133	28	47
320.	2.6861	40	51
321.	2.5621	48	68
322.	2.0026	31	45
323.	3.5873	50	66
324.	3.5555	40	85
325.	2.3200	43	53
326.	2.1029	11	39
327.	2.6274	65	78
328.	2.4782	48	84
329.	2.2111	40	47
330.	2.0612	40	63
331.	2.1734	53	66
332.	3.4975	55	84
333.	2.0476	52	63
334.	2.3541	48	73
335.	2.5000	36	76
336.	2.4772	34	67
337.	3.0000	54	85
338.	2.9707	44	80
339.	2.3348	31	72
340.	2.5631	52	70
341.	2.3761	33	79
342.	2.7157	49	78
343.	3.7083	48	82
344.	2.2068	51	50
345.	2.1269	54	80
346.	2.4822	56	77
347.	2.2008	45	62
348.	2.0233	8	26
349.	3.1344	43	61
350.	2.5514	46	79
351.	2.4642	47	78
352.	2.1632	47	69

TABLE 5

A. C. E. Q AND L SCORES AND GRADE POINT AVERAGES
FOR UNSUCCESSFUL GROUP

	Grade Point Average	A. C. E.	
		Q	L
1.	1.7272	43	69
2.	1.6896	42	57
3.	1.9545	23	48
4.	1.0000	43	65
5.	1.2653	41	73
6.	1.8412	49	87
7.	1.6363	43	73
8.	1.4827	45	49
9.	1.6000	47	57
10.	1.8809	34	74
11.	1.0909	36	31
12.	1.0000	42	40
13.	1.7910	36	55
14.	1.7241	49	34
15.	1.5057	45	54
16.	1.3548	37	66
17.	1.8769	50	89
18.	1.2439	36	75
19.	1.1875	41	63
20.	1.6428	33	29
21.	1.9513	48	70
22.	1.8260	46	56
23.	1.8609	38	67
24.	1.6097	35	45
25.	1.8037	41	68
26.	1.6097	43	72
27.	1.1666	33	49
28.	1.5777	41	61
29.	1.8750	48	35
30.	1.3636	30	51
31.	1.9361	50	60
32.	1.6541	35	47
33.	1.7820	37	72
34.	1.7346	32	54
35.	1.6825	43	74
36.	1.9835	39	65

TABLE 5--Continued

37.	1.8504	41	56
38.	1.9767	27	43
39.	1.6666	44	54
40.	1.3793	46	42
41.	1.0000	28	26
42.	1.9347	42	47
43.	1.3437	11	16
44.	1.0484	50	50
45.	1.2608	48	41
46.	1.0000	50	48
47.	1.0000	25	37
48.	1.7647	50	59
49.	1.3921	37	8
50.	1.3000	50	50
51.	1.1250	23	55
52.	1.6039	31	51
53.	1.3800	21	43
54.	1.6982	32	58
55.	1.2758	38	48
56.	1.8684	43	78
57.	1.5833	29	33
58.	1.7809	27	47
59.	1.3103	47	55
60.	1.3333	45	61
61.	1.2380	56	77
62.	1.5833	54	65
63.	1.0601	43	65
64.	1.7500	28	67
65.	1.1612	19	73
66.	.9523	45	47
67.	1.6976	28	58
68.	.8200	29	60
69.	1.6603	41	70
70.	1.7187	64	77
71.	1.7654	44	55
72.	1.2702	15	57
73.	1.4936	51	72
74.	1.4843	38	65
75.	1.6666	38	73
76.	1.8918	59	68
77.	1.8376	35	69
78.	1.4230	45	55
79.	1.8750	47	67
80.	1.9537	44	60
81.	1.4117	39	69
82.	1.5000	38	40

TABLE 5--Continued

83.	1.0588	43	68
84.	1.6060	47	60
85.	1.9970	36	54
86.	1.7894	49	80
87.	1.5111	30	40
88.	1.9700	43	48
89.	1.9949	14	33
90.	.6373	38	51
91.	1.8750	38	55
92.	1.2388	51	70
93.	1.7314	48	48
94.	1.9787	47	46
95.	1.8809	31	46
96.	1.3750	17	68
97.	1.1851	30	66
98.	1.5781	29	62
99.	1.8333	36	83
100.	1.0833	47	67
101.	1.4666	16	45
102.	1.3142	45	78
103.	1.8043	30	36
104.	1.7058	50	69
105.	1.5833	32	57
106.	1.9166	22	55
107.	1.2553	56	68
108.	1.3600	48	53
109.	1.5714	24	53
110.	1.7944	38	60
111.	1.5833	34	45
112.	1.5555	41	78
113.	1.6250	44	68
114.	1.2055	46	75
115.	1.8474	31	55
116.	1.2325	58	66
117.	1.8061	47	77
118.	1.9512	31	53
119.	1.7906	36	47
120.	1.6491	33	63
121.	1.3529	41	53
122.	1.7936	65	72
123.	1.9027	47	51
124.	1.6274	50	69
125.	1.2380	40	57
126.	1.5833	29	44
127.	1.4000	27	50
128.	1.7815	36	66

TABLE 5--Continued

129.	1.3888	42	79
130.	1.5208	34	59
131.	.9523	28	31
132.	1.6039	65	56
133.	1.7073	40	57
134.	1.4444	42	57
135.	1.6500	35	63
136.	1.8000	46	74
137.	1.2105	44	47
138.	1.6325	43	58
139.	1.7857	47	98
140.	1.7046	51	85
141.	1.8315	42	61
142.	1.5000	45	55
143.	1.8431	39	74
144.	1.5000	36	56
145.	1.8055	56	56
146.	1.9166	37	46
147.	1.3333	17	50
148.	1.8431	33	60
149.	1.0909	47	64
150.	1.6043	36	52
151.	1.4285	38	51
152.	1.5000	40	64
153.	1.8750	45	65
154.	1.8727	45	50
155.	1.5517	45	77
156.	1.7222	60	64
157.	1.3333	42	45
158.	1.2456	27	56
159.	1.3846	30	41
160.	1.8026	30	49
161.	1.4166	32	61
162.	1.7526	43	49
163.	1.0000	43	47
164.	1.7142	54	75
165.	1.5454	39	45
166.	1.6829	20	37
167.	1.5185	13	49
168.	1.2545	48	72
169.	1.2790	46	52
170.	1.7424	37	71
171.	1.6754	35	62
172.	1.6739	54	90
173.	1.7333	44	66
174.	1.6111	35	44

TABLE 5--Continued

175.	1.7777	55	74
176.	1.6095	53	70
177.	1.5454	9	25
178.	1.8043	41	50
179.	1.3750	53	52
180.	1.1176	36	62
181.	1.0909	44	40
182.	1.7111	26	30
183.	1.8936	37	68
184.	1.8853	31	79
185.	1.6277	38	37
186.	1.6981	49	37
187.	1.4375	39	46
188.	1.2758	24	41
189.	1.8936	38	37
190.	1.4210	48	55
191.	1.8387	37	70
192.	1.2083	34	40
193.	1.9660	52	43
194.	1.2857	20	54
195.	1.8333	30	68
196.	1.9782	47	74
197.	1.0000	50	43
198.	1.8058	48	63
199.	1.9444	40	53
200.	1.4791	45	57
201.	1.0000	45	40
202.	1.7058	32	55
203.	1.2325	24	55
204.	1.7297	35	56
205.	1.7666	46	38
206.	1.1777	47	67
207.	1.3589	30	47
208.	1.7753	34	54
209.	1.8676	39	53
210.	1.6904	30	51
211.	1.0714	43	48

BIBLIOGRAPHY

BIBLIOGRAPHY

BOOKS

- Campbell, William C. A Form Book for Thesis Writing. Boston: Houghton Mifflin Co., 1939.
- Cummins, W. D. in The Third Mental Measurements Yearbook. O. K. Buros, Editor, New Brunswick: Rutgers University Press, 1949.
- Edwards, Allen L. Statistical Analysis. New York: Rhinehart and Co., 1946.
- Johnson, Palmer O. Statistical Methods in Research. New York: Prentice-Hall, Inc., 1949.
- Turabian, Kate L. A Manual for Writers of Dissertations. Chicago: The University of Chicago Press, 1937.

ARTICLES

- Barrett, Dorothy M. "Differential Value of Q and L Scores on the ACE for Predicting Achievement in College Mathematics," Journal of Psychology, Vol. 33, 1952, pp. 205-207.
- Brown, Hugh S. "Differential Prediction by the ACE," Journal of Educational Research, Vol. 44, 1950, p. 116.
- Fisher, R. A. "The Use of Multiple Measurements in Taxonomic Problems," Annals of Eugenics, Vol. 7, 1936, pp. 376-386.
- Martin, Frederick M. "The Prognostic Value of Significantly Different Q and L Scores of the ACE Psychological Examination at the College Level," American Psychologist, Vol. 5, 1950, p. 471.
- Osborne, R. T. et.al. "The Differential Prediction of College Marks by the ACE Score," Journal of Educational Research, Vol. 44, 1950, pp. 107-115.

Smith, D..D. and Triggs, F. O. "Educational Successes and Failures of Students with High Q and Low L on the ACE Psychological Examination," - American Psychologist, Vol. 5, 1950, pp. 353-354.

Thurstone, L. L. and Thurstone, T. G. "ACE Psychological Examination for College Freshmen," Manual of Instruction, 1947.

The American Council on Education. "ACE Psychological Examination for College Freshmen," Norms Bulletin, 1952.

Wallace, W. L. "Differential Predictive Value of the ACE," School and Society, July 9, 1949.

UNPUBLISHED MATERIAL

Crowley, Joseph R. "An Evaluation of the American Council on Education Psychological Examination and the Cooperative English Test as Guidance Instruments at Montana State University." Unpublished Master's Thesis, Department of Education, Montana State University, 1951.