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An Experimental Study in Association Involving a Comparison of Two Methods of Learning Latin Vocabulary

Henry M. Hellekson

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AN EXPERIMENTAL STUDY IN ASSOCIATION
INVOLVING A COMPARISON OF TWO METHODS
OF LEARNING LATIN VOCABULARY

A THESIS

1934/5

Submitted to the Graduate Faculty
of the
University of North Dakota

by

Henry M. ^{W.}Hellekson

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In Partial Fulfillment of the Requirements

for the

DEGREE

of

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A thesis submitted to the Department of
Psychology and the Graduate Committee of the
University of North Dakota in Partial Fulfill-
ment of the Requirements for the Degree of
Master of Science

Committee

C. W. Telford
Chairman

J. W. Breitwieser

Raymond R. Hitchcock

Bdg. 150'34 Hertzberg 1.00

J. W. Breitwieser
Director of the Graduate Division

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CONTENTS

	Page
INTRODUCTION	
Historical Orientation in Association.....	1
Purpose of the Study.....	8
Other Studies.....	9
PROCEDURE	
Methods and Materials.....	11
How Data was Secured.....	14
RESULTS.....	16
INTERPRETATION AND CONCLUSION	
Interpretation of Data.....	26
Summary.....	29
Limitations of the Study.....	32
Recommendations.....	33
APPENDIX.....	34
BIBLIOGRAPHY.....	43

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LIST OF TABLES

TABLE	PAGE
I	DISTRIBUTION OF ERRORS OF 68 GENERAL PSYCHOLOGY STUDENTS..... 16
II	GROUPS A..... 18
III	GROUP B..... 19
IV	DISTRIBUTION OF ERRORS OF 33 NINTH GRADE STUDENTS..... 20
V	COMPARISON OF ERRORS OF GROUP C AND GROUP D, NONE HAVING HAD OR TAKING LATIN..... 21
VI	COMPARISON OF ALL SUBJECTS HAVING HAD NO LATIN WITH THOSE HAVING HAD LATIN..... 22

LIST OF ILLUSTRATIONS

FIGURE	PAGE
1	ERRORS IN INDIVIDUAL IMMEDIATE REPRODUCTION..... 24
2	ERRORS IN RETENTION..... 25

INTRODUCTION

Historical Orientation in Association

The early Greek philosophers in their studies of many problems also delved into the psychology of association. Plato suggests the function of contiguity and similarity as involved in recollection but does not go into the problem any further, possibly because he believed that knowledge was innate and learning consisted of drawing upon experiences of the soul in past existences.¹

Aristotle's careful and broad study of mental facts as well as physical phenomena led him to develop the following conception of association. "In accounting for recollection we should observe that it depends on the sequence of mental processes. Mental processes always take the form of a series, or train. Their serial association is due in some cases to a necessary connection, in others merely to their occurring together habitually. Habitual connection brings about actual association in most cases, but not always. Its power to do so varies with the individual and the sort of experience. The series may start with present experience (sensation ?) or with something besides experience. Its members follow one another according to similarity, contrast, or contiguity. The process is the same in efforts to recollect, whether successful or not, as in spontaneous recollections."²

1- Warren, Howard C., A History of the Association Psychology
Charles Scribner's Sons, 1921, p 23-24

2- Ibid., p. 27

Thomas Hobbes is important, mainly, for establishing the type of psychology out of which associationism has developed. He concluded that contiguity was the basis of all sorts of sequence of representation with desire and habit as powerful influences in association.³

David Hume classified association into three principles: resemblance, contiguity in time or place, and cause or effect. This is the first attempt following Aristotle to classify association.⁴ David Hartley, a contemporary of Hume, regards contiguity as the basis of association and disregards in the main the other two concepts developed by Hume.⁵

Thomas Brown divided association (suggestion as he termed it) into Primary and Secondary Laws. The Primary Laws were resemblance, contrast, and nearness in time and space. The Secondary Laws, his important contribution, were duration, liveliness, frequency, recency, coexistence in the past with fewer alternative experiences, constitutional differences, variations in the same individual, temporary diversities of state (intoxication for example), and prior habits of life and thought. "According to Brown the primary laws 'are founded on the mere relations of the objects or feelings to each other', while the secondary laws indicate the influence exerted by circumstances or conditions upon the particular application of the primary laws."⁶

3- Ibid., p. 34-36

4- Ibid., p. 43

5- Ibid., p. 55

6- Ibid., p. 72-74

James Mill said that there were degrees in association. "An association is said to be stronger than another when it is (1) more permanent, (2) performed with more certainty, and (3) performed with facility. The causes of strength in association seem all to be resolvable into two: the vividness of the associated feelings, and the frequency of the association. These two principles of vividness and frequency are Mill's substitute for Brown's secondary laws."⁷

Francis Galton published what is usually recognized as the first experimental study in association in 1879 dealing with reaction time. "Galton's method at first was to allow free play to thought for a brief period of time, and then to direct his attention to the traces of thoughts still lingering." He then followed this method by another which consisted of selecting some word at random on a page and timing the interval necessary to make two successive associations.⁸

Not long after Galton's study, Ebbinghaus carried out a very comprehensive study on the effects of repetition and lapse of time using the saving of time as his basis of comparison. The most significant results of this study were the introduction of the use of nonsense-syllables and the making of a model of later researches.⁹

Alfred Jost used nonsense-syllables joined in series to determine whether massed practice or repetitions over a number of days was better in learning. "Jost's results indicate that a

7- Ibid., p.85

8- Ibid., p.214

9- Ibid., p.217-218

distribution of repetitions over a lengthy period is more favorable than concentrating them into one day, but that it is more economical to learn the material as a unit than piecemeal."¹⁰

Wundt guided many of his students in studies in association and his own work distinguishes between association and apperceptive connection, he, also, accepted the doctrine of mediate association. Kraepelin, Jung, and others contributed to many phases of association by means of association tests used for purposes of mental diagnosis.¹¹

There have been many studies on practically all the aspects of association and psychologists have attempted to classify the concepts or "laws" of association in many ways bringing in a wide variety of terminology. We will consider briefly the "primary laws" of contiguity and assimilation and the "secondary laws" of frequency, intensity, duration, context, acquaintance, composition, and individual differences.

Robinson defines contiguity in this manner. "The fact that two psychological processes occur together in time or in immediate succession increases the probability that an associative connection will develop - that one process will become the associative instigator of the other."¹² This definition involves temporal contiguity and not spacial contiguity as the latter is a physical condition which often leads to temporal contiguity of processes as is shown by Robinson. Most writers think of contiguity as the association of objects always found together.

10- Ibid., p. 219-220

11- Ibid., p. 223-235

12- Robinson, Edward S., Association Theory To-day. New York: The Century Company., 1932, p. 72

The law of assimilation often is thought of as association by similarity. Robinson defines assimilation in this fundamental manner: "Whenever an associative connection is so established that an activity, A, becomes capable of instigating an activity, B, activities other than A also undergo an increase or decrease in their capacity to instigate B."¹³ He then extends his definition and says, "Whenever an associative connection is so established that an activity, A, becomes capable of instigating an activity B, that same A will vary in its capacity for instigating certain activities other than B."¹⁴ This capacity will vary according to the similarity or elements in common between the two.

Frequency has been accepted by nearly everyone as a fundamental law of association. If practice is continued often under what are considered good learning conditions and that practice conducted in a good manner a better and stronger associative connection will be made.

Intensity is based on clearness and vividness. A given stimulation, if vivid or intense in its effect, will make a very strong connection with only one presentation. This is the basis of a long and clear memory of some harrowing experience.

The law of duration has nearly the same factors as those of intensity. In duration practice or experience is carried over a long or set period of time. This law is the basis of associative connection in massed practice.

Context has much in common with assimilation. In context

13- Ibid., p. 86

14- Ibid., p. 92

there is an interrelationship of the present stimulus with what has gone before and the present stimulus tends to tie up with the stimulus following. In experience involving similar material as, for instance, vocabulary lists the present stimulus is effected by words preceding and following.

The law of acquaintance has been shown by experimental evidence to exist in that new material learned and then relearned in a new order or arrangement a certain amount of time has been saved by acquaintance with the material at some former time. Even in learning nonsense-syllables time has been saved in re-learning demonstrating the law of acquaintance. The law of acquaintance also involves similarity.

The law of composition can be illustrated by the fact that certain processes of learning are associated with other processes. The nature of the arrangement under one condition may be more adaptable than the same arrangement under another condition. This then involves the order and arrangement of the stimuli for better or poorer learning. Composition, like acquaintance, must include similarity.

Robinson defines the law of individual differences as: "The rate at which any given associative connection can be fixated depends, among other things, upon a factor of idiosyncrasy which cannot be adequately explained in terms of the individual's personal history."¹⁵ It is a common accepted fact that individual differences exist in many wide and varied forms. Every testing program brings more evidence to show how each individual differs

15- Ibid., p. 121

from every other individual.

The above laws of association probably all play important roles in this experiment. However, there are six that seem to bear more directly on the problem than the others. They are contiguity, assimilation, duration, context, acquaintance, and individual differences. These particular laws and their bearing on the problem will be taken up more fully in the interpretation of the problem in the final chapter.

Purpose of the Study

The purpose of this study was to determine to what extent additional associative links facilitate the learning of Latin vocabulary material. The general plan of the study was to have students study lists of Latin words and their English equivalents by two methods. One of the methods seemingly involving greater associative possibilities than the other. The one method used only a Latin word and the English meaning; the other method had this arrangement: Latin word, English derivative, English meaning (see appendix). The experiment measured the amount that can be learned and retained within a given time limit as demonstrated by people having had no Latin at any previous time and others having had Latin. In this study the derivative was stressed in conjunction with the learning of vocabulary and the common method of teaching Latin has been to learn the English meaning and the Latin word and later take up the derivatives. Since we often have a similarity between the Latin word and its English derivative and a strong relationship between the English derivative and English meaning, it was thought that these associative links would facilitate the learning of the Latin words and at the same time stressing the possibilities of application of Latin in the study of English words.

Other Studies

The writer has not been able to find any similar study conducted with Latin or any other language study where tables and experimental evidence has been recorded.

Herbert T. Archibald has published a study which he conducted concerning the English derivative and Latin vocabulary. He does not include any tabulations or results but in his summary he states his findings which are concerned with the learning of Latin vocabulary and the application of it to Latin teaching and technique. He finds that vocabulary is almost wholly learned from the English derivative, a better system of parsing is acquired from paradigms of endings rather than paradigms of whole words, and syntax is abbreviated and very much simplified.¹⁶

John A. McGeoch studied the influence of associative value upon the difficulty of nonsense-syllable lists using lists which varied in their associative value from 0 to 100 per cent. These were taken from a study made by Glaze where a list of 2019 nonsense syllables were exposed to fifteen subjects. If all the subjects gave a response word as an association to a syllable it was rated as having 100 per cent associative value. If none gave any response to a syllable it was given 0 per cent associative value. Between these extremes were placed the remainder of the list according to the percentage of associative value as rated by the subjects.¹⁷ "Two 10-syllable lists were constructed

16- Archibald, Herbert T., Latin Vocabulary and the English Derivative., "Classical Journal", IX (1914), pp 265-271.

17- Glaze, J. Arthur, The Associative Value of Non-sense Syllables., "Pedagogical Seminary", XXXV (1928), pp 255-269

from each of six groups of syllables, the associative value of which were 0, 20, 46, 53, 73, and 100 per cent." McGeoch found that there was a steady increase in rate of learning with an increase in its associative value.¹⁸

H. B. Reed made a study of associative aids concerning their relation to learning, retention, and other associations. He used four types of word lists: two of English words - one having greater associative possibilities than the other, one involving a German word and its English meaning, and the fourth using nonsense syllables. All subjects were to make use of any associations they wished. He found that word pairs are quickly learned and slowly forgotten by associative aids and the absence of these aids produces slow learning and quick forgetting. His principle classes of associative aids are order and position, patterns, predication, and rhythm.¹⁹

18- McGeoch, John A., The Influence of Associative Value upon the Difficulty of Nonsense-Syllable Lists., "Pedagogical Seminary", XXXVII, (1930), pp.421-426

19- Reed, H. B., Associative Aids: Their Relations to Learning, Retention, and Other Associations., "Psychological Review", XXV (1918), pp. 128-155

PROCEDURE

Methods and Materials

At the beginning of the experiment each subject was given a list of complete instructions which he was to read carefully so as to understand exactly what was expected of him. In this manner no verbal instructions were necessary beyond some preliminary remarks regarding the reason for reading the instructions. The instructions were as follows:

This is a study in association.

You are going to be asked to study different sets of materials for given periods of time according to two methods.

Some persons will receive papers containing three lists of words. These lists consist of, first, a Latin word, then an English derivative, and last the English meaning. You are to learn the Latin and English meaning through the English derivative. In general there is a similarity in sound and appearance between the Latin word and the English equivalent which should make the association fairly easy. There is also a similarity in meaning between the English equivalent and the English meaning of the Latin word. This should also facilitate recall. In your study try to take advantage of these similarities. Use the English derivative as a link between the Latin word and its English meaning.

Some persons will receive papers containing two lists. One list consists of Latin words and the other consists of English meanings. You are to study these attempting to learn the pairs as rapidly as you can. Make use of any associations such as similarities in meaning, appearance of words, etc. which you discover.

Concentrate and learn all you can in the time allotted. You will be tested to determine how much you have learned from the study.

The papers will be passed to you and you are to leave

them face down on the table before you until you are given the signal to begin. As soon as time is called turn the paper face down on the table before you and wait further instructions.

You will be allowed four (4) minutes to study the lists. Word lists will be in a different order on the test lists.

After the instructions had been read and returned to the experimenter one of the lists of vocabulary was placed with the written material face down on the desks before the subjects. At a given signal the subjects turned their vocabulary lists over and were allowed four minutes in which to learn as many of the English meanings of the Latin words as possible. Then at a signal from the experimenter the lists were turned face down on the desk and immediately collected. Other sheets with only the Latin words in a different order were then passed out and the subjects were required to reproduce as many of the English meanings as they were able. One week later they were tested again on the same vocabulary list for retention. Each subject indicated on the sheets on which he reproduced the English meaning the date, amount of Latin, if any, previously studied, and his name.

As will be noticed on referring to the appendix there are four different sets of vocabulary lists each indicated by the Arabic numeral 1, 2, 3, or 4. Each vocabulary list, it will be noted, involves two methods: method II making use of only the Latin word and the English meaning and method III having the Latin word and the English meaning with the addition of the

English derivative in between. With this notation system it was a very simple matter for the experimenter to determine by which method a given group of subjects had studied. All persons studied two lists, one by each of the two methods described above.

The vocabulary lists were made up of the first eighty nouns and verbs found in a popular first-year Latin text²⁰ which very definitely had an English derivative. Every fourth word was then taken to make up the working list of twenty words. Only the nominative singular of the nouns and the second principle part (the infinitive) of the verb were used, only one English derivative, and one English meaning as illustrated by the first list headed by the words "agricola - farmer" under method II and "agricola - agriculture - farmer" under method III and the third row "occupare - to seize" and "occupare - occupy - to seize".

By using the notation system explained above and only one meaning to be learned the experimenter could easily compile the results and tabulate the number of errors.

In every case the time of day was constant for each group - being tested during regular given class periods.

20- Smith's , First Year Latin, (Revised by Harold G. Thompson), New York: Allyn and Bacon, 1933.

How Data Was Secured

The data were secured by testing a class of 68 general psychology students of the University of North Dakota and a group of 33 ninth grade pupils of Central High School, Grand Forks, North Dakota. Every subject was tested by the two methods but in each case with a new list of words.

The general psychology class was divided into two groups, called Group A and Group B, according to the laboratory sections in which they were registered. The ninth grade class was also divided into two groups, Group C and Group D. Due to the unevenness of the size of the laboratory sections or people being absent on days tests were given, so that their scores were thrown out when they could not be used over the entire test, the groups are not equal in number of subjects. Group A was made up of 30 subjects, Group B - 38 subjects, Group C - 16 subjects, and Group D - 17 subjects.

A period of two weeks was required in testing each group. For example, a group tested January 9th by one method were tested for retention January 16th and given a list of vocabulary of the other method to study and be tested for immediate reproduction and then tested for retention on the last list studied January 23rd.

The first week Group A was tested by method II and Group B was tested by method III. Group C was tested by method II and Group D was tested by method III. The second week Group A was

tested by method III, Group B - method II, Group C - method III, and Group D - method II. In this manner Group A and Group B could be compared by the two methods and Group C compared with Group D by the two methods.

RESULTS

In Group A 20 subjects had had Latin and 10 had had no Latin. In Group B 25 subjects had had Latin and 13 had had no Latin. Only three of the ninth grade pupils were taking Latin and none had had any Latin at any previous time.

The results of Group A and Group B will be presented first and will be considered of equal ability for in each case there are roughly two times as many subjects that have had Latin as those that have had no Latin.

TABLE I.
DISTRIBUTION OF ERRORS OF 68 GENERAL PSYCHOLOGY STUDENTS

Test Number	Immediate Reproduction		Retention		Immediate Reproduction		Retention	
	II-1	III-1	II-1	III-1	III-2	II-2	III-2	II-2
Group	A	B	A	B	A	B	A	B
Total group error	48		117		83		181	
		101		179		50		200
Mean Error	1.6	2.66	3.9	4.71	2.77	1.32	6.33	5.26
Average Deviation	1.77	2.22	3.45	3.61	2.07	1.52	3.23	3.79
Difference of Means	1.06		.81		1.45		1.07	
Probable Error of Difference	.99		1.74		.98		1.74	
Date Tests were given	1-9-34		1-16-34				1-23-34	

Table I has two columns of immediate reproduction and two of

retention. It will be noted that Group A was tested on vocabulary list 1 by method II for immediate reproduction and at the same time Group B was tested on vocabulary list 1 by method III. One week later both groups were tested for retention and the same day Group A studied and were tested for immediate reproduction of vocabulary list 2 by method III and Group B studied and were tested for immediate reproduction of vocabulary list 2 by method II. At the end of the second week both groups were tested for retention of the last studied lists.

The total group error is given showing the relative number of errors of each group out of a possible 600 errors for Group A and 760 errors for Group B.

The mean error indicates that the errors per person for both groups is higher for those learning by method III (using the derivative) than for those using method II for both immediate reproduction and retention after a period of one week had elapsed. The average deviation was calculated from the mean error and the individual scores.

The probable error was calculated by the formula:

$$P.E. \text{ diff.} = .84535 \sqrt{\frac{A.D._{II}^2}{N_x} + \frac{A.D._{III}^2}{N_y}}$$

Where .84535 is constant, A.D._{II} is the average deviation of distribution of errors in method II, and A.D._{III} is the average deviation of distribution of errors in method III. N_x is the

number of subjects taking the test by method II and N_y is the number taking the test by method III. This formula was used to measure the probable error of the difference throughout this entire study. The date indicates as stated the days that the tests were given.

TABLE II
GROUP-----A

Test Number	Immediate Reproduction		Retention		Immediate Reproduction		Retention	
	II-1	II-1	II-1	II-1	III-2	III-2	III-2	III-2
Had Latin	No	Yes	No	Yes	No	Yes	No	Yes
Total group error	33		77		52		96	
		15		40		31		85
Mean Error	3.3	.75	7.7	2	5.2	1.55	9.6	4.25
Average Deviation	2.16	.83	3.3	1.9	1.66	1.41	3.44	2.58
Difference of Means	2.55		5.7		3.65		5.35	
Probable Error of Difference	1.08		1.74		1.01		1.94	
Date Tests were given	1-9-34		1-16-34				1-23-34	

Table II represents a comparison of the subjects in Group A who have had Latin (20 subjects) and those that have had no Latin (10 subjects).

The mechanics of this table are identically the same as are those of Table I which will be true of the remaining four tables given in this chapter.

The mean error shows the error per person to be much higher for those having had no Latin as compared with those having had Latin.

Table III, immediately following, represents a comparison of the subjects in Group B on the same basis as Table II and shows the same tendency in the results as to errors. In Group B 13 had had no Latin and 25 had had Latin.

TABLE III
GROUP-----B

Test Number	Immediate Reproduction		Retention		Immediate Reproduction		Retention	
	III-1	III-1	III-1	III-1	II-2	II-2	II-2	II-2
Had Latin	No	Yes	No	Yes	No	Yes	No	Yes
Total group error	62		125		35		137	
		39		54		15		63
Mean Error	4.77	1.56	9.26	2.16	2.69	.60	10.54	2.52
Average Deviation	2.91	1.51	3.39	1.88	2.54	.77	3.35	1.34
Difference of Means	3.21		7.46		2.09		8.02	
Probable Error of Difference	1.42		1.67		1.17		1.58	
Date Tests were given	1-9-34		1-16-34				1-23-34	

In the study of the ninth grade pupils it was found that two of the 16 subjects in Group C were taking first-year Latin at the time of testing and one of the 17 subjects in Group D was taking first-year Latin.

TABLE IV
DISTRIBUTION OF ERRORS OF 53 NINTH GRADE PUPILS

Test Number	Immediate Reproduction		Retention		Immediate Reproduction		Retention	
	II-3	III-3	II-3	III-3	III-4	II-4	III-4	II-4
Group	C	D	C	D	C	D	C	D
Total group error	109		150		121		197	
		149		165		72		172
Mean Error	6.81	8.76	9.38	9.71	7.56	4.24	12.31	10.12
Average Deviation	4.29	4.13	4.03	3.13	3.51	3.42	4.02	4.46
Difference of Means	1.95		.33		3.32		2.19	
Probable Error of Difference	2.49		2.15		2.45		2.52	
Date Tests were given	4-5-34		4-12-34				4-19-34	

Table IV like Table I includes all the subjects tested at the high school regardless of amount of Latin. It will be noticed that vocabulary lists 3 and 4 were used for the high school group whereas lists 1 and 2 were used for the college students, although the writer does not recognize any difference in difficulty of any of the vocabulary lists used.

The mean error shows in Table IV, also, that the error per person is higher for the groups learning by method III than by method II.

TABLE V
COMPARISON OF ERRORS OF GROUP C AND GROUP D,
NONE HAVING HAD OR TAKING LATIN

Test Number	Immediate Reproduction		Retention		Immediate Reproduction		Retention	
	II-3	III-3	II-3	III-3	III-4	II-4	III-4	II-4
Group	C	D	C	D	C	D	C	D
Total group error	104		144		117		193	
		149		164		72		172
Mean Error	7.43	9.31	10.29	10.25	8.35	4.5	13.79	10.75
Average Deviation	4.29	3.81	3.32	2.81	3.2	3.44	2.93	4.03
Difference of Means	1.88		.04		3.85		3.04	
Probable Error of Difference	2.47		1.88		2.02		2.13	
Date Tests were given	4-5-34		4-12-34				4-19-34	

Table V differs from Table IV in that the three pupils taking Latin and only those without Latin in the two groups are compared on the basis of learning by the two methods. Group C is made up of 14 subjects without Latin and Group D - 16 subjects.

The results here, too, show that the average error per person is higher for those learning by the derivative, method III, as compared to those learning by method II.

The following table is a compilation of all the subjects studied comparing the subjects who had had no Latin (53 in number) with those who had had Latin (48 in number).

TABLE VI
A COMPARISON OF ALL SUBJECTS HAVING HAD NO LATIN
WITH THOSE HAVING HAD LATIN

	Immediate Reproduction		Retention		Immediate Reproduction		Retention	
	II	II	II	II	III	III	III	III
Had Latin ?	No	Yes	No	Yes	No	Yes	No	Yes
Total group error	244		530		380		578	
		72		109		74		144
Mean Error	4.60	1.5	10	2.27	7.17	1.54	10.91	3
Average Deviation	3.5	1.21	3.7	1.59	3.51	1.48	3.53	2.25
Difference of Means	3.1		7.73		5.63		7.91	
Probable Error of Difference	1.16		1.26		1.20		1.32	

Table VI shows the group having had no Latin making a total group error of 244 or a mean error of 4.60 in testing for immediate reproduction in learning by method II as compared with

a total group error of 72 or a mean error of 1.5 for those having had Latin testing by the same method. In retention the total group error for those having had no Latin as compared to those having had Latin are 530 to 109 and the mean error 10 to 2.27. By method III it is seen that the same relationships are shown - total group error for those without Latin being 380 or a mean error of 7.17 as compared with a total group error of 74 or a mean error of 1.54 for those having had Latin. In retention by method III the total group error is 578 or a mean error of 10.91 for those having no Latin as compared with a total group error of 144 or a mean error of 3 for those having had Latin. Comparing the results of the same groups learning by both methods show that the total group error and the mean error is higher in every case for the derivative method of learning than for method II.

Figure 1 is a graphic comparison of the two methods of learning of total group error in immediate reproduction and is based on the individual results which make up Table VI.

Figure 2 is a graphic comparison of the two methods of learning of total group error in retention and is based on individual results which make up Table VI.

FIGURE 1

ERRORS IN IMMEDIATE REPRODUCTION

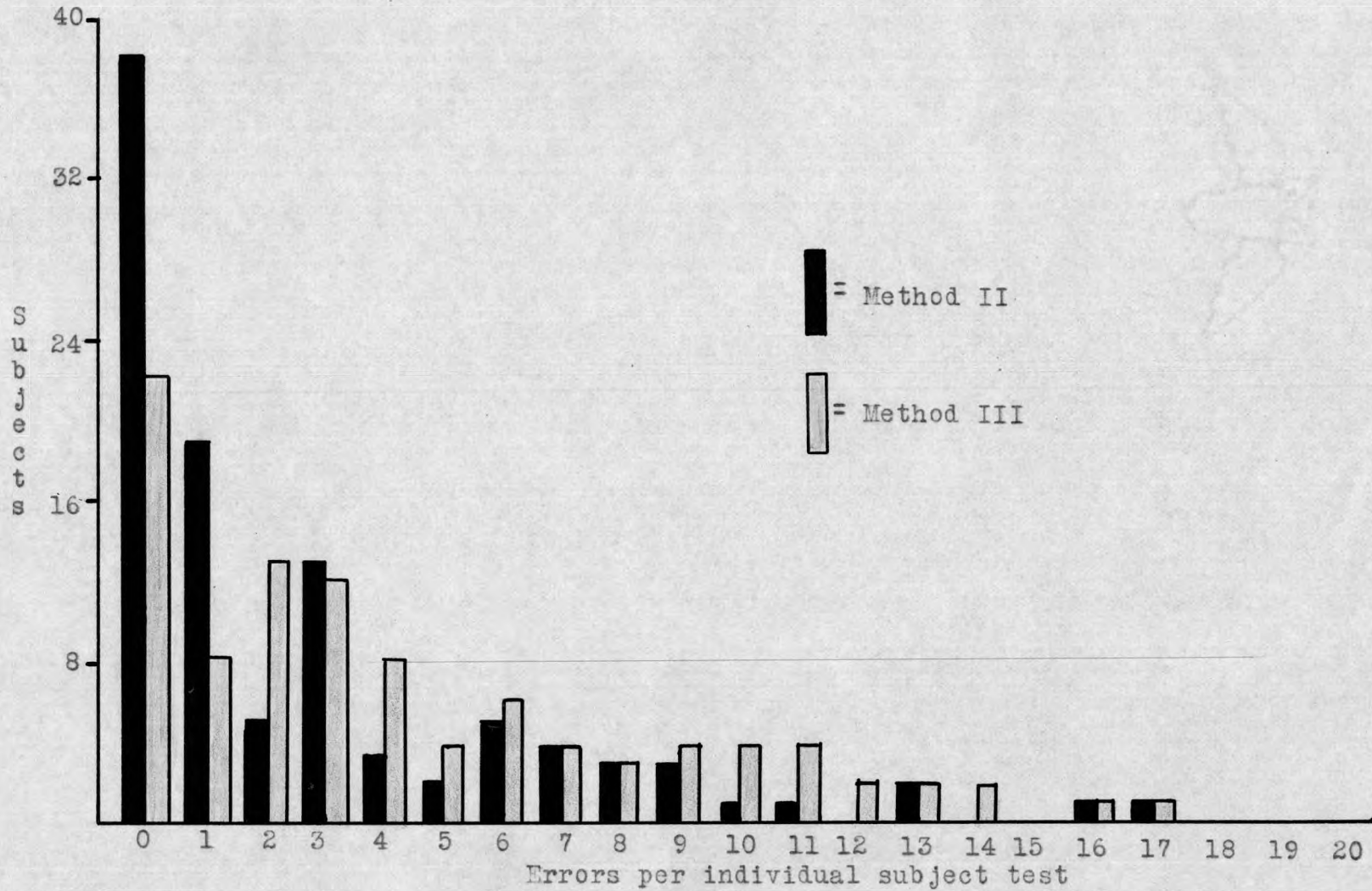
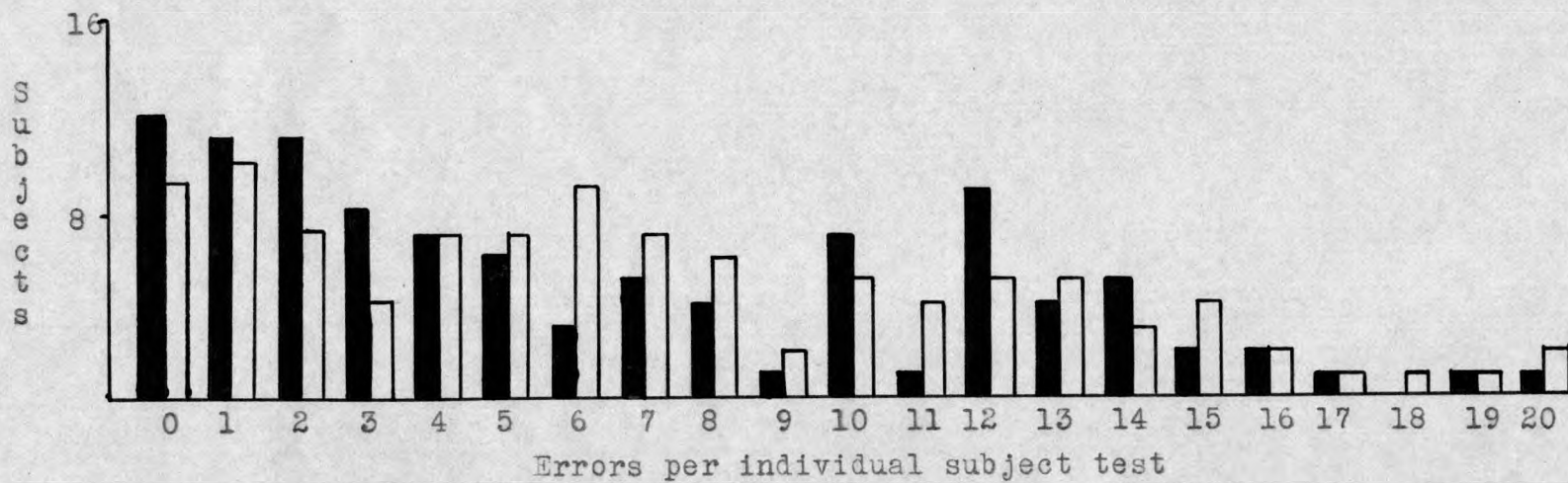


FIGURE 2
ERRORS IN RETENTION

■ = Method II
□ = Method III



INTERPRETATION & CONCLUSION

Interpretation of Data

A study of all the tables regarding the probable error of the difference indicates that the results are not statistically reliable in any one case. However, error and trend point in every case in the same direction suggesting that the results may be reliable in their indications and results of the tests.

The experiment measures the amount that can be learned and retained within a given time limit.

The figures 1 and 2 merely supplement pictorially Table VI except that they show how the number of errors per test ranged according to the two methods of learning. We note that for both immediate reproduction and retention the number of errors per individual tests are generally lower for those learning by method II than for those learning by method III. There were 38 perfect scores by method II as compared to 22 for those learning by method III in immediate reproduction and 19 with one error as compared to 8 with one error in method III. In retention there is the same trend but without such a large range in the difference. These figures show total results irrespective of whether or not the subjects have had Latin.

The law of contiguity is very important in the analysis of the results shown. To one studying vocabulary there is always the relationship of the unknown word and the English meaning and

these are always associated together. This, then, may be one of the main reasons why the results in method II are more favorable in this study than method III.

Assimilation enters into the problem in that the material and arrangement are constant and the effect of learning of the Latin word, then the English derivative, and lastly the English meaning would tend to make the derivative the instigator in recalling the Latin word related to it and the English meaning following it. This law probably did not operate as might ordinarily be expected or not to such a great extent in the associative possibilities of method III.

Since this study involves one short massed practice and no further need of studying the words except by those very few studying Latin at the present time the duration of time would enter into the study but it is held constant in every case.

Context would effect the problem in much the same manner as assimilation except that context would be influenced by the meaning and interweaving of the terms more where assimilation would be effected by similarity.

The law of acquaintance was very noticeable in the case of those having had Latin or taking Latin at the time of testing. In many cases correct meanings, different from the ones used in the tests, were used by the people acquainted with Latin from previous study.

The range of individual differences was large for either those who had had Latin or those who had had no Latin. These differences had a larger spread in learning by method III than

by method II as can be seen from the study of the graphs.

If we compare this study with the studies of McGeoch and Reed where associative aids or words having great association possibilities were used, we would infer that our use of the derivative as an aid in learning does not show the same results, in fact they are just the opposite on a basis of comparing our two methods of study. It would be difficult to compare the results of method II with the results of these two studies as the purpose of our experiment is so different. There probably are many possibilities for association as mentioned in the discussion of the laws of association in this chapter and maybe in reality this experiment bears out these other findings.

Summary

In the present study two methods of studying Latin vocabulary material have been compared. The one method (method II) consisted of learning the Latin word and its English meaning and the other method (method III) consisted of learning the Latin word and the English meaning with the English derivative placed in between as an associative link. Our results seem to justify the following conclusions:

1. That learning from the Latin word directly to the English meaning is better for both immediate reproduction as well as recall within a week's time than using an English derivative between the Latin word and the English meaning.

2. That there were 38 perfect scores by method II as compared to 22 for those learning by method III in immediate reproduction and 19 with one error as compared to 8 with one error by method III. In retention there is the same trend but without such a large range in the difference.

3. This indicates that contiguity is most important in learning vocabulary in that the unknown words are associated directly with the English or known meanings. Using the derivative as a cue, key, or help in learning would seem to be a waste of time so far as amount learned is concerned and the

amount of retention is not, during the period of a week at least, helped.

4. The study also tends to show that learning to recognize new words and their meanings does not take a very long period of learning for either immediate reproduction or retention for one week. The average number of words of ordinary Latin vocabulary material recalled immediately by method II after a study period of 4 minutes duration was 19.33 for college students who had studied Latin previously and 17.04 for those who had never studied Latin and 18.44 for those who had studied Latin and 15.04 for those who had never had Latin studying by method III. The same figures for the ninth grade students are 18.33 for those having had Latin and 14.13 for those who had not had any Latin using method II and by method III the figures are 18.67 for those having had or having Latin and 11.13 for those who had had no Latin. Retention after one week gave 17.71 to 10.69 by method II and 16.91 to 10.37 by method III for the college students. Retention after one week gave 18 to 9.47 by method II and 18.33 to 8.1 by method III for the ninth grade students.

5- The time limit allotted to study the vocabulary list by these two methods may operate to the advantage of method II. Those learning by method III have one-half again more material to study in the same amount of time given to those learning by method II. However, in a few cases the percentage of the amount recalled after one week by method III is higher than the

amount reproduced immediately as compared with those tested by method II, in other cases there is very little difference in percentage of the amount recalled by either method, and in most cases the percentage of the amount recalled by method III is lower than the amount recalled by method II. This is a very poor check but it would seem to suggest that recall is not effected, in the main, by the use of the derivative as an associative link to as great an extent as might be expected.

Limitations of the Study

As mentioned before the experiment may not be fair in its time limit. The choice of Latin words might bring better results if the genitive singular of the nouns and all the principle parts of the verbs were used. (This particular experiment, it must be remembered, was not for the purpose of merely learning Latin vocabulary but how to learn Latin vocabulary with association as the basis of learning.)

It was not possible to study retention for a period of more than a week in the case of the college students as the end of the semester broke up the general psychology class.

Various time limits for study were tried out before this testing program was started and on the basis of these trials four minutes was chosen. This time limit, however, possibly could be determined better.

There is the possibility that the variation of the age of the subjects affect the results. The ages ranged from about thirteen to twenty-two years of age.

No check was made to determine whether or not the subjects used any associative aids of their own or to what extent those aids might have been employed to remember the meanings of the Latin words.

Recommendations

It is recommended that a further study of this problem be made, taking up other features and phases not touched upon here and carried over a longer period of time. The age of the subjects and amount of Latin studied could be held constant to insure more reliable data. A possible study might be a comparison of either or both methods of study used in this experiment with a series of nonsense material or possibly meaningful material.

A further study could be made of the abilities of the students to use their Latin in English when it has been studied by these two methods.

List 11

Method---III

Latin Word	English Derivative	English Meaning
agricola	agriculture	farmer
poeta	poetic	poet
occupare	occupy	to seize
diligentia	diligent	diligence, care
silva	silvan	forest
legatus	legate	lieutenant
praemium	premium	reward
expectare	expect	to look out for
fama	fame	reputation
dominus	dominant	master
pecunia	pecuniary	money
comparare	compare	to make ready
consul	consular	consul
mater	maternal	mother
movere	move	to move
caput	capital	head
pes	pedal	foot
deus	diety	god
pedes	pedestrian	foot soldier
periculum	peril	danger

List 2

Method-----III

Latin Word	English Derivative	English Meaning
natura	natural	nature
laudare	laud	to praise
vocare	vocation	to call
patria	patriot	country
equus	equine	horse
insula	insular	island
convocare	convocation	to call together
factum	fact	deed
signum	sign	signal
numerus	numerous	number
appellare	appellation	to name
arbor	arbor	tree
legio	legion	legion
monēre	admonish	to warn
vidēre	visible	to see
latitudo	latitude	width
consilium	counsel	plan
oculus	oculist	eye
multitudo	multitude	a great number
reducere	reduce	to lead back

List 3

Method-----III

Latin Word	English Derivative	English Meaning
aqua	aquatic	water
provincia	provincial	province
portare	portable	to carry
fortuna	fortune	chance
via	viaduct	way
terra	territory	earth
regnum	reign	kingdom
superare	insuperable	to surpass
fuga	fugitive	flight
gladius	gladiator	sword
annus	annual	year
confirmare	confirmation	to strengthen
imperator	imperative	commander-in-chief
miles	militia	soldier
tenere	tenacious	to hold
rex	regal	king
locus	local	place
socius	social	ally
populus	population	people
celeritas	celerity	swiftness

List 4

Method-----III

Latin Word	English Derivative	English Meaning
femina	feminine	woman
vita	vital	life
pugnare	pugnacious	to fight
lingua	linguist	tongue
ager	agrarian	field
vir	virile	man
copia	copious	plenty
vulnerare	vulnerable	to wound
luna	lunatic	moon
liber	library	book
arma	armament	arms
liberare	liberation	to set free
victor	victory	victor
pater	paternal	father
retinēre	retain	to restrain
corpus	corpse	body
virtus	virtue	manliness
navigare	navigate	to sail
altitudo	altitude	height
porta	portal	gate

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