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The Influence of The Number of Readings On The Rate of Forgetting.

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THE INFLUENCE OF THE NUMBER OF READINGS
ON THE RATE OF FORGETTING

being

A Thesis presented to the Graduate Faculty
in partial fulfillment of the requirements
for the degree of Master of Science

by

Yuba L. Hunsley, B. S. in Educ.

Fort Hays Kansas State College

1933

Approved by:

H. B. Reed,
Professor of Psychology

Chairman of Graduate Council.

Date: Sept. 29, 1933,



Gift

Acknowledgements.

Guba L. Hunsley

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6/26/34

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I. INTRODUCTION

A. Problem

1. Scope.

The object of the investigation was to find the relation of retention to the number of readings of factual prose articles and to the study of other factors which may influence retention. Students of the freshman and sophomore college classes were used as subjects. The experimental material consisted of reading material of highly factual articles and objective tests. Memory was measured at the end of two weeks after one, two, three, four and five readings. The other factors investigated in relation to memory ability were the effect of rereading upon retention, sex differences, and the correlation of retention of factual prose with achievement and intelligence. The emphasis of this investigation is upon a practical aspect of memory rather than on theoretically fundamental questions. We cannot remember and forget the information secured by reading and study in the same way we remember and forget nonsense syllables learned by rote to the degree of one correct repetition. The emphasis of the study is, therefore, on the number of thought units which are logically related to a subject's general knowledge rather than on rote memory for disconnected material. The method used is an indirect approach to the problem to be solved, in which group technique and statistical analysis take the place of fine control of conditions.

Reading is the chief method of study in college and the wide spread habit prevails of reading assignments a single time. Charters,

in her study of how college women study, writes, "A surprisingly large number of students read an assignment a single time. Forty-one per cent of 258 college students habitually read their lessons only once."¹

These problems arise: Is it profitable to read the assignment more than once? How many times is it profitable to read an assignment? Where is the place beyond which repetition ceases to be of value?

2. Summary.

The chief problems which this investigation attempts to solve may be summarized in form of the following questions:

- a. What effect does increased repetition have upon retention?
- b. Does rereading effect retention?
- c. Does testing increase retention?
- d. What relation does sex have to factual memory?
- e. How does factual memory correlate with achievement and intelligence?

B. Review of Relevant Literature.

1. Studies of Retention.

It will be interesting at this place to discuss briefly some experimental methods and results of investigations in the field. Experimental studies of memory have been in progress for a number of years. The divergent conclusions reached are due, mainly, to differences in

¹Charters, Jessie. "How 258 Junior College Women Study." Journal of Education Research. Vol. XI, (1915), p. 41-49.

method and conditions of experimentations. The problems of experimental work have been the determination of the relation of memory to age, sex, intelligence, achievement, number of repetitions, form and manner of presenting the material, rapidity of learning and kinds of material. This investigation is interested only in the relation of memory to number of repetitions, sex, intelligence and achievement.

One of the first and most important significant investigations was made by Ebbinghaus in 1885. Ebbinghaus learned a series of nonsense syllables until he could repeat it once correctly and then, after a definite interval of time, relearned the same series, measuring how long it took him to relearn it. Then he learned another similar series and, after a different time interval, relearned that series. And so on, for many different time intervals. The conclusions drawn are: "The effect of increasing the number of repetitions of a series of syllables....grew at first approximately in proportion to their number of repetitions, then that effect decreased gradually, and finally became very slight when the series were so deeply impressed that they could be repeated after 24 hours almost spontaneously."².

Similar conclusions were the result of experiments by Radossawljewitsch³ in 1903. He used sixteen adults for subjects and required two successive perfect repetitions to be made instead of one, as in Ebbinghaus' experiment. When the material is slightly overlearned the

².Ebbinghaus, H. Memory, p. 61.

³.Thorndike, Edward L. Psychology of Learning, p. 304-309.

initial forgetting is much less abrupt. Radossawljewitsch also compared the retention for meaningful material (poetry) with that for nonsense syllables and found forgetting of poetry to continue more slowly than for meaningless words. It has been shown that it is due to the fact that a subject already has associations for the words and thoughts of poems and other meaningful material, while nonsense syllables are entirely new to him.

Bean,⁴ in a similar experiment, found that the loss was rapid at first and then slow. The results are similar to the results of Ebbinghaus and Radossawljewitsch.

McGeoch and Whitely⁵ in an experiment studying the retention of poetry found that retention falls abruptly from immediate recall, to recall after 30 to 120 days. It thus approximates the Ebbinghaus curve for nonsense syllables. The degree of retention is, however, much greater for poetry than for nonsense syllables.

Cuff⁶ in an experiment using consonants, digits and nonsense syllables on a study of the relation of overlearning to repetition concludes that this is not an approximate proportionality between the number of readings of a series and the savings of work made possible thereby and that the percentage saved may decrease as the repetitions increase after a series is learned. Subjects scoring high on one test, often score low on another. The bright pupils profit more from additional

⁴op.cit. p. 307-308.

⁵Whitely, P. L. and McGeoch, J. A. The curve of retention for poetry. Journal of Educational Psychology. Vol. XIX, (1928), p. 471-479.

⁶Cuff, N. B. The relation of overlearning to retention. Psychological Abstracts. No. 91, Vol. III, p. 13.

readings after a series is learned than do the duller ones.

In learning digits, abstract and concrete nouns and a descriptive paragraph, it was found by Trow⁷. that recall of material was more effectual in producing retention than was representation without recall according to Pyle.⁸ "The greater the number of attentive repetitions the better the retention." All the repetitions are not of equal value for retention---the first few repetitions and particularly the first one, for most people, prove of more value than succeeding repetitions. The degree of attention is probably the most important factor; if a high degree of attention can be maintained then the repetitions will have a higher value for retention, at least till fatigue begins to set in.

Smith⁹. with 8 subjects in auditory presentations of numbers, found a noticeable increase in retention with the number of repetitions as is shown in Table I.

Table I. Retention in Relation to Repetition. (Smith.)

| | | | | | |
|--------------------|-----|-----|-----|-----|-----|
| No. of repetitions | 1 | 3 | 6 | 9 | 12 |
| Retention score | 2.2 | 2.5 | 2.8 | 3.4 | 3.9 |

Pohlmann¹⁰. presented 10 numbers and 10 words to 120 boys,

⁷.Trow, W. C. Recall vs. repetition in the learning of rote and meaningful material. American Journal of Psychology. Vol. 40, p.112-16.

⁸.Pyle, Wm. Henry. The Outline of Educational Psychology, p. 190-192.

⁹.Smith, W. G. Place of Repetition in Memory. Psychological Review, Vol. III, (1896), p. 21-31.

¹⁰.Pohlmann, A. Beitrage zur Lehre vom Gedächtnis.

ranging in age from 9 to 20 years, using 1, 2, and 3 repetitions. There is an increase in the percentage of retention in relation to number of repetitions for numbers but the percentage does not increase with more than two repetitions in the presentation of words.

Table II. Effect of Increase of Repetitions. (Pohlmann.)

| Repetitions | 1 | 2 | 3 |
|-----------------------------------|----|----|----|
| Per cent of retention for numbers | 41 | 55 | 59 |
| Per cent of retention for words | 61 | 77 | 77 |

Two similar experiments were made by Parker and Nelson^{11.} of the effect of number of repetitions^{of} spelling words upon accuracy. Each word was presented visually and audibly. The results are given in Table III. It will be noticed that the increase in accuracy for Parker's group stops at the fourth repetition, but in Nelson's group the limit has apparently not been reached in the fifth repetition. This experiment suggests that there is probably a limit beyond which more repetitions are not profitable.

Table III. Accuracy in Spelling in Relation to Number of Repetitions.

| Number of repetitions | Percentage of Nelson's class | Percentage of Parker's class |
|-----------------------|------------------------------|------------------------------|
| 1 | 63.5 | 92 |
| 2 | 74.5 | 97 |
| 3 | 64 | 96 |
| 4 | 83 | 98.6 |
| 5 | 93 | 98.6 |
| 6 | | 98.6 |
| 7 | | 98.6 |
| 8 | | 98.6 |

^{11.}Reed, H. B. Psychology of Elementary School Subjects, p. 231-232.

Three independent investigations of the problem of the optimal time for introducing the reading-recitation process in learning were made by Skaggs and Grossman, Louise Krueger, and William Krueger.^{12.} They agree in that the evidence of their experiments indicates that some reading-recitation or attempted recall is more efficient than mere reading, and that the attention factor functions best during the reading-recitation process. This is especially true for adults.

2. Studies of individual differences in memory.

Individual differences in memory ability are due to a variety of causes. The influence of intelligence and of general achievement on memory ability has been studied many times.

Pyle^{13.} finds a correlation of .76 between logical memory tests and school achievement. The relation is found to be positive, those having good retention standing well in their studies and those having poor retention standing low in their studies. A very close correlation could not be expected because there are many factors that determine class standing, memory is only one of these. He says, "All psychologists who have seriously investigated the retention of memory to intelligence have found the facts as above stated."^{14.} i.e., that there is a marked positive correlation between memory and intelligence.

There is a wide range of individual differences in many

^{12.} Skaggs, E. B., Grossman, S., Krueger, L., and Krueger, W. Further Studies in the Reading-Recitation Process in Learning. Archives of Psychology, No. 114, (1930), p. 28. (Psychological Abstract. Vol. V, p. 187. Abstract No. 1812.)

^{13.} Pyle, W. H. Psychology of Learning, p. 173-178.

^{14.} Pyle, W. H. loc. cit. p. 174.

aspects of memory. Pyle¹⁵. determined the logical memory of 100 high school students and found the best memory to be four times as good as the poorest. The range of scores on the Marble Statue tests given to 1032 university students was from 6 to 55 of total number of ideas contained.

Most experimental studies of memory that have taken sex into consideration have found that the memory of girls was better than that of boys. It seems as if the results depend upon the nature of the experimental material used, boys excelling in rote memory and girls in logical memory. In testing public school children, Pyle found that girls excel in logical memory at every age from 9 to 15 with the exception of age 11 where both boys and girls made practically the same score.

Atkins¹⁶. gave students in one Pasadena junior high school various tests covering the subject of general science. The true-false type of tests were given at two weeks' intervals. The boys showed a superiority over the girls---57 per cent exceeding the median of the girls. The girls showed a slight superiority in intelligence on a Terman group test. This strengthens the superiority of boys in general science. In a test measuring retention in college zoology conducted by Cederstrom¹⁷. women showed better retention than men.

15. Pyle, W. H. op. cit. p. 173.

16. Atkins, C. The Effect of Sex Differences in Study of General Science. Journal of Educational Research, Vol. XXIV, (1931), p. 61-66.

17. Cederstrom, J. A. Retention of Information Gained in College Zoology. Journal of Genetic Psychology, Vol. XXXVIII, (1930), p. 516-520. (Psychological Abstract, Vol. V, p. 311, Abstract No. 2916.)

In logical memory for 151 university men and women, Pyle,^{18.} using The Marble Statue as material, finds that women have a superiority of 24.1 per cent over university men, and that girls have a superiority of 8.7 per cent over boys. The comparison between boys and girls is based on test scores of 2579 boys and girls. Pyle states that "in extensive experimental work in memory the superiority of girls over boys is so general that we are warranted in concluding that they have a better retentive capacity."

Nifeneckek^{20.} in giving a spelling test, of which the words were from the Ayres Scale, to 5260 pupils, found that girls are uniformly superior to boys by an average of 4.5 per cent.

C. Relation of Investigation to Investigation by Dietze.

This investigation is indebted to an experiment on factual memory, "Factual memory of secondary school pupils for a short article which they read a single time," by Alfred Dietze for reading selections and retention tests and for numerous other helps and suggestions.

The object of the investigation by Dietze was to measure factual memory for a short article which had been read only once and to study the relation of this ability to certain other factors which in-

18. Pyle, W. H. Psychology of Learning, p. 150-151.

19. ibid. p. 150.

20. Reed, H. B. Psychology of Elementary School Subjects, p. 225-226.

fluenced it. Memory was measured immediately after reading an article and after one, fourteen, thirty, and one hundred days. The other factors investigated in their relation to memory ability include mental age, silent reading ability, knowledge of English vocabulary, and chronological age and sex. The reading material and objective tests used were carefully constructed by Dietze through proper experimentation.²¹ The difficulty of the reading selection was determined by three methods, judgment of subject, vocabulary load, and average of control group.

The question arose as to what was the influence of the number of readings on the rate of forgetting. The purpose of our investigation, as has been stated, was to measure factual memory for prose articles after one, two, three, four, and five readings. The material used in this investigation was the same as that used in the investigation by Dietze. The material used in our investigation, taken from the experiment by Dietze, was used as it appears in the appendix.

All scores which were made on Radium, German, and Arkwright after one reading on a two weeks' retention test, were used as a basis for comparison between retention, achievement, and intelligence. Because of the different degrees of difficulty of the articles, Radium and German scores were converted into scores equivalent to Arkwright scores. The regression equation²² which was obtained from the correlation between the different pairs of material as worked out by Dietze was used in our experiment for this purpose.

²¹.Dietze, A. G. Factual Memory of Secondary School Pupils for a Short Article Which They Read a Single Time, p. 48-75.

²².Garrett, Henry E. Statistics in Psychology and Education, p. 180-181.

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II. METHOD

A. Subjects.

This investigation was made in the spring semester of 1933.

The subjects in this experiment were taken from classes in Psychology in Fort Hays Kansas State College. The number of students used was 187, nearly eighty-five per cent of subjects being freshmen and sophomores and the rest being juniors and seniors. There were 92 men and 95 women used.

The method of experimentation used was a combination of equivalent group method and rotation method.^{1.}

The groups were equated so that any difference in results would not be due to ability of subjects. There were six comparable groups equated^{2.} on the basis of total achievement scores taken from the scores of the freshmen entrance examinations of 1931 and 1932. There were four tests used for the purpose of entrance and achievement classification, and for the purpose of finding intelligence scores. Each student's name corresponds to a number on the test. Students who entered college in the fall of 1932 were given a common number. Those who entered in the fall of 1931 were given a number with a check (*) before it. Juniors, seniors, and those who did not enter as freshmen in either fall semester were given a number which was underscored (___). The scores of this group were obtained from college class records.

^{1.} McCall, W. A. How to Experiment in Education, p. 18-36.

^{2.} ibid, p. 42-48.

The number in each group, average and standard deviation, are given in Table IV.

Table IV. Number, average, and standard deviation for equated group.

| Group | Number | Average | Standard Deviation |
|-------|--------|---------|--------------------|
| 1 | 33 | 53.2 | 8.2 |
| 2 | 37 | 50.9 | 10.2 |
| 3 | 33 | 53.6 | 9.0 |
| 4 | 27 | 53.7 | 9.6 |
| 5 | 35 | 51.4 | 6.1 |
| 6 | 18 | 55.8 | 9.3 |

B. Materials.

1. Reading selections.

The reading material used in this experiment was three short, highly factual articles, the same as used in an experiment on factual memory of secondary school pupils by Dietze.³ When the articles are arranged according to difficulty on the basis of vocabulary load and the judgments of the subjects, and averages of the subjects, "Radium the Magic Metal" is ranked as easiest and "Sir Richard Arkwright" as hardest.

The first article, "Radium: The Magic Metal"⁴ is an interesting account of the properties, uses and discovery of radium. Its length is 1265 words. The second, "The Early Germans"⁵ describes the

³.Dietze, A. G. Factual Memory of Secondary School Pupils for a Short Article which They Read a Single Time, p. 55-157.

⁴.Ibid, p. 155.

⁵.Ibid, p. 156.

customs and habits of the early inhabitants of Central Europe. Its length is 1061 words. The third, "Sir Richard Arkwright,"⁶ is a story of the life and work of an inventor. Its length is 1279 words.

2. Retention tests.

Objective tests used for the purpose of measuring factual memory, a test being constructed for each of the articles described in the preceding section, were also the same used by Dietze⁷ in his experiment on factual memory studies.

The exercises of the tests are in the form of statements followed by five words or phrases, one of which completes the meaning. The following are samples of the type used:

- () 1. Radium is (1. red) (2. black) (3. green) (4. blue) (5. white)
- () 2. Richard Arkwright was born in (1. Dublin) (2) Liverpool
(3. London) (4. Preston) (5. Edinburgh).

The subjects are required to underline the correct response and place its proper number in the parentheses in the left margin.

Success on the tests depends to a great extent upon recognition, since the correct answer is presented with four other responses which are false.

C. Procedure.

1. Reading periods.

The tests were given by the instructors in charge of the

⁶.Dietze, A. G. op. cit. p. 157.

⁷.Ibid, p. 159-61.

classes used. An instruction sheet for conducting test periods was given to the instructors so as to make the testing of various classes uniform. All work took place in the regular class period, this investigation taking the place of the regular lesson for the day.

The reading periods were conducted during the regular class sessions by the instructor in charge. The instructors were each given an instruction sheet to follow. Instructions were given to subjects and copies of the reading material were then distributed. The students were allowed to read at their own rate but a time limit of ten minutes for each reading and rereading was set. Each group was required to read the material a different number of times and to read each article once, each article being read by two groups. An immediate retention test was given to three groups, each group covering a different article. The other three groups were given a retention test after two weeks, as was done throughout the rest of the experiment.

The scheme for testing and rotating groups is as shown in Table V. It will be noted that each group was represented in three different experiments, reading a different selection in each experiment. Each article had all the numbers of readings. Groups 2, 4, and 6 took an immediate retention test after the one reading in the first experiment (so as to form a basis for comparison with the results obtained by Dietze in his experiment). All the rest of the experiments were given retention tests at the end of two weeks.

Table V. Testing Program.

| Group | Number of readings | | | | |
|-------|--------------------|-----------|-----------|-----------|-----------|
| | 1 | 2 | 3 | 4 | 5 |
| 1 | Radium | German | | | Arkwright |
| 2 | Radium | | German | Arkwright | |
| 3 | German | Arkwright | | | Radium |
| 4 | German | | Arkwright | Radium | |
| 5 | Arkwright | Radium | | | German |
| 6 | Arkwright | | Radium | German | |

The articles and number of readings were rotated to make sure that any difference in results was not due to the difficulty of material or fatigue of subjects, each article being read the different number of readings.

2. Testing period.

Both the reading and testing conditions were kept as natural as possible. The artificiality of a laboratory situation was thus avoided.

Two weeks after reading the article the subjects were given an objective test covering the material read. There was no time limit set, the students taking as much time as was needed to finish the test.

3. Retesting period.

For purposes of finding the amount of gain in retention by

rereading after testing, each group was given a second retention test, at the end of two days after the first test. Each group was subdivided into two equal groups on the basis of teachers' paired ratings. One subgroup, called Group A for convenience, reread the article immediately after the first retention test. The other sub-group, Group B, did not reread the articles but took a second retention test as did Group A at the end of two days, and the results of both groups were then compared.

4. Scoring.

One point was given for each correct response and the total number of correct responses was taken as the score. This new score was converted for convenience into terms of percentage. No attempt was made to correct for guessing in the tests.

The tests had a high degree of objectivity by (1) providing clear and simple directions for taking the test, so the pupil knows what is to be done; (2) by using a uniform scoring key for all papers; (3) by having all answers either right or wrong.

D. Treatment of Data.

1. Retention.

The raw scores from the retention tests of the various articles were converted into percentages for purposes of comparison of the different numbers of readings.

The scores made by each group on each article after the var-

ious number of readings were averaged, for total group, for the two sub-groups, and for both sexes in each group. The average of all articles for each number of readings was computed and compared to note the increase in score, if any. To find the effect of testing and re-reading, the averages of each of the two sub-groups of all articles for each number of readings were found and the total averages compared to note the change of the score, if any.

2. Individual differences.

(a) Sex differences.

Scores made by each sex in each of the sub-groups of each group were changed to percentage scores and averaged. The averages were then compared to find the differences in retention of the sexes.

(b) Intelligence or achievement differences.

Scores for the subjects in intelligence and achievement were obtained from the freshman entrance examinations given to the subjects at the beginning of their freshman year. Intelligence scores are based on the results of "Psychological Examination for High School Graduates and College Freshmen." The achievement scores are based on a total of scores made on "Entrance and Classification Examination for Teachers" - Greeley, Colorado; "Cross English Test, Form A"; "Sones-Harry High School Achievement Test for Secondary Schools and College Entrance" and "Elementary Section - Entrance and Classification Examination for Teachers Colleges - Form A." - Greeley, Colorado. The scores on all the tests were converted into comparable units in terms

of McCall T score.⁷ In order to compute the correlation between factual memory and intelligence and achievement, the scores on Radium and German were converted into terms of Arkwright scores, because of the different degrees of difficulty of the articles. Through experiment Dietze found Radium to be easiest and Arkwright the most difficult.⁸ The scores were converted into terms of Arkwright scores by using the regression equation worked out by Dietze.⁹ The equation used for converting test scores from Radium into terms equivalent to Arkwright was equal $.80R + 2.4$, and for converting German in a similar fashion was equal to $.67G + 11.0$.

⁷McCall, W. How to Experiment in Education, Chap. V.

⁸Deitze, A. G. Factual Memory of Secondary School Pupils for a Short Article Which They Read a Single Time, p. 50-55.

⁹ibid. p. 74.

III. Results.

A. Factual memory after one, two, three, four, and five readings.

1. Factual memory after one reading.

(a) Immediate retention.

Individual and average scores for immediate retention after one reading on Radium, German and Arkwright are shown in Tables I, II, and III in the appendix. The individual scores on Radium after one reading range from 49 to 94 with an average of 77.10. The range of scores on German is 30 to 88.8 with an average of 70.27. The range of scores on Arkwright is 22.76 to 73.17, the average being 51.04.

(b) Retention after two weeks.

Table VI. Immediate Retention and Retention After Two Weeks in Relation to Number of Readings.

| Article | Immediate | | Number of readings. | | | | | | | | | |
|-----------|-----------|----|---------------------|----|-------|----|-------|----|-------|----|-------|----|
| | Retention | n | 1 | n | 2 | n | 3 | n | 4 | n | 5 | n |
| Radium | 77.10 | 31 | 50.71 | 31 | 67.00 | 16 | 63.97 | 29 | 71.90 | 25 | 60.43 | 30 |
| German | 70.27 | 22 | 47.09 | 30 | 51.21 | 32 | 60.43 | 28 | 57.96 | 31 | 70.36 | 18 |
| Arkwright | 51.04 | 34 | 45.29 | 16 | 45.87 | 30 | 56.05 | 22 | 54.39 | 28 | | |
| Average | 66.14 | 87 | 47.69 | 77 | 54.69 | 78 | 60.15 | 79 | 61.42 | 84 | 65.4 | 48 |

Individual and average scores of the first retention test after one reading on Radium, German and Arkwright are shown in Tables IV, V, and VI in the appendix. The average scores for the groups are 50.71 for Radium, 47.09 for German, and 45.29 for Arkwright, making an average of 47.69 for the first retention test after one reading.

The averages are given in the second column of Table V.

2. Factual memory after two readings.

The range of individual scores and average retention scores after two readings of Radium, German, and Arkwright are shown in Tables VII, VIII, and IX in the appendix. The average scores for the groups are 67.00 for Radium, 51.21 for German and 45.87 for Arkwright. The average for all groups reading a selection two times is 54.69. The average scores for two readings are shown in the third column of Table VII.

3. Factual memory after three readings.

The range of individual retention scores and the average retention scores of Radium, German, and Arkwright after three readings are shown in Tables X, XI, and XII in the appendix.

The average scores for each article are 63.97 for Radium, 60.43 for German and 56.05 for Arkwright. The average score for all groups reading on articles read three times is 60.15. The average scores for three readings are shown in the fourth column of Table VI.

4. Factual memory after four readings.

The range of individual retention scores and the average retention scores of the three selections after four readings are shown in Tables XIII, XIV, and XV in appendix.

The average retention scores for each article after four readings are 71.90 for Radium, 57.96 for German and 54.39 for Arkwright.

The averages of the retention scores on articles after four readings is 61.42. The average scores are shown in column five of Table VI.

5. Factual memory after five readings.

The range of individual retention scores and the average retention scores of the selections after five readings are shown in Tables XVI and XVII in the appendix. The average retention scores for each article after five readings are Radium 60.43 and German 70.36. The score on Arkwright after five readings was not obtained. The average score for articles read five times is 65.4. The average scores are shown in column six, Table VI.

6. Summary.

A summary of the results from the first retention test on each article after the various numbers of readings is given in Table VI.

Curves of retention are shown in Figure I for retention of each article and average of all articles.

The curve of retention of average of all articles indicates that there is an increase in per cent retained in proportion to the increase in number of repetitions.

B. Factual memory after testing and rereading.

1. Factual memory after testing.

Group B of each equated group was given a second retention test two days after the first retention test. The results are shown in Table VI. The average increase in score was 5.47 over the first test.

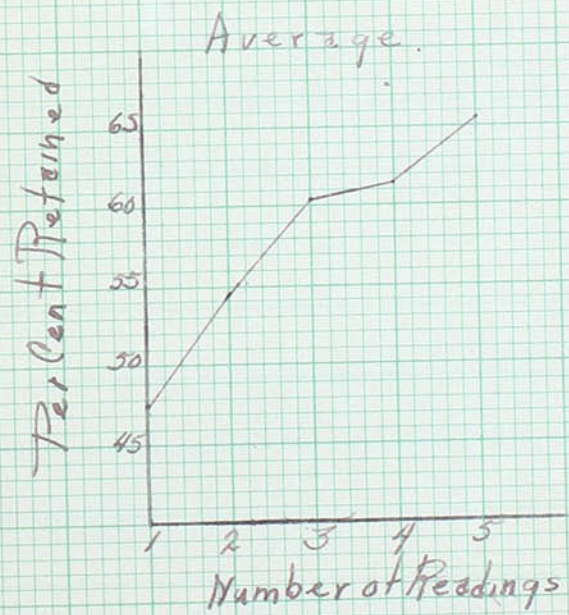
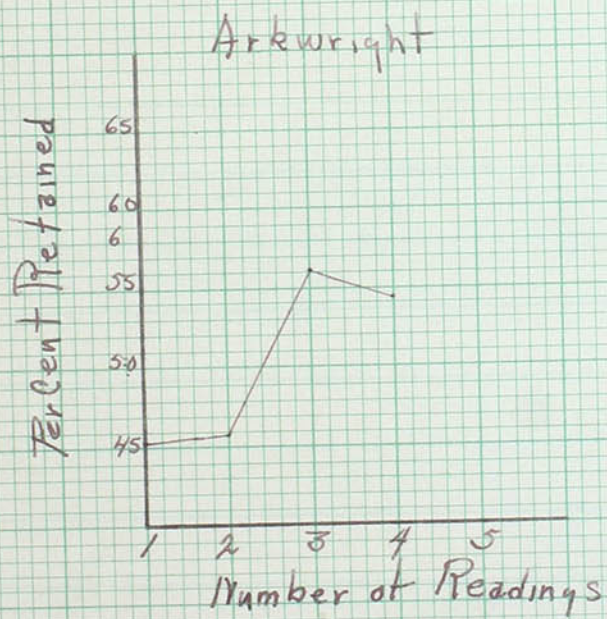


Figure I. Curves of First Retention Scores After Each Reading.

The increase in scores ranged from 2.37 points to 8.07, Table VIII.

Group A of each equated group reread the selection immediately after the first retention test and was given a second retention test two days later. The scores are shown in Table VI. The increase in score of the second test over the first was from 16.95 to 26.5, Table VIII. The average increase in score was 20.85 over the first test.

Figure II shows the curve of retention of Group A and B for second retention test, and indicates the differences in scores made by rereading after testing.

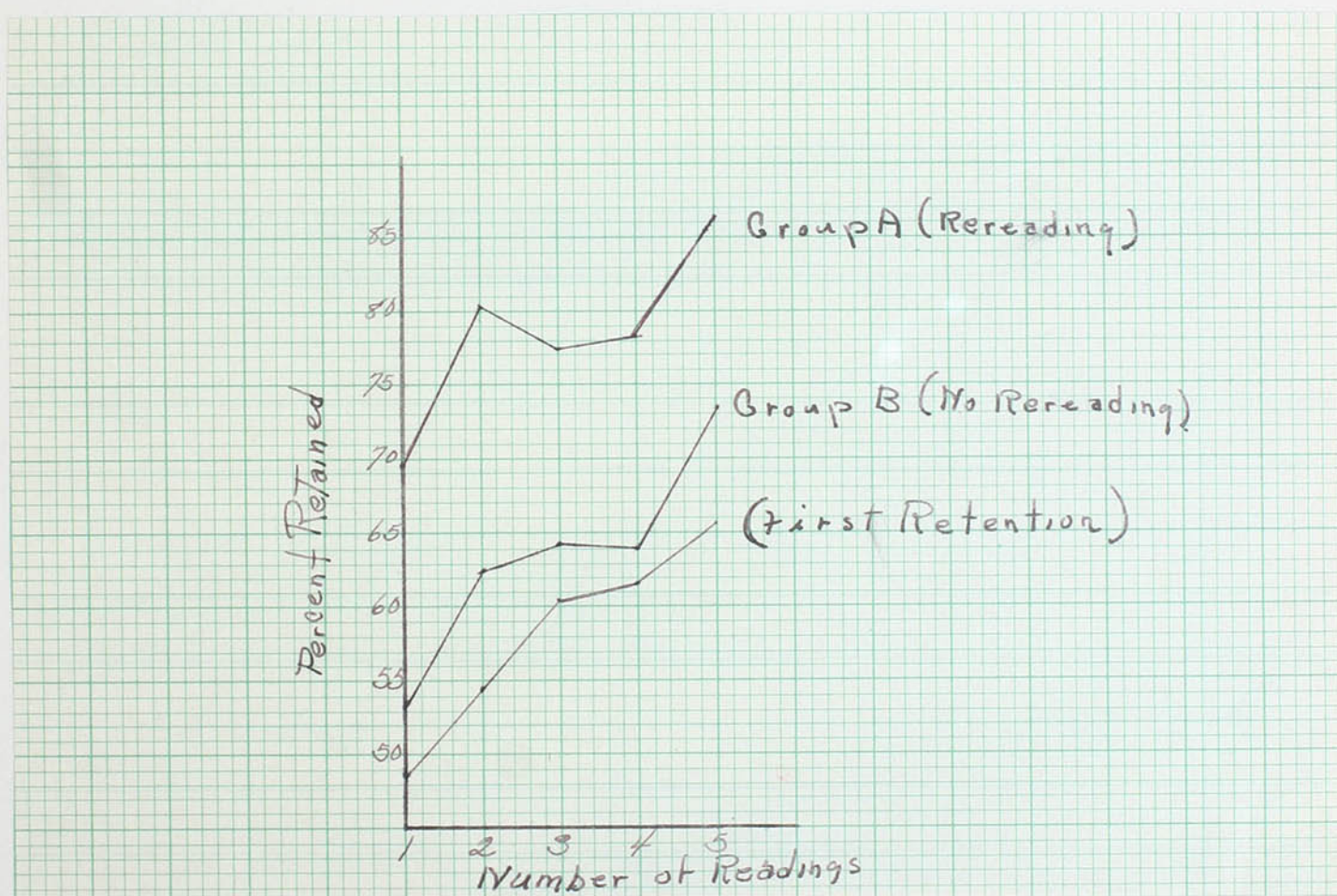


Figure II. Curves of averages on second retention test for each reading.

Table VII. Retention in relation to number of original readings two days after one rereading which followed first retention test.

| | Number of Readings | | | | | | | | | |
|------|--------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| | 1-A | 1-B | 2-A | 2-B | 3-A | 3-B | 4-A | 4-B | 5-A | 5-B |
| Rad. | 71.85 | 53.69 | 86.63 | 70.83 | 81.94 | 68.69 | 86.62 | 75.25 | - | - |
| Ger. | 68.80 | 51.20 | 73.74 | 53.71 | 77.06 | 64.07 | 77.40 | 63.54 | 86.10 | 73.47 |
| Ark. | 68.40 | 54.14 | - | - | 73.48 | 59.76 | 71.09 | 52.60 | - | - |
| Ave. | 69.68 | 53.01 | 80.19 | 62.27 | 77.49 | 64.17 | 78.37 | 63.79 | 86.10 | 73.47 |

Table VIII. Comparison of average scores in first and second retention.

| | Number of Readings | | | | |
|------------------|--------------------|-------|-------|-------|-------|
| | 1 | 2 | 3 | 4 | 5 |
| First Retention | 47.69 | 54.69 | 60.15 | 61.42 | 65.40 |
| Second Retention | | | | | |
| Group A | 69.68 | 80.19 | 77.49 | 78.37 | 86.10 |
| Group B | 53.01 | 62.27 | 64.17 | 63.79 | 73.47 |

Table IX. Sex Differences in First Retention Test.

| | Number of Readings | | | | |
|---|--------------------|-------|-------|-------|-------|
| | 1 | 2 | 3 | 4 | 5 |
| Radium | | | | | |
| Men | 49.69 | 66.13 | 64.36 | 72.83 | 67.67 |
| Women | 51.80 | 67.88 | 63.42 | 71.60 | 63.14 |
| German | | | | | |
| Men | 43.04 | 50.03 | 59.88 | 60.72 | 68.06 |
| Women | 47.90 | 52.40 | 62.40 | 53.92 | 73.60 |
| Arkwright | | | | | |
| Men | 44.58 | 47.29 | 50.80 | 51.68 | -- |
| Women | 45.77 | 43.73 | 57.22 | 61.29 | -- |
| Average | | | | | |
| Men | 45.77 | 54.48 | 58.35 | 61.74 | 67.87 |
| Women | 48.49 | 54.67 | 61.01 | 65.60 | 68.37 |
| Number | | | | | |
| Men | 26 | 30 | 43 | 44 | 16 |
| Women | 49 | 48 | 36 | 40 | 32 |
| Diff. | 2.72 | .19 | 2.66 | 3.86 | .50 |
| S.D. Diff. | 2.54 | 3.24 | 2.71 | 2.84 | 3.94 |
| <u>Diff.</u> | | | | | |
| S.D. Diff. | 1.07 | .06 | .98 | 1.39 | .13 |
| Chances in 100 that difference is greater than zero. | 85 | 52 | 83 | 92 | 56 |

C. Sex Differences.

The scores of each sex for each number of readings of the article were averaged and the differences^{10.} between averages were found.

The standard deviations of the differences between the sexes in each number of readings of the articles were calculated to find the reliability of the differences. This is shown in Tables IX, X, and XI. The chances in 100 that the difference is greater than zero^{11.} shows that there are 99.7 chances that women will make a better score than men on immediate retention, but that this difference tends to disappear on the two weeks retention test.

^{10.} Garrett, Henry E. Statistics in Psychology and Education. p. 128-133

^{11.} ibid. Table XIV, p. 134.

Table X. Sex Differences in Sub-groups on First Retention Test.

| Rad Immed. | | Number of Readings | | | | | | | | | | |
|--|-------|--------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|----|
| Retent. | | 1-A | 1-B | 2-A | 2-B | 3-A | 3-B | 4-A | 4-B | 5-A | 5-B | |
| Rad. | | | | | | | | | | | | |
| Men | 76.33 | 49.97 | 49.71 | 61.80 | 73.33 | 67.44 | 60.88 | 77.00 | 68.67 | - | - | |
| Women | 78.89 | 55.33 | 49.44 | 68.80 | 66.67 | 65.14 | 61.00 | 72.00 | 71.50 | - | - | |
| Ger. | | | | | | | | | | | | |
| Men | 52.93 | 43.04 | - | 48.13 | 52.46 | 54.73 | 63.45 | 58.24 | 63.54 | 68.28 | 67.87 | |
| Women | 76.78 | 49.60 | 46.77 | 47.87 | 55.12 | 62.40 | - | 53.06 | 54.93 | 71.44 | 76.53 | |
| Ark. | | | | | | | | | | | | |
| Men | 49.32 | 44.51 | 44.71 | - | - | 54.95 | 46.74 | 52.96 | 50.91 | - | - | |
| Women | 53.83 | 45.04 | 46.54 | - | - | 58.18 | 56.26 | 64.49 | 39.00 | - | - | |
| Ave. | | | | | | | | | | | | |
| Men | 59.53 | 45.74 | 47.21 | 54.96 | 62.70 | 59.04 | 62.17 | 62.73 | 61.04 | 62.28 | 67.87 | |
| Women | 69.83 | 48.22 | 47.58 | 58.34 | 60.90 | 61.99 | 58.63 | 63.15 | 55.14 | 71.44 | 76.53 | |
| Num. | | | | | | | | | | | | |
| Men | 48 | 19 | 9 | 21 | 10 | 20 | 23 | 20 | 24 | 11 | 5 | |
| Women | 37 | 21 | 28 | 20 | 28 | 22 | 16 | 24 | 16 | 14 | 18 | |
| Dif. | 10.3 | 2.48 | .37 | 3.37 | -1.8 | 2.95 | -3.54 | .42 | -5.90 | 9.16 | 9.66 | |
| S.D.Dif. | 3.7 | 3.83 | 2.87 | 4.03 | 4.46 | 3.83 | 3.38 | 3.43 | 4.49 | 5.58 | 5.8 | |
| Dif. | | | | | | | | | | | | |
| S.D.Dif. | 2.78 | .65 | .13 | .84 | .40 | .77 | 1.05 | .12 | 1.31 | 1.64 | 1.66 | |
| Chances in 100 that dif- ference is great- er than zero. | | 99.7 | 74 | 55 | 80 | 85 | 78 | 85 | 55 | 90 | 94 | 95 |

Table XI. Sex Differences in Sub-groups on Second Retention Test.

| | Number of Readings | | | | | | | | | |
|--|--------------------|-------|-------|-------|-------|-------|-------|--------|-------|-------|
| | 1-A | 1-B | 2-A | 2-B | 3-A | 3-B | 4-A | 4-B | 5-A | 5-B |
| Rad. | | | | | | | | | | |
| Men | 71.75 | 55.71 | 85.00 | 75.00 | 83.33 | 70.25 | 84.67 | 71.33 | - | - |
| Women | 72.00 | 52.11 | 88.25 | 74.20 | 80.14 | 66.20 | 87.26 | 72.56 | - | - |
| Ger. | | | | | | | | | | |
| Men | 62.43 | - | 69.25 | 53.26 | 70.85 | 64.07 | 76.62 | 66.93 | 85.06 | 66.40 |
| Women | 70.71 | 51.20 | 79.73 | 54.07 | 85.33 | - | 78.40 | 52.44 | 86.72 | 77.20 |
| Ark. | | | | | | | | | | |
| Men | 65.01 | - | - | - | 73.70 | 47.65 | 62.95 | 54.34 | - | - |
| Women | 69.76 | 53.66 | - | - | 73.44 | 62.77 | 79.23 | 30.00 | - | - |
| Ave. | | | | | | | | | | |
| Men | 66.39 | 55.71 | 77.13 | 64.13 | 75.96 | 60.66 | 74.75 | 64.20 | 85.06 | 66.40 |
| Women | 70.96 | 52.32 | 83.99 | 64.14 | 76.30 | 64.49 | 81.61 | 53.33 | 86.72 | 77.20 |
| Num. | | | | | | | | | | |
| Men | 12 | 8 | 12 | 10 | 18 | 22 | 19 | 24 | 5 | 5 |
| Women | 17 | 25 | 10 | 12 | 19 | 13 | 24 | 15 | 5 | 3 |
| Dif. | 4.57 | -3.39 | 6.86 | .01 | .34 | 3.83 | 6.86 | -10.87 | 1.66 | 10.80 |
| S.D.Dif. | 3.54 | 3.16 | 5.50 | 7.70 | 4.19 | 3.94 | 3.79 | 4.84 | .78 | 8.60 |
| <u>Dif.</u> | 1.29 | 1.96 | 1.25 | .001 | .08 | .97 | 1.80 | 2.25 | 2.13 | 1.25 |
| <u>S.D.Dif.</u> | | | | | | | | | | |
| Chances in 100 that dif- ference is great- er than zero. | 89 | 97 | 89 | 0 | 53 | 83 | 96 | 98.6 | 98 | 89 |

D. Correlation of Factual Memory with Intelligence and Achievement.

1. Correlation of factual memory with intelligence.

The scores in intelligence used in finding the correlation were scores taken from the freshman entrance examination. The factual memory scores used were scores taken after one reading in the two-week retention test, converted into A-scores, i.e., in terms of Arkwright scores. The correlation between (1) factual memory and (2) intelligence was $.33 \pm .08$.

2. Correlation of factual memory with achievement.

The scores in achievement used in finding the correlation were taken from the freshman entrance examinations. The correlation between (1) factual memory and (3) achievement was $.42 \pm .06$.

The correlation between (3) achievement and (2) intelligence scores on the freshman entrance examination was $.81 \pm .01$.

The method used in finding the correlations between the two factors was the Pearson Product-Moment Coefficient of Correlation.^{12.}

If we hold (3) achievement scores constant, $r_{12.3}$ becomes $.02$, thus showing that a correlation between (2) intelligence and (1) factual memory to be insignificant.

If we hold (2) intelligence scores constant, $r_{13.2}$ equals $.28$. This shows a somewhat lower relationship between (1) factual memory and (3) achievement.

When (1) factual memory was held constant, $r_{23.1}$ equaled $.78$,

^{12.} op. cit. p. 163-168.

showing that factual memory had little influence on correlation between achievement and intelligence. This showed that the achievement score was the most significant factor in factual memory.

The regression equation (Deviation Form)^{13.} becomes

$x_1 = .02x_2 + .36x_3$. This equation may be interpreted as meaning that achievement contributes 18 times as much as intelligence in factual memory in this particular constellation.

^{13.} op. cit. p. 224-231.

IV. CONCLUSIONS

The following are the most important general conclusions contributed by this investigation as indicated by the data presented and discussed in the preceding chapters:

A. Students vary in the amount of factual memory in the same articles read the same number of times.

B. There is an increase in the retention with an increase in the number of repetitions.

C. Testing increases retention score on certain factual prose articles.

D. Rereading after testing greatly increases the retention score.

E. Women retain a greater amount than men on immediate retention but the differences disappear on two-weeks retention.

F. There is a low positive correlation between factual memory and intelligence.

G. There is a low positive correlation between factual memory and achievement.

H. Achievement contributes more than intelligence in factual memory in this particular constellation.

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INSTRUCTIONS FOR COMPLETING YOUR ANSWERS

Introduction of Project

At the beginning of the study period, you will be given a copy of the instructions and a list of the questions to be answered. You will be given a copy of the instructions and a list of the questions to be answered. You will be given a copy of the instructions and a list of the questions to be answered.

These instructions will be given to you at the beginning of the study period.

100

You will be given a copy of the instructions and a list of the questions to be answered. You will be given a copy of the instructions and a list of the questions to be answered. You will be given a copy of the instructions and a list of the questions to be answered.

When you are asked to write, read the instructions carefully and follow them. Do not write anything on the instructions. Do not write anything on the instructions. Do not write anything on the instructions.

A P P E N D I X

A

The results of this study will be published in a journal. The results of this study will be published in a journal. The results of this study will be published in a journal.

Introduction of Project

These instructions will be given to you at the beginning of the study period.

You will be given a copy of the instructions and a list of the questions to be answered. You will be given a copy of the instructions and a list of the questions to be answered. You will be given a copy of the instructions and a list of the questions to be answered.

Instructions

When you are asked to write, read the instructions carefully and follow them. Do not write anything on the instructions. Do not write anything on the instructions. Do not write anything on the instructions.

You will be given a copy of the instructions and a list of the questions to be answered. You will be given a copy of the instructions and a list of the questions to be answered. You will be given a copy of the instructions and a list of the questions to be answered.

Instructions

When you are asked to write, read the instructions carefully and follow them. Do not write anything on the instructions. Do not write anything on the instructions. Do not write anything on the instructions.

DIRECTIONS FOR CONDUCTING STUDY PERIODS

Introduction of Project.

At the beginning of the class period wait until the students are settled, then tell them about the project and encourage them to do their best work. You may tell it in the following manner, or in your own way, as long as all the following points are covered:

"Today we will take part in a scientific experiment in reading.

"You will be asked to read a short article on an interesting topic. After you have read it, either immediately or after several days or weeks, you will be given a set of questions about the article to be answered as well as you can. We want to find out just how much of such an article will be remembered by students of your grade and ability.

"When you are asked to begin, read the article through very carefully just one time. While reading keep in mind what the author is saying and note the points which he makes with the purpose of remembering as many of them as possible.

"The results of this work will not affect your grades in any way, but you are asked to cooperate in the best way you can, i.e., by putting into the work your very best effort."

Distribution of Material.

Before distributing the papers say,

"You will now be given a copy of the article. When you receive it, place it face down upon your desk and do nothing with it until you are told to."

Study Period.

When the articles have all been distributed and the students have come to order, say,

"When I say 'GO' begin to read. Read carefully, but do not dawdle. Try to understand everything as you go along. Read through the article just once. When you have finished, hold up your hand so that I may take your paper. READ THE PAPER ONCE ONLY, THEN HAND IT IN. I will call time at the end of 10 minutes."

Students Finishing.

As the students finish reading, take up the papers. Exactly 10

minutes after you give the signal to go, tell them all to stop whether they have finished or not.

Retention of Papers.

Make sure that all papers are turned in. This is absolutely necessary because retention of papers by students will invalidate results. At no time during the experiment allow any pupil to have a copy of any of the experimental material.

Discussion of Material.

Do not discuss the material in class until the experiment has been entirely completed, and caution the students not to discuss the material they read until the experiment has been completed.

Analysis of Test.

Read with you students the directions at the top of the test. Explain the nature of the test, the purpose of the test, and the nature of the test. Make sure that the students understand the test, and make sure that the students understand the test. Make sure that the students understand the test, and make sure that the students understand the test.

Application of Test.

As the students finish the test have up their papers. This is an individual test, and each student should finish the test. The test is not to be shared among students, and the students should understand that the test is actually a test of the student's ability.

Retention of Papers.

Make sure that all papers are turned in to you. This is an individual test, and each student should finish the test. The test is not to be shared among students, and the students should understand that the test is actually a test of the student's ability.

Discussion of Material.

Do not discuss the material in class until the experiment has been entirely completed, and caution the students not to discuss the material they read until the experiment has been completed.

DIRECTIONS FOR CONDUCTING TESTS

Introduction of Project.

At the beginning of the period wait until all the students are settled, then tell them the following,

"Today we will continue the experiment in memory which I told you about some time ago. You will be given a set of questions about the article on..... which you read at that time. We want to see how much you remember of it. Do nothing with the papers until you are told to."

Distribution of Papers.

Distribute the papers one at a time. The papers should be distributed by the experimenter and care should be taken that no student gets more than one copy in his possession.

Administration of Test.

Read with the students the directions at the top of the test blank. Explain the method of marking the questions, i.e., by drawing a line under the best answer and putting its number in the parentheses in the left margin. Make sure that the pupils understand this, and have them answer the three examples given in the blank. When you feel sure everything is understood, tell them to write their names on the blanks provided, also the date and hour. Then tell them to begin the test. ANSWER NO QUESTIONS AFTER THE TEST IS BEGUN!

Completion of Test.

As the students finish the test take up their papers. Give each individual as much time as he needs to finish the test. The test is not to be scored against time, but the results should represent what the subject is actually able to remember of the reading.

Retention of Papers.

Make sure that all papers are turned in to you. Allow no one to retain a copy of the test, since that would invalidate the work. At no time during the experiment allow any pupil to see any of the experimental materials.

Re-reading Material.

Group A is given material to read again immediately after the test. Only 10 minutes is allowed for reading. Read material just once then hand in.

Re-testing - (next class meeting)

Follow same procedure as when given first time. Give to both Groups A and B.

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Table 1. (continued) - Section 1 results

| Area | Investigator | Number | Percentage |
|------|--------------|--------|------------|
| 10 | 71 | 100 | 71 |
| 11 | 71 | 100 | 71 |
| 12 | 71 | 100 | 71 |
| 13 | 71 | 100 | 71 |
| 14 | 71 | 100 | 71 |
| 15 | 71 | 100 | 71 |
| 16 | 71 | 100 | 71 |
| 17 | 71 | 100 | 71 |
| 18 | 71 | 100 | 71 |
| 19 | 71 | 100 | 71 |
| 20 | 71 | 100 | 71 |
| 21 | 71 | 100 | 71 |
| 22 | 71 | 100 | 71 |
| 23 | 71 | 100 | 71 |
| 24 | 71 | 100 | 71 |
| 25 | 71 | 100 | 71 |
| 26 | 71 | 100 | 71 |
| 27 | 71 | 100 | 71 |
| 28 | 71 | 100 | 71 |
| 29 | 71 | 100 | 71 |
| 30 | 71 | 100 | 71 |
| 31 | 71 | 100 | 71 |
| 32 | 71 | 100 | 71 |
| 33 | 71 | 100 | 71 |
| 34 | 71 | 100 | 71 |
| 35 | 71 | 100 | 71 |
| 36 | 71 | 100 | 71 |
| 37 | 71 | 100 | 71 |
| 38 | 71 | 100 | 71 |
| 39 | 71 | 100 | 71 |
| 40 | 71 | 100 | 71 |
| 41 | 71 | 100 | 71 |
| 42 | 71 | 100 | 71 |
| 43 | 71 | 100 | 71 |
| 44 | 71 | 100 | 71 |
| 45 | 71 | 100 | 71 |
| 46 | 71 | 100 | 71 |
| 47 | 71 | 100 | 71 |
| 48 | 71 | 100 | 71 |
| 49 | 71 | 100 | 71 |
| 50 | 71 | 100 | 71 |
| 51 | 71 | 100 | 71 |
| 52 | 71 | 100 | 71 |
| 53 | 71 | 100 | 71 |
| 54 | 71 | 100 | 71 |
| 55 | 71 | 100 | 71 |
| 56 | 71 | 100 | 71 |
| 57 | 71 | 100 | 71 |
| 58 | 71 | 100 | 71 |
| 59 | 71 | 100 | 71 |
| 60 | 71 | 100 | 71 |
| 61 | 71 | 100 | 71 |
| 62 | 71 | 100 | 71 |
| 63 | 71 | 100 | 71 |
| 64 | 71 | 100 | 71 |
| 65 | 71 | 100 | 71 |
| 66 | 71 | 100 | 71 |
| 67 | 71 | 100 | 71 |
| 68 | 71 | 100 | 71 |
| 69 | 71 | 100 | 71 |
| 70 | 71 | 100 | 71 |
| 71 | 71 | 100 | 71 |
| 72 | 71 | 100 | 71 |
| 73 | 71 | 100 | 71 |
| 74 | 71 | 100 | 71 |
| 75 | 71 | 100 | 71 |
| 76 | 71 | 100 | 71 |
| 77 | 71 | 100 | 71 |
| 78 | 71 | 100 | 71 |
| 79 | 71 | 100 | 71 |
| 80 | 71 | 100 | 71 |
| 81 | 71 | 100 | 71 |
| 82 | 71 | 100 | 71 |
| 83 | 71 | 100 | 71 |
| 84 | 71 | 100 | 71 |
| 85 | 71 | 100 | 71 |
| 86 | 71 | 100 | 71 |
| 87 | 71 | 100 | 71 |
| 88 | 71 | 100 | 71 |
| 89 | 71 | 100 | 71 |
| 90 | 71 | 100 | 71 |
| 91 | 71 | 100 | 71 |
| 92 | 71 | 100 | 71 |
| 93 | 71 | 100 | 71 |
| 94 | 71 | 100 | 71 |
| 95 | 71 | 100 | 71 |
| 96 | 71 | 100 | 71 |
| 97 | 71 | 100 | 71 |
| 98 | 71 | 100 | 71 |
| 99 | 71 | 100 | 71 |
| 100 | 71 | 100 | 71 |

A P P E N D I X

B

Table I. GROUP II RADIUM--1 Reading

| Men | Immediate Retention | Women | Immediate Retention |
|-----------|---------------------|-----------|---------------------|
| 16 | 73. | 123 | 71. |
| 233 | 86. | <u>17</u> | 67. |
| 60 | 87. | 191 | 83. |
| <u>12</u> | 84. | <u>15</u> | 84. |
| 147 | 68. | 180* | 81. |
| 157* | 78. | <u>8</u> | 87. |
| <u>10</u> | 84. | 219 | 90. |
| 17 | 83. | <u>7</u> | 83. |
| 33 | 86. | <u>18</u> | 64. |
| 206* | 49. | | |
| <u>16</u> | 79. | | |
| 69 | 88. | | |
| 85 | 79. | | |
| 88 | 60. | | |
| 126 | 74. | | |
| 96* | 72. | | |
| <u>11</u> | 72. | | |
| 181 | 79. | | |
| <u>14</u> | 94. | | |
| 9 | 51. | | |
| 21 | 77. | | |
| Average | 76.33 | | 78.89 |

Total Average -- 77.10

Table II. GROUP IV GERMAN--1 Reading

| Men | Immediate Retention | Women | Immediate Retention |
|-----------|---------------------|-----------|---------------------|
| <u>40</u> | 69.6 | <u>41</u> | 76.8 |
| <u>49</u> | 30. | 81 | 78.4 |
| 62* | 76.8 | <u>43</u> | 74.4 |
| 141 | 53.6 | 101 | 84. |
| <u>48</u> | 62.4 | 108 | 60.8 |
| <u>46</u> | 25.2 | <u>47</u> | 78.4 |
| | | <u>38</u> | 85.6 |
| | | 217 | 98.6 |
| | | <u>39</u> | 84. |
| | | <u>36</u> | 83.2 |
| | | 236 | 78.4 |
| | | 114 | 70.4 |
| | | <u>37</u> | 55.4 |
| | | 190 | 88. |
| | | <u>45</u> | 43.2 |
| | | 203 | 88.8 |
| Average | 52.93 | | 76.78 |

Total Average -- 70.27

Table III. GROUP VI ARKWRIGHT--1 Reading.

| Men | Immediate Retention | Women | Immediate Retention |
|-----------|---------------------|-----------|---------------------|
| 21 | 49.59 | <u>56</u> | 54.46 |
| 49 | 52.84 | 12 | 73.17 |
| <u>61</u> | 41.46 | 22 | 51.21 |
| 115* | 42.27 | 40* | 69.11 |
| 165 | 56.91 | 110 | 44.70 |
| <u>63</u> | 56.91 | <u>62</u> | 55.20 |
| 184* | 56.09 | 181* | 57.70 |
| 188* | 73.17 | 19 | 52. |
| <u>55</u> | 26.01 | <u>54</u> | 47.15 |
| 36* | 46.34 | <u>58</u> | 63.41 |
| <u>57</u> | 60.10 | 83 | 41.46 |
| 77 | 59.30 | <u>60</u> | 39.83 |
| 105* | 28.45 | <u>65</u> | 50.48 |
| 108* | 60.97 | | |
| <u>63</u> | 22.76 | | |
| 161* | 31.70 | | |
| 184 | 36.58 | | |
| 187 | 60.16 | | |
| <u>66</u> | 62.60 | | |
| 211 | 69.91 | | |
| 150* | 41.47 | | |
| Average | 49.32 | | 53.83 |

Total Average -- 51.04.

Table IV. RADIUM--1 Reading.

1.

| Men | First Retention | A-Score | Second Retention | Women | First Retention | A-Score | Second Retention |
|---------|-----------------|---------|------------------|-------|-----------------|---------|------------------|
| A-Group | | | | | | | |
| 31 | 46. | 52.8 | 91. | 19* | 57. | 48. | 66. |
| 98 | 51. | 43.2 | 72. | 28 | 53. | 45. | 67. |
| 97* | 44. | 37.6 | -- | 128 | 60. | 50.4 | -- |
| 158 | 48. | 41. | 47. | 140 | 52. | 44. | 75. |
| 2 | 51. | 43.2 | 65. | 183 | 58. | 48.4 | 82. |
| 172 | 70. | 58.4 | 87. | 224 | 52. | 44. | 70. |
| 206 | 60. | 50.4 | 82. | | | | |
| 208 | 42. | 36. | 60. | | | | |
| 216 | 35. | 30. | 70. | | | | |
| Average | 49.67 | | 71.75 | | 55.33 | | 72.00 |

B-Group

| | | | | | | | |
|---------|-------|------|-------|-----|-------|------|-------|
| 2 | 47. | 40. | 55. | 18 | 49. | 41.6 | 46. |
| 25 | 46. | 39.2 | 48. | 52. | 42. | 36. | 52. |
| 59 | 56. | 47.2 | 58. | 1 | 40. | 34.4 | 42. |
| 133 | 53. | 44.8 | 69. | 73 | 57. | 48. | 66. |
| 3 | 52. | 44. | 56. | 82 | 47. | 40. | 50. |
| 4 | 52. | 44. | 47. | 96 | 50. | 42.4 | 53. |
| 207 | 42. | 36. | 57. | 138 | 48. | 41. | 46. |
| | | | | 161 | 66. | 55.2 | 65. |
| | | | | 169 | 46. | 39.2 | 49. |
| Average | 49.71 | | 55.71 | | 49.44 | | 52.11 |

2. SUMMARY TABLE.

| | First Retention | | | Second Retention | |
|-----------|-----------------|---------|---------|------------------|---------|
| | Total Group | Group A | Group B | Group A | Group B |
| Raw Score | | | | | |
| Men | 49.69 | 49.67 | 49.71 | 71.75 | 55.71 |
| Women | 51.8 | 55.33 | 49.44 | 72. | 52.11 |
| Total | 50.71 | 51.93 | 49.56 | 71.85 | 53.69 |
| A Scores | | | | | |
| Men | 43.01 | 43.67 | 42.19 | | |
| Women | 43.87 | 46.7 | 41.99 | | |
| Total | 43.43 | 44.87 | 42.06 | | |

Table V. GROUP III. GERMAN--1 Reading.

| Men | First Retention | A-Score | Second Retention | Women | First Retention | A-Score | Second Retention |
|---------------|-----------------|---------|------------------|-------|-----------------|---------|------------------|
| A-Group | | | | | | | |
| 118* | 34.4 | 34.05 | 60. | 18* | 52.8 | 46.38 | 71.2 |
| 33 | 48.7 | 43.7 | 64.8 | 28 | 72.8 | 59.78 | -- |
| 34 | 44. | 40.48 | -- | 26 | 16. | 21.72 | 49.6 |
| 30 | 59.2 | 50.66 | -- | 24 | 51.2 | 51.96 | 83.2 |
| 55* | 28.8 | 30.3 | -- | 78* | 52.8 | 46.38 | 75.2 |
| | | | | 23 | 45.6 | 41.55 | 68.8 |
| | | | | 134 | 39.2 | 37.26 | 68.8 |
| | | | | 136* | 59.2 | 50.66 | 77.6 |
| | | | | 141* | 48. | 43.16 | -- |
| | | | | 154* | 54.8 | 50.13 | -- |
| Average | 43.04 | 39.84 | 62.4 | | 49.6 | 44.85 | 70.71 |
| B-Group | | | | | | | |
| | | | | 8* | 53.6 | 46.91 | 60.8 |
| | | | | 27 | 31.2 | 39.9 | 40. |
| | | | | 14* | 46.4 | 42.09 | 51.2 |
| | | | | 26* | 63.2 | 53.34 | 68. |
| | | | | 35* | 64.8 | 54.42 | -- |
| | | | | 25 | 42.4 | 39.4 | 50.4 |
| | | | | 29 | 41.6 | 36.87 | 42.4 |
| | | | | 107 | 55.2 | 47.98 | 60. |
| | | | | 91* | 46.4 | 42.09 | 56.8 |
| | | | | 109* | 39.2 | 37.26 | 40. |
| | | | | 132 | 39.2 | 35.92 | 46.4 |
| | | | | 32 | 64.4 | 54.19 | 63.2 |
| | | | | 22 | 52. | 45.84 | -- |
| | | | | 178 | 40. | 37.8 | 35.2 |
| | | | | 41 | 24. | 27.08 | -- |
| Average | | | | | 46.77 | 42.74 | 51.2 |
| Total Average | 43.04 | 39.84 | | | 47.9 | 43.58 | |

SUMMARY TABLE

| | First Retention | | | Second Retention | |
|-----------|-----------------|---------|---------|------------------|---------|
| | Total Group | Group A | Group B | Group A | Group B |
| Raw Score | | | | | |
| Men | 43.04 | 43.04 | -- | 62.4 | -- |
| Women | 47.90 | 49.6 | 46.77 | 70.71 | 51.2 |
| Total | 47.09 | 47.41 | 46.77 | 68.8 | 51.2 |
| A Score | | | | | |
| Men | 39.9 | 39.9 | -- | | |
| Women | 43.6 | 44.9 | 42.74 | | |
| Total | 40.31 | 43.21 | 42.74 | | |

Table VI. GROUP V ARKWRIGHT--1 Reading.

| Men | First Retention | Second Retention | Women | First Retention | Second Retention |
|----------------|-----------------|------------------|-----------|-----------------|------------------|
| A-Group | | | | | |
| 144 | 52. | 68.24 | 90 | 38.21 | 69.11 |
| 164* | 30. | 61.78 | 153 | 51.21 | 79.7 |
| <u>52</u> | 47.96 | -- | 147* | 39.02 | 63.41 |
| <u>53</u> | 49.59 | -- | 185 | 54.46 | 67.48 |
| <u>10</u> | 50.48 | -- | 225 | 42.27 | 69.11 |
| Average | 44.51 | 65.01 | | 45.15 | 69.76 |
| B-Group | | | | | |
| 229 | 54.46 | -- | 36 | 52.84 | 60.97 |
| 192 | 34.96 | -- | <u>30</u> | 48.78 | 56.91 |
| | | | 146 | 43.09 | 53.66 |
| | | | <u>51</u> | 41.46 | 43.09 |
| Average | 44.71 | | | 46.54 | 53.66 |
| Total Average | 44.58 | | | 45.77 | |

SUMMARY TABLE

| | First Retention | | | Second Retention | |
|------------------|-----------------|---------|---------|------------------|---------|
| | Total Group | Group A | Group B | Group A | Group B |
| Raw Score | | | | | |
| Men | 44.58 | 44.51 | 44.71 | 65.01 | -- |
| Women | 45.77 | 45.04 | 46.54 | 69.76 | 53.66 |
| Total | 45.29 | 44.87 | 45.63 | 68.4 | 53.66 |

Table VII. GROUP V RADIUM--2 Readings

| Men | First Retention | Second Retention | Women | First Retention | Second Retention |
|----------------|-----------------|------------------|-----------|-----------------|------------------|
| A-Group | | | | | |
| 10 | 66. | 84. | 90 | 69. | 81. |
| 144 | 65. | 88. | 153 | 77. | 93. |
| 164* | 57. | 82. | 147 | 56. | -- |
| <u>52</u> | 60. | 86. | 185 | 72. | 87. |
| <u>53</u> | 61. | -- | 225 | 69. | 92. |
| Average | 61.8 | 85. | | 68.6 | 88.25 |
| B-Group | | | | | |
| 87 | 76. | 69. | 146 | 66. | 71. |
| 163 | 68. | 74. | <u>51</u> | 57. | 62. |
| 229 | 76. | 82. | 36 | 77. | 77. |
| Average | 73.33 | 75. | | 66.67 | 70. |
| Total Average | 66.13 | | | 67.88 | |

SUMMARY TABLE

| | First Retention | | | Second Retention | |
|-----------|-----------------|---------|---------|------------------|---------|
| | Total Group | Group A | Group B | Group A | Group B |
| Raw Score | | | | | |
| Men | 66.13 | 61.8 | 73.33 | 85. | 75. |
| Women | 67.88 | 68.6 | 66.25 | 88.25 | 70. |
| Total | 67. | 65.2 | 70. | 86.63 | 70.83 |

Table VIII. GERMAN--2 Readings.

| Men | First Retention | Second Retention | Women | First Retention | Second Retention |
|----------------|-----------------|------------------|-------|-----------------|------------------|
| A-Group | | | | | |
| 31 | 68.8 | 97.6 | 19* | 40. | 89.6 |
| 98 | 56. | 82.4 | 28 | 50.4 | 68. |
| 97* | 46.4 | 68. | 128 | 67.2 | 91.2 |
| 158 | 40. | 38.8 | 140 | 48.8 | 79.2 |
| 2 | 34.4 | 61.6 | 183 | 30.4 | 76.8 |
| 172 | 65.6 | 75.2 | 224 | 50.4 | 73.6 |
| 206 | 63.2 | -- | | | |
| 208 | 21.6 | 58.4 | | | |
| 216 | 37.2 | 72. | | | |
| Average | 48.13 | 69.25 | | 47.87 | 79.73 |
| B-Group | | | | | |
| 2 | 65.6 | 58.4 | 18 | 53.6 | 42.2 |
| 25 | 46.4 | 43.2 | 52 | 40.8 | 37.2 |
| 59 | 31.2 | 24. | 1 | 46.4 | 42.4 |
| 133 | 52.8 | 53.6 | 67 | 45.6 | 39.2 |
| 3 | 67.2 | 86.4 | 73 | 68.8 | 70.4 |
| 4 | 55.2 | 57.6 | 82 | 47.2 | 53.6 |
| 207 | 48.8 | 49.6 | 96 | 69.6 | 76. |
| | | | 138 | 43.2 | 39.2 |
| | | | 161 | 85.6 | 86.4 |
| | | | 169 | 50.4 | -- |
| Average | 52.46 | 53.26 | | 55.12 | 54.07 |
| Total | | | | | |
| Average | 50.03 | | | 52.4 | |

SUMMARY TABLE

| Raw Score | First Retention | | | Second Retention | |
|-----------|-----------------|---------|---------|------------------|---------|
| | Total Group | Group A | Group B | Group A | Group B |
| Men | 50.03 | 48.13 | 52.46 | 69.25 | 53.26 |
| Women | 52.4 | 47.87 | 55.12 | 79.73 | 54.07 |
| Total | 51.21 | 48.00 | 54.04 | 73.74 | 53.71 |

Table IX. GROUP III ARKWRIGHT--2 Readings.

| Men | First Retention | Women | First Retention |
|----------------|-----------------|-----------|-----------------|
| A-Group | | | |
| 118* | 46.65 | <u>26</u> | 28.50 |
| 33 | 42.27 | <u>24</u> | 47.96 |
| 34 | 39.02 | 78* | 52.8 |
| 30 | 46.34 | <u>23</u> | 44. |
| 55* | 41.46 | 134 | 44.70 |
| <u>35</u> | 74. | 136* | 52.84 |
| | | 141* | 27.70 |
| | | 154* | 50.48 |
| | | 176 | 49.59 |
| B-Group | | | |
| | | 8* | 59.36 |
| | | <u>27</u> | 59.3 |
| | | 14* | 26.9 |
| | | 26* | 53.66 |
| | | 35* | 34.96 |
| | | <u>25</u> | 37.4 |
| | | <u>29</u> | 41.46 |
| | | 107 | 48.78 |
| | | 91* | 40.65 |
| | | 109* | 24.40 |
| | | 132 | 56.09 |
| | | <u>32</u> | 55.2 |
| | | <u>22</u> | 47.15 |
| | | 178 | 36.58 |
| | | 41 | 29.30 |
| Average | 47.29 | | 43.73 |

Total Average -- 45.87.

Table X. GROUP VI RADIUM--3 Readings.

| Men | First Retention | Second Retention | Women | First Retention | Second Retention |
|----------------|-----------------|------------------|-----------|-----------------|------------------|
| A-Group | | | | | |
| 21 | 79. | 92. | <u>56</u> | 51. | 71. |
| <u>59</u> | 67. | 79. | <u>22</u> | 65 | 84. |
| 115* | 75. | 83. | 40* | 56. | 74. |
| 165 | 61. | 81. | 115 | 76. | 90. |
| 150* | 64. | 79. | 110 | 56. | 81. |
| <u>63</u> | 68. | 83. | <u>62</u> | 74. | 82. |
| 184* | 50. | 79. | 181* | 78. | 79. |
| 188* | 68. | 89. | | | |
| <u>61</u> | 75. | 85. | | | |
| Average | 67.44 | 83.33 | | 65.14 | 80.14 |
| B-Group | | | | | |
| <u>55</u> | 62. | 62. | 19 | 65. | 64. |
| 36* | 41. | 87. | <u>54</u> | 54. | 60. |
| 77 | 69. | 59. | <u>58</u> | 66. | 64. |
| 105* | 66. | 76. | <u>83</u> | 61. | 58. |
| 108* | 69. | 80. | <u>65</u> | 59. | 85. |
| 161* | 61. | 58. | | | |
| 184 | 50. | 68. | | | |
| 187 | 69. | 72. | | | |
| Average | 60.88 | 70.25 | | 61. | 66.2 |
| Total Average | 64.36 | | | 63.42 | |

SUMMARY TABLE

| Raw Score | First Retention | | Second Retention | | |
|-----------|-----------------|---------|------------------|---------|---------|
| | Total Group | Group A | Group B | Group A | Group B |
| Men | 64.36 | 67.44 | 60.88 | 83.33 | 70.25 |
| Women | 63.42 | 65.14 | 61.00 | 80.14 | 66.2 |
| Total | 63.97 | 66.44 | 60.92 | 81.94 | 68.69 |

Table XI. GROUP II GERMAN--3 Readings.

| Men | First Retention | Second Retention | Women | First Retention | Second Retention |
|----------------|-----------------|------------------|-----------|-----------------|------------------|
| A-Group | | | | | |
| <u>19</u> | 46.6 | 73.6 | 191 | 49.6 | 83.2 |
| <u>16</u> | 57.6 | 81.6 | <u>15</u> | 68. | 84. |
| 233 | 61.6 | 84. | 180* | 53.6 | 76.8 |
| 60 | 61.6 | -- | <u>8</u> | 73.6 | 86.4 |
| 76 | 42.2 | 47.2 | 219 | 66.4 | 91.2 |
| <u>12</u> | 68.8 | 87.2 | <u>7</u> | 63.2 | 90.4 |
| 147 | 36. | 52. | | | |
| <u>10</u> | 68.8 | 84. | | | |
| <u>20</u> | 49.6 | 57.6 | | | |
| Average | 54.73 | 70.85 | | 62.4 | 85.33 |
| B-Group | | | | | |
| 17 | 71.2 | 66.4 | | | |
| 33 | 80. | 77.6 | | | |
| 69 | 81.6 | 76.8 | | | |
| 85 | 56. | 64.8 | | | |
| <u>13</u> | 62.4 | 61.2 | | | |
| 126 | 54.4 | 51.2 | | | |
| 96* | 51.2 | 56.8 | | | |
| <u>11</u> | 72.8 | 77.6 | | | |
| 181 | 68. | 70.4 | | | |
| <u>14</u> | 88. | -- | | | |
| 9 | 26.4 | 24. | | | |
| <u>21</u> | 52. | 75.2 | | | |
| <u>6</u> | 60.8 | 66.4 | | | |
| Average | 63.45 | 64.07 | | | |
| Total Average | 59.88 | | | 62.4 | |

SUMMARY TABLE

| Raw Score | Total Group | First Retention | | Second Retention | |
|-----------|-------------|-----------------|---------|------------------|---------|
| | | Group A | Group B | Group A | Group B |
| Men | 59.88 | 54.73 | 63.45 | 70.85 | 64.07 |
| Women | 62.4 | 62.4 | -- | 85.33 | -- |
| Total | 60.42 | 57.83 | 63.45 | 77.06 | 64.07 |

Table XII. GROUP IV ARKWRIGHT--3 Readings.

| Men | First Retention | Second Retention | Women | First Retention | Second Retention |
|----------------------|-----------------|------------------|------------|-----------------|------------------|
| A-Group | | | | | |
| <u>46</u> | 52. | 73.7 | <u>41</u> | 52. | -- |
| <u>49</u> | 57.7 | -- | <u>69*</u> | 26.01 | 46.34 |
| | | | 81 | 57.7 | -- |
| | | | <u>44</u> | 77.24 | 87.8 |
| | | | 101 | 49.59 | 69.11 |
| | | | 108 | 57.7 | 66.77 |
| | | | <u>47</u> | 64.3 | 64.3 |
| | | | <u>38</u> | 67.48 | -- |
| | | | <u>217</u> | 91.6 | 95.1 |
| Average | 54.95 | 73.7 | | 58.18 | 73.44 |
| B-Group | | | | | |
| 62* | 61.78 | 63.1 | <u>39</u> | 51.21 | 73.66 |
| 141 | 31.7 | 32.6 | <u>36</u> | 78.10 | 76.5 |
| | | | 236 | 52.84 | 60.16 |
| | | | 114 | 51.21 | -- |
| | | | <u>42</u> | 56.91 | 67.48 |
| | | | <u>37</u> | 48.78 | 50.48 |
| | | | 190 | 55.20 | 57.7 |
| | | | <u>45</u> | 56.91 | 59.3 |
| | | | <u>203</u> | 55.20 | 56.9 |
| Average | 46.74 | 47.65 | | 56.26 | 62.77 |
| Total Average | 50.8 | | | 57.22 | |

SUMMARY TABLE

| Raw Scores | Total Group | First Retention | | Second Retention | |
|------------|-------------|-----------------|---------|------------------|---------|
| | | Group A | Group B | Group A | Group B |
| Men | 50.8 | 54.95 | 46.74 | 73.7 | 47.65 |
| Women | 57.22 | 58.18 | 56.26 | 73.44 | 62.77 |
| Total | 56.05 | 57.57 | 54.53 | 73.48 | 59.76 |

Table XIII. GROUP IV RADIUM--4 Readings.

| Men | First Retention | Second Retention | Women | First Retention | Second Retention |
|----------------|-----------------|------------------|-------|-----------------|------------------|
| <u>A-Group</u> | | | | | |
| 51 | 77. | 92. | 41 | 68. | 90. |
| 40 | 77. | 84. | 69* | 64. | 67. |
| 49 | 76. | 78. | 81 | 77. | 97. |
| | | | 43 | 61. | 87. |
| | | | 44 | 85. | 97. |
| | | | 101 | 86. | 83. |
| | | | 108 | 70. | 91. |
| | | | 47 | 67. | 84. |
| | | | 38 | 69. | 81. |
| | | | 217 | 73. | 95. |
| Average | 77. | 84.67 | | 72.00 | 87.2 |
| <u>B-Group</u> | | | | | |
| 141 | 52. | 47. | 39 | 75. | 76. |
| 48 | 73. | 80. | 36 | 77. | 79. |
| 46 | 81. | 87. | 236 | 80. | 76. |
| | | | 114 | 63. | 64. |
| | | | 42 | 80. | 83. |
| | | | 37 | 70. | 66. |
| | | | 190 | 68. | 69. |
| | | | 45 | 61. | 70. |
| | | | 203 | 70. | 70. |
| Average | 68.67 | 71.33 | | 71.55 | 72.56 |
| Total Average | 72.83 | | | 71.6 | |

SUMMARY TABLE

| Raw Score | First Retention | | | Second Retention | |
|-----------|-----------------|---------|---------|------------------|---------|
| | Total Group | Group A | Group B | Group A | Group B |
| Men | 72.83 | 77.00 | 68.67 | 84.67 | 71.33 |
| Women | 71.6 | 72.00 | 71.5 | 87.2 | 72.56 |
| Total | 71.9 | 72.95 | 70.83 | 86.62 | 72.25 |

Table XIV. GROUP VI GERMAN--4 Readings

| Men | First Retention | Second Retention | Women | First Retention | Second Retention |
|----------------|-----------------|------------------|-------|-----------------|------------------|
| A-Group | | | | | |
| 21 | 65.6 | -- | 56 | 44.8 | 56. |
| 49. | 50.4 | 72. | 22 | 53.6 | 79.2 |
| 59 | 72. | 83.2 | 40* | 52. | 74.4 |
| 61 | 61.6 | 96.8 | 115 | 56. | 78.4 |
| 115* | 72. | 79.2 | 110 | 53.8 | 96.8 |
| 165 | 52. | 75.2 | 62 | 63.2 | 91.2 |
| 150* | 67.2 | 89.6 | 181* | 48. | 72.8 |
| 63 | 53.6 | 67.2 | | | |
| 184* | 48. | 68.8 | | | |
| 188* | 40. | 57.6 | | | |
| Average | 58.24 | 76.62 | | 53.06 | 78.4 |
| B-Group | | | | | |
| 55 | 52.8 | 46.4 | 19 | 71.2 | 68. |
| 36* | 65.6 | 63.2 | 54 | 52.8 | -- |
| 57 | 57.6 | 56. | 58 | 50.4 | 46.4 |
| 77 | 71.2 | 72.8 | 83 | 57.6 | 56. |
| 161* | 69.6 | 74.4 | 60 | 40. | 43.2 |
| 184 | 45.6 | 53.6 | 65 | 57.6 | 73.6 |
| 187 | 73.6 | 77.6 | | | |
| 211 | 68. | 92. | | | |
| Average | 63.54 | 66.93 | | 66.93 | 57.44 |
| Total Average | 60.72 | | | 53.92 | |

SUMMARY TABLE

| Raw Score | First Retention | | | Second Retention | |
|-----------|-----------------|---------|---------|------------------|---------|
| | Total Group | Group A | Group B | Group A | Group B |
| Men | 60.72 | 58.24 | 63.54 | 76.62 | 66.93 |
| Women | 53.92 | 53.06 | 54.93 | 78.4 | 57.44 |
| Total | 57.96 | 56.10 | 60.05 | 77.4 | 63.54 |

Table XV. GROUP II ARKWRIGHT --4 Readings.

| Men | First Retention | Second Retention | Women | First Retention | Second Retention |
|----------------|-----------------|------------------|-----------|-----------------|------------------|
| A-Group | | | | | |
| 16 | 32.6 | 47.96 | 123 | 56.9 | 78.1 |
| 233 | 62.6 | 82.1 | <u>17</u> | 70.73 | 70.73 |
| 60 | 59.23 | 69.9 | 191 | 64.3 | 78.1 |
| 76 | 32.6 | 43.09 | <u>15</u> | 81.3 | 89.4 |
| <u>20</u> | 51.21 | 49.59 | 180* | 52. | 71.6 |
| <u>12</u> | 70.7 | 78.1 | <u>8</u> | 74.86 | 87. |
| <u>10</u> | 61.78 | 69.9 | 219 | 63.4 | 79.7 |
| Average | 52.96 | 62.95 | | 64.49 | 79.23 |
| B-Group | | | | | |
| 17 | 69.9 | 74.8 | <u>18</u> | 39. | 30. |
| 206* | 60.97 | 60.97 | | | |
| <u>16</u> | 45.6 | 50.48 | | | |
| 69 | 63.4 | 65.1 | | | |
| 85 | 45.6 | 52.00 | | | |
| 88 | 60.97 | 68.24 | | | |
| <u>13</u> | 43.09 | 47.15 | | | |
| 126 | 57.70 | 52.00 | | | |
| 96* | 30.89 | 34.96 | | | |
| <u>11</u> | 67.48 | 57.7 | | | |
| <u>9</u> | 25.25 | 28.45 | | | |
| <u>21</u> | 39.00 | 46.34 | | | |
| <u>6</u> | 52.00 | 68.24 | | | |
| Average | 50.91 | 54.34 | | 39. | 30. |
| Total | | | | | |
| Average | 51.68 | 57.35 | | 61.29 | |

SUMMARY TABLE

| Raw Score | Total Group | First Retention | | Second Retention | |
|-----------|-------------|-----------------|---------|------------------|---------|
| | | Group A | Group B | Group A | Group B |
| Men | 51.68 | 52.96 | 50.91 | 62.95 | 54.34 |
| Women | 61.29 | 64.49 | 39. | 79.23 | 30. |
| Total | 54.39 | 58.72 | 50.06 | 71.09 | 52.60 |

Table XVI. GROUP III RADIUM--5 Readings

| Men | First Retention | Women | First Retention |
|----------------|-----------------|-----------|-----------------|
| <u>A-Group</u> | | | |
| 118* | 63. | 28 | 74. |
| <u>33</u> | 82. | <u>26</u> | 55. |
| 34 | 69. | <u>24</u> | 63. |
| 30 | 53. | 78* | 58. |
| 35 | 90. | <u>23</u> | 62. |
| 55* | 49. | 134 | 64. |
| | | 136* | 73. |
| | | 141* | 53. |
| | | 154* | 66. |
| <u>B-Group</u> | | | |
| | | 8 | 70. |
| | | <u>27</u> | 63. |
| | | 14* | 30. |
| | | 26* | 71. |
| | | 35* | 50. |
| | | <u>25</u> | 51. |
| | | <u>29</u> | 68. |
| | | 107 | 70. |
| | | 91* | 51. |
| | | 109* | 33. |
| | | 132 | 66. |
| | | <u>32</u> | 72. |
| | | <u>22</u> | 55. |
| | | 178 | 59. |
| | | 41 | 30. |
| <u>Average</u> | <u>67.67</u> | | <u>63.14</u> |

Total Average -- 60.43

Table XVII. GROUP V GERMAN--5 Readings.

| Men | First Retention | Second Retention | Women | First Retention | Second Retention |
|----------------|-----------------|------------------|-------|-----------------|------------------|
| A-Group | | | | | |
| 10 | 77.6 | 87.2 | 90 | 54.8 | 82.4 |
| 144 | 68. | 81.6 | 153 | 90.4 | 97.6 |
| 164* | 66.4 | -- | 147* | 54.4 | 69.6 |
| 52 | 64.8 | 86.4 | 185 | 76. | 85.6 |
| 53 | 65.6 | -- | 225 | 81.6 | 98.4 |
| Average | 68.28 | 85.06 | | 71.44 | 86.72 |
| B-Group | | | | | |
| 87 | 64.8 | -- | 36 | 91.2 | 86.4 |
| 163 | 55.2 | -- | 146 | 72. | 68. |
| 192 | 71.2 | -- | 51 | 66.4 | -- |
| 30 | 82.4 | -- | | | |
| 229 | 65.6 | 66.4 | | | |
| Average | 67.84 | 66.4 | | 76.53 | 77.2 |
| Total Average | 68.06 | | | 73.65 | |

SUMMARY TABLE

| Raw Score | Total Group | First Retention | | Second Retention | |
|-----------|-------------|-----------------|---------|------------------|---------|
| | | Group A | Group B | Group A | Group B |
| Men | 68.06 | 68.28 | 67.84 | 85.06 | 66.4 |
| Women | 73.65 | 71.44 | 76.53 | 86.72 | 77.2 |
| Total | 70.36 | 69.86 | 71.10 | 86.1 | 73.47 |

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ON THE RATE OF FORGETTING

being

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by

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Date: Sept. 29, 1933,