

## COMMUNICATIONS AND DISCUSSIONS.

### REPETITION *VERSUS* RECALL IN MEMORIZING VOCABULARIES.

Twenty-eight adult students learned four vocabularies of twenty pairs each, the second by attentive reading and re-reading, the first by reading, then covering the second members of the pairs and recalling each of them upon seeing the first member, so far as possible, re-reading only as necessary. The third vocabulary was learned in the same manner as the second, and the fourth in the same manner as the first. The first members of the pairs were unknown German words in I and II, two-syllable nonsense words in III and IV. The second members were in all cases English words. In testing, the order of the pairs was changed. The score kept was (1) the time required for the learner to (as he thought) learn the vocabulary, and (2) the number of equivalents given correctly in the test. The test was made immediately after the learning.

There was no demonstrable superiority in the method involving recall from within so far as possible. Indeed, the results, at their face value, slightly favored the mere reading and re-reading. This, however, was partly due to the over-learning of the first vocabulary, there being a tendency to take profitable risks in the vocabularies after the first.

The experiment was too crude and too slight to give numerical results worth presenting in detail. For the eleven individuals whose records in the first vocabulary were 17 correct or less, the mere reading and re-reading required 3 per cent. less time and produced 14 per cent. more words correct, the scores for the individuals separately being as shown in Table I.

# THE EFFECT OF CONTINUOUS EXERCISE AND OF REST UPON DIFFICULT MENTAL MULTIPLICATION.

In 1911 (JOURNAL OF EDUCATIONAL PSYCHOLOGY, Vol. 2, pp. 61-80) the author reported the results of continuous work of from three and a half to twelve hours and of a night's rest upon the efficiency of adult students in the very hard task of multiplying mentally a three-place by a three-place number. It appeared there that the exercises resulted in improvement in spite of its continuity, and that the rest resulted in a further improvement, but of moderate amount.

I report at the present time the results for a somewhat similar experiment, but with a work period of only about two hours and with *two retests*, one after a rest of 30 minutes, and another after a full night's sleep. The subjects of this experiment were seventy-two undergraduate students who did the work without supervision, being given only the directions printed below.

TABLE I.

*The Time Spent in Learning and the Number of Correct Equivalents (out of 20) for 11 Adults in a Test in Learning Vocabularies. I, II, III, IV Represent the Order of Time.*

	I. Studied by Recall.		II. Studied by Repetition.		III. Studied by Repetition.		IV. Studied by Recall.	
	Time in min.	No. correct.	Time in min.	No. correct.	Time in min.	No. correct.	Time in min.	No. correct.
Individual.								
A .....	11	13	8	14	10	9	6	7
B .....	12	15	12	20	12	19	12	18
C .....	20	16	10	20	10	20	8	19
D .....	15	17	14	19	16	14	23.5	17
E .....	18	12	17	20	17	17	14	16
F .....	14.7	11	15.5	14	16.2	13	12.3	14
G .....	9	5	7	11	3.5	15	4	14
H .....	19.8	17	14	18	15	17	17	12
I .....	25	17	21	18	25	20	25	15
J .....	45	14	40	12	25	9	25	10
K .....	15	16	19	20	23.5	20	14.5	19
Average .....	18.6	13.9	16.1	16.9	15.8	15.7	14.7	14.6

It would seem desirable to repeat such experiments in view of the conflict between the results obtained here and the deduction which psychologists and students of education have made from the law of "forward conduction."

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Do experiment 36 at home and record the results. Follow the directions absolutely.

#### EXPERIMENT 36.

Arrange to be undisturbed through a morning or an afternoon or evening. Provide yourself with a watch that records seconds. Multiply mentally, using the examples printed on this page, writing absolutely nothing until you have an entire answer to an example. Then write it and proceed at once to the next. Record the time at which you begin, and record the time at which you finish each row. Do not stop at all except to record these times until you have finished all the examples or worked at least two hours. Then proceed as directed on page 107. Do absolutely the best work you can throughout.

	653	537	927	847	286	728
A.	<u>926</u>	<u>453</u>	<u>384</u>	<u>265</u>	<u>757</u>	<u>487</u>

Here follow 8 similar rows.

After finishing examples above or working for two hours, rest for half an hour and then do row J on this page, recording the time of beginning and the time of ending.

On the following day in the morning after you have had breakfast and a half hour's rest, do row K on this page, recording the time of beginning and the time of ending as before.

You will, of course, do these mentally, without writing anything till the whole answer is obtained.

	428	495	467	256	297	279
J.	<u>369</u>	<u>743</u>	<u>853</u>	<u>368</u>	<u>832</u>	<u>687</u>
	853	486	294	372	287	837
K.	<u>294</u>	<u>954</u>	<u>623</u>	<u>736</u>	<u>924</u>	<u>568</u>

Fill out the record-blank below. A key of the answers will be found on page ....

As in the earlier experiment, the product produced per unit of time improved in amount and quality during the work period. I have divided the seventy-two subjects into four groups according to their initial ability in the test. The first group averaging .61 of an example per minute in the first row did .68 examples per minute in the last row of the work period. The percentage of right figures in the answers rose from .86 to .87. The second group rose from .36 examples per minute with 80% right figures to .38 examples with 83% of right figures. Similar facts are given in Table I for the other groups.

The rest of 30 minutes improves the scores further and the rest of a night improves them still further. The improvement which follows upon them, and which is the most useful measure of fatigue, or the

temporary deterioration preventable or curable by rest, is, however, small. The facts are given in Table I. We may summarize them very roughly as follows: The rest of 30 minutes increased the product produced per unit of time by about 5%; the rest of a night increased the product by about 7% more. The accuracy of the work remained almost exactly the same.

TABLE I.

*The Effect of Continuous Exercise of from 100 to 140 Minutes, of a Rest of 30 Minutes, and of a Full Night's Rest, Upon the Quantity and Quality of Mental Multiplication with Three-Place Numbers, in the Case of 72 Individuals.*

	1		2		3		4	
	Average score for first row of six examples.		Average score for last row of six examples done.		Average score for row done after 30 minutes' rest.		Average score for row done after night's rest.	
	Amount per minute.	Percentage of correct figures in answers.	Amount per minute.	Percentage of correct figures in answers.	Amount per minute.	Percentage of correct figures in answers.	Amount per minute.	Percentage of correct figures in answers.
Group I (n=18)...	.61	.86	.68	.87	.80	.88	.80	.90
Group II (n=18)...	.36	.80	.38	.83	.41	.81	.44	.82
Group III (n=18)...	.24	.80	.35	.85	.33	.85	.39	.84
Group IV and III combined.....	.30	.80	.365	.84	.365	.83	.41	.83
Group IV (n=18)...	.143	.76	.168	.78	.182	.78	.191	.81

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