

Hard-to-find classics 3: Peterson & Peterson (1959)

Reference

Peterson LR & Peterson MJ (1959) Short-term retention of individual verbal items. *Journal of Experimental Psychology*, 58: 193-8.

Introduction

Lloyd & Margaret Peterson were interested in the relationship between acquisition, repetition and retention. They observed that in learning verbal material, for example, repetition during acquisition was needed for retention. However, they also noted that previous studies had not tested the effects of repetitions within the time span available for acquisition. In other words, nobody had looked at the effect of re-reading or repeating stimuli while they are being learned on later ability to remember them. They therefore measured how well items were retrieved after different length delays before recall. They also investigated the effect of varying the opportunity for rehearsal. Their findings were subsequently used to indicate the duration of short-term memory.

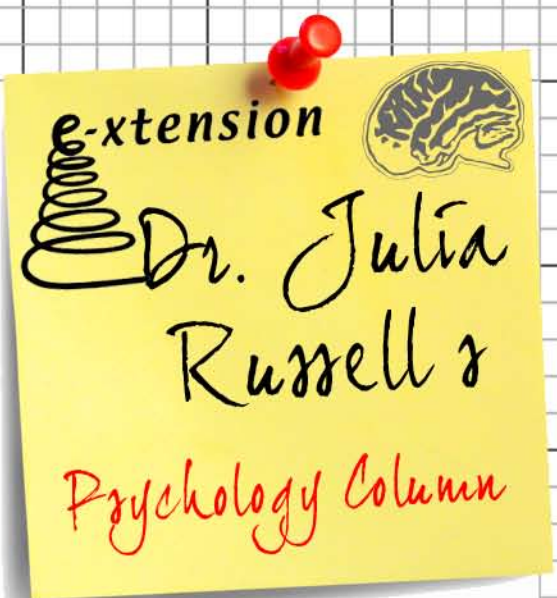
Experiment 1: Aim

To investigate the probability of recalling items when rehearsal is prevented for different lengths of time.

Experiment 1: Procedure

The participants were 24 introductory psychology students from Indiana University. They were tested on recall of trigrams - meaningless three-consonant syllables (eg CHJ). The experimenter sat on the participant's right and spoke each trigram out loud, individually. No two successive trigrams contained any of the same letters. After hearing a trigram, the participant was instructed to count backwards in threes or fours (from a random number). The purpose of this was to prevent rehearsal. When a red light appeared they recalled the trigram. For example a participant might be told they were expected to count backwards in threes. They could hear the experimenter say 'FBC 309' and would be required to say '309, 306, 303, 300' etc until they saw the red light appear and would then try to remember '309'.

There were six different time intervals between the experimenter saying the syllable and the light signalling recall (3, 6, 9, 12, 15 and 18 seconds). Each participant was tested on each of these intervals once in each block of six trials.



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Experiment 1: Findings

As the delay between hearing the trigram and reporting it increased, the ability to recall it decreased. This relationship can be seen in Figure 1

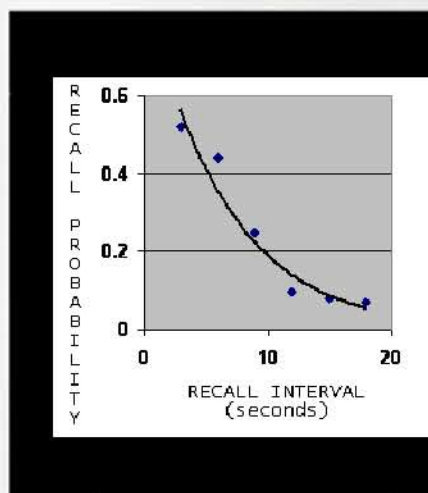


Figure 1 Recall declines over time.
(From Peterson & Peterson)

Experiment 2: Aim

If, as suggested by Experiment 1, retention is dependent on the opportunity for repetition, then the probability of recall after any given time delay should be related to the number of repetitions of the stimulus. The aim of Experiment 2 was to test this idea.

Experiment 2: Procedure

The participants were 48 introductory psychology students from Indiana University. The general procedure was similar to experiment 1 but with the following differences:

- Only recall intervals of 3, 9, and 18 seconds were tested.
- These were repeated in 'vocal' and 'silent' conditions (in which the participant either repeated the trigram aloud in time with a metronome or 'in their head' respectively).
- In each of the 'vocal' and 'silent' conditions, three different time periods were given for rehearsal: 3 seconds, 1 second or 0 seconds (the latter being the same as Experiment 1).

e-extension



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Psychology Column

Experiment 1: Conclusion

Verbal repetition prevents rehearsal so items being learned (those in short-term memory) are lost. Items last a maximum of approximately 18 seconds.



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Experiment 2: Procedure

The participants were 48 introductory psychology students from Indiana University. The general procedure was similar to experiment 1 but with the following differences:

- Only recall intervals of 3, 9, and 18 seconds were tested
- These were repeated in 'vocal' and 'silent' conditions (in which the participant either repeated the trigram aloud in time with a metronome or 'in their head' respectively)
- In each of the 'vocal' and 'silent' conditions, three different time periods were given for rehearsal: 3 seconds, 1 second or 0 seconds (the latter being the same as Experiment 1).

Experiment 2: Findings

Table 1 The effect of repetition

Probability of recall retention time (secs)	Recall interval (secs)		
	3	9	18
3	.96	.85	.72
1	.90	.72	.57
0	.86	.64	.56

As in Experiment 1, longer delays (recall intervals) produced poorer recall. As predicted, greater opportunity for repetition led to better recall, although this general pattern only appeared consistently in the 'vocal' condition.

Peterson & Peterson also noted that a major source of error was the confusion of the consonants 'm' and 'n'.

Experiment 2: Conclusion

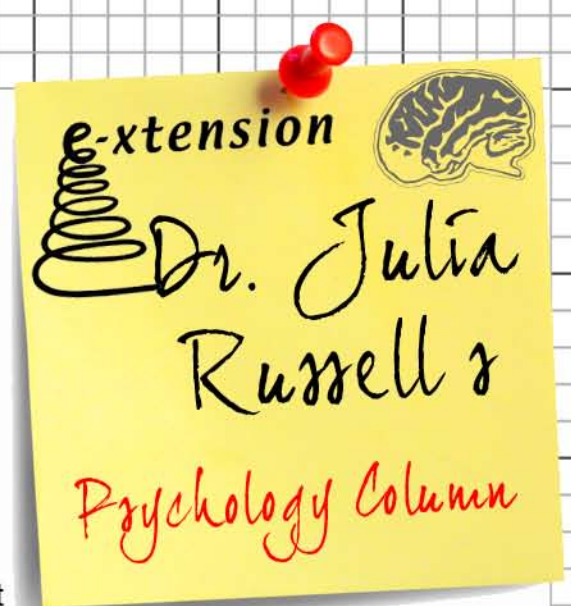
Peterson & Peterson concluded that the retention of items over short periods of time is less like a 'memory trace' and more akin to a product of 'trials' because it depends on repetition.

Comments

Many aspects of the procedure were very rigorously controlled. For example, the instructions to participants were standardised, repetitions of consonants and trigrams was avoided, the position of the experimenter and participant were fixed and the gap between learning one trigram and the next was standardised for all participants. In addition, much was done to avoid bias or the effects of practice. The starting number for counting backwards was randomised and counting was sometimes requested in 3s, sometimes in 4s.

Of course, learning nonsense trigrams and reciting them in time with a metronome are hardly day-to-day activities, so the task lacks mundane realism. However, we are required to remember things we have had little time to practice and things with very little meaning. In these respects the findings generalise to real world tasks so do have some ecological validity.

One interesting observation is the errors generated by the letters 'm' and 'n'. These consonants sound alike and this finding preceded the work of Conrad (1964) and Baddeley (1966) who, independently, demonstrated that sound-based errors are common in short-term recall, paving the way for the idea of an acoustic code in short-term memory.



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Questions

1. a) Suggest one reason why recall might have been better in the 'vocal' condition in Experiment 2 compared to the 'silent' condition.
b) Suggest one reason why recall in the 'silent' condition in Experiment 2 was more variable than the recall in the 'vocal' condition.
2. Identify two more examples of pairs of letters which sound alike and could be muddled in short-term memory.
3. An alternative way to vary the number of repetitions would have been to change the speed of the metronome. Suggest one reason why this might have been a better design than changing the amount of time available to rehearse and one reason why this might not have been a better design.

Ideas for practicals

1. Test the effect of fast and slow repetitions as described in question 3 above.
2. Repeat the Peterson & Peterson experiment using other stimuli, such as sets of three pictures or three words.



Ideas for practicals

References

Baddeley AD (1966) The influence of acoustic and semantic similarity on long-term memory for word sequences. *Quarterly Journal of Experimental Psychology*, 18(4):302-9.

Conrad R (1964) Acoustic confusions in immediate memory. *British Journal of Psychology*, 55:75-84.

