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THREE COMPARISONS OF RETROACTIVE AND PROACTIVE INHIBITION

BENTON J. UNDERWOOD*

Retroactive inhibition (RI) has long been recognized as one of the most potent factors in forgetting. Of relative recent treatment is the forgetting produced by the operations defining proactive inhibition (PI). If RI is defined as a decrement in the recall of an activity as a result of other activity *intervening* between the original learning and recall, PI may be defined as a decrement in recall as a consequence of an activity which took place *prior* to the original learning.

Before a precise formulation of a theory of forgetting is attainable, or before an adequate mathematical expression of the conditions of forgetting can be derived, it is necessary to make extensive comparisons of factors which cause variations in RI and PI. By such experimentation it may be possible to discover the convergent or divergent mechanisms which underlie the forgetting produced by these two types of inhibition.

It has been shown (Melton, A. W. & von Lackum, W. J., 1941) that with serially learned nonsense syllables RI is significantly greater than PI. It seemed desirable to extend their experiment by using adjectives learned as paired associates but keeping intact their basic experimental design. The present paper is a report of a series of experiments in which this has been done. In short, will RI always be greater than PI under comparable conditions?

METHODS AND MATERIALS

Three experiments have been performed with each experiment inculcating within its design the control and experimental conditions necessary for yielding measures of RI and PI. Except for minor variations, the design duplicates that used in the experiment cited above (Melton, A. W. & von Lackum, W. J., 1941).

* This research was under direction of the late Dr. John A. McGeoch. Experiment C, reported here, was in progress at the time of his death.

TABLE I

Sequence of Events in Experimental Conditions Designed to Measure Retroactive and Proactive Inhibition

Condition	Original Learning	Rest or Interpolated Learning	Relearning
I (RI Control)	A-B	30'	A-B
II (RI Work)	A-B (1')	A-K	A-B
III (PI Work)	A-B (1')	A-K	A-K
IV (PI Control)		A-K	A-K

Table I is a schematic outline of the 4 experimental conditions. Conditions I and II are the control and experimental conditions respectively for measuring RI, and conditions IV and III are comparable conditions for the measurement of PI. A-B represents a pair of two-syllable adjectives symbolic of the original learning, with A-K the interpolated learning in which the old stimulus is paired with a new response. Ten pairs of adjectives made up each list used.

The pairs were presented at a 4 sec. rate on a modified Hull memory drum. For each of the 3 experiments, 24 subjects were used. This allows for a complete counterbalancing of conditions so that unknown differential effects of any list are not specific to any conditions. Before the 4 experimental sessions started, each subject went through 2 practice sessions to familiarize them with the procedures used. Thus, each subject served approximately 6 hours. All rest periods were filled with the ranking (for humor) of mounted cartoons.

The basic design shown in Table I was used with the specific conditions of the three experiments varying as follows:

Experiment A. The subjects were graduate students in psychology. The adjectives were presented in constantly changing order with the criterion of original and interpolated learning being 6 correct responses on 1 trial.

Experiment B. The subjects were undergraduates. The pairs were presented in constantly changing order, but the criterion or original and interpolated learning was 6 trials.

Experiment C. Here again, the subjects were undergraduates, but the adjectives were presented in a *constant* order for each trial. The original and interpolated learning was for 4 trials.

The degree of original learning in the 3 experiments was approximately the same, despite the varying criteria used. The mean of the 4 original learnings for experiment A was 6.65, for B, 5.50, and for C, 5.74.

RESULTS

The most reliable measures of inhibition are the recall scores. Table II shows the mean number of correct responses on each of the 4 conditions of the 3 experiments of the first relearning trial. The experimental design outlined above allows for a direct com-

TABLE II

Amounts of RI and PI as Measured by the Mean Number of Correct Anticipations on the First Relearning Trial

Conditions	I	II	III	IV
Exp. A	4.08(.28)	2.17(.30)	2.71(.30)	4.54(.42)
Exp. B	4.54(.50)	2.50(.36)	3.25(.45)	4.79(.55)
Exp. C	3.71(.53)	1.71(.39)	2.54(.35)	3.33(.46)

parison of the recall scores of the PI and RI work conditions after it is shown that the recall on the two control conditions (I and IV) do not vary significantly by virtue of the small time differences existing between original learning and recall. Table II indicates that the recall differences on these conditions may be considered as being chance differences. In experiment C the difference is in the opposite direction from that which might be expected by the shorter time interval of condition IV. The sigma values are given after each mean.

In experiments A and B, significant amounts of RI and PI are found on the first relearning trial (t 's = 5.65 and 3.81, respectively for Exp. A, and 5.23 and 3.21 for Exp. B). In experiment C, however, no significant amount of PI is found, although the difference between the work and rest conditions is in the expected direction. The mean difference is .79, with a t value of 1.44. On the other hand, the mean difference between the RI work and PI conditions is 0.83 ($t=1.73$); in experiment B the difference is .75 ($t=2.03$); and in experiment A the difference is .54 ($t=2.00$). While all of these differences are statistically insignificant they are consistent with the finding previously reported (Melton, A. W. & von Lackum, W. J., 1941) with serial learning. What is left to be explained is why in serial learning the differences should be greater than in paired associates learning; this in spite of the fact that experiment C was set up to enhance serial learning of paired associates, since the adjectives were presented in a constant order and many of the subjects reported they learned the adjectives serially, at least in the initial and final portions of the lists.

Table III shows the percent of inhibition for the three experiments during the first three relearning trials. The percentages for the first relearning trial supplement the absolute decrements shown in Table II. Additional evidences for the greater influence of RI is shown by the more rapid dissipation of PI. Shown also is the greater transitoriness of the inhibition in experiment C as

TABLE III

RI and PI as Measured by Percent of Inhibition on the First Three Relearning Trials for Experiments A, B, and C

	Exp. A		Exp. B		Exp. C	
	RI	PI	RI	PI	RI	PI
Trial No. 1.....	47%	40%	45%	32%	54%	25%
Trial No. 2.....	31%	16%	25%	10%	12%	-5%
Trial No. 3.....	16%	11%	10%	4%	9%	-4%

compared with experiments A and B.

The data so far shown seem to indicate that RI is greater than PI, though the differences are small. We have one further measure of the inhibition which is corroborative evidence of these consistent though small differences. During the relearning of the original list (Condition II) or relearning of the interpolated list (Condition III), responses are made which are inappropriate for the list being learned, i.e., they are overt intrusions either from the original learning in PI, or from the interpolated learning in RI. Such intrusions are the most direct evidence available to support a competition theory of PI and RI (McKinney, F. & McGeoch, J. A., 1935, and Melton, A. W. & McQueen-Irwin, J., 1940). Table IV shows the frequency and locus of these intrusions as they occurred in the present experiments. More than cursory interest should be attached to these phenomena since a comparison of the frequency of these intrusions with the percent of inhibition shown in Table III shows a striking correlation, and this in spite of the fact that the gross frequency of intrusions is

TABLE IV

The Frequency and Locus of Overt Intrusions on the PI and RI Conditions of Experiments A, B, and C

	Exp. A		Exp. B		Exp. C	
	RI	PI	RI	PI	RI	PI
RL Trial No. 1.....	19	16	16	9	13	5
RL Trial No. 2.....	12	2	3	4	4	0
RL Trial No. 3.....	5	2	3	1	1	1
Remainder	20	4	6	1	2	0

relatively small, being less than one per subject at the point of maximal inhibition. No particular importance should be attach-

ed to intrusions which occurred in experiment A after the first three relearning trials. This sum, 20 overt intrusions, is a result of perseveration of errors for three subjects and is not typical of the learning of most subjects.

Any conclusions that can be drawn as to differences between RI and PI under the conditions reported in these experiments are contingent upon the acceptance of consistent small differences as true differences. The reason for placing some confidence in these differences is based upon a prior experiment with serial learning in which considerably larger and significant differences were found. The data on overt intrusions that have been presented also tend to support a conclusion of the greater potency of RI over PI. However, whether these differences are true differences or not, it appears that one important condition determining variations in PI and RI is the method of learning, i.e., serially or by the paired associates technique used here. Nevertheless, it is not clear from these experiments why or how these inhibitions diverge as a function of the mode of learning.

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LITERATURE CITED

- MCKINNEY, FRED, and MCGEOCH, J. A. 1935. The character and extent of transfer in retroactive inhibition: Disparate serial lists. *Amer. J. Psychol.* 47:409-423.
- MELTON, A. W. and IRWIN, J. M. 1940. The influence of degree of interpolated learning on retroactive inhibition and the overt transfer of specific responses. *Amer. J. Psychol.* 53:173-203.
- MELTON, A. W. and VON LACKUM, W. J. 1941. Retroactive and proactive inhibition in retention: Evidence for a two-factor theory of retroactive inhibition. *Amer. J. Psychol.* 54:157-173.