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## RETROACTIVE INHIBITION AS A FUNCTION OF THE RELATIVE SERIAL POSITIONS OF THE ORIGINAL AND INTERPOLATED ITEMS

ARTHUR L. IRION

The importance of retroactive inhibition as one of the major theoretical conditions of forgetting makes experimentation on it particularly important at this time. Retroactive inhibition may be defined as the decrement in an originally learned act attributable to the learning of a second act between the time of the original learning and its recall. More rigidly than this, retroactive inhibition may be defined in terms of the experimental operations, the experimental design employed in the production of it. This design, with minor variations, is of the following type.

*Condition*

Rest or control	Original Learning	Rest Interval	Relearning
Work or experimental	Original Learning	Interpolated Learning	Relearning

(There may, of course, be more than one experimental condition.) Retroactive inhibition is measured in terms of a comparison between the recall and relearning scores under these two conditions.

The acceptance of a transfer theory of retroactive inhibition carries with it the implication that the degree of similarity appertaining between the original and interpolated learning tasks is one of the major conditions of retroactive inhibition, for transfer of training, without regard to sign, is considered to be a function of the similarity between the two tasks. Similarity, however, is not a unitary thing. We may, for example, speak of the meaningful similarity of two words, or of the formal similarity between them. In other words, two tasks may be highly similar with respect to one characteristic and, at the same time, highly dissimilar with respect to another. It is, therefore, necessary to set up dimensions of similarity. Two dimensions, the dimension of formal similarity and the dimension of meaningful similarity have already been mentioned. In serial learning, by the anticipation method, however, we may set up between any two series of items a third dimension of similarity, providing that the items in the first list are in some other way related, say, as to meaning, with the items in the second list. This dimension we may call similarity of serial position.

Whether or not degree of similarity of serial position is one of the determining conditions of retroactive inhibition has long been a debated point. McGeoch and McGeoch<sup>1</sup> found that "similarity or identity of serial position is not an essential condition for the inhibitory operation of synonyms, nor is the relation a regular function of the positional disparity."

The experiment to be presented here is intended to investigate the effects of identical and changed serial order between the original and interpolated lists when these lists are composed of synonyms and when they are composed of identical words. Four experimental conditions and a control condition were employed. The control condition, or condition A, consisted simply of learning a list of ten adjectives by the anticipation method for five trials, then resting for ten minutes, then relearning the original list to a criterion of two successive perfect trials. The two experimental conditions wherein the interpolated list was composed of synonyms of the words in the original list differ with respect to the relative serial positions of these synonyms. In the first of the experimental conditions or condition B, the interpolated synonyms of the words in the original list were in the same serial position as the corresponding words in the original list. Thus, if the word "happy" appeared in the third serial position in the original list, its synonym "joyful" would appear in the third serial position in the interpolated list. In the second of these conditions, or condition C, the synonyms of the words in the original list which were used in the interpolated list appeared in a specifically changed serial order so that if the word "required" appeared in the fifth position in the original list, the fifth position in the interpolated list would contain, not the synonym of the word "required", but the synonym of some other word in the original list. The two conditions which investigated the effects of relative serial order when the same words are employed in the original and interpolated lists, were as follows: In condition D the original and interpolated lists were identical, both as regards the words contained in them and the order of presentation of these words. Under condition D, therefore, the subjects learned the same list during the interpolated as during the original learning period. Under condition E, although the same words were employed in the original and interpolated lists, the two lists were presented with the items in different or-

<sup>1</sup> McGeoch J. A. and McGeoch G. O. Studies in Retroactive Inhibition VI: The Influence of the Relative Serial Positions of Interpolated Synonyms. *J. Exper. Psychol.* 1936, v. 19, 1-23.

ders, so that now, if the word "spiral" was in the fourth serial position in the original list, another word contained in the original list would occupy the fourth position in the interpolated list.

The results obtained under these conditions are summarized in Table I.

Table I. Means.

Condition	Recall I.	Recall II.	Relearning I.	Relearning II.
A	5.68	7.72	3.68	5.00
B	2.16	5.24	5.76	6.44
C	1.24	4.16	6.12	7.60
D	8.80	9.64	0.76	1.00
E	2.04	4.44	6.44	8.48

(Recall I. equals the number correctly anticipated on the first relearning trial.

Recall II. equals the number correctly anticipated on the second relearning trial.

Relearning I. equals the number of relearning trials up to, but not including, the first perfect trial.

Relearning II. equals the number of trials to reach, but not to include the criterial trials. (2 successive perfect.)

(n = 25)

The significance of the differences between the means of these various measures as between the several conditions is shown in Table II.

Table II. "t" Tests Between the Conditions.

Condition	Recall I.	Recall II.	Relearning I.	Relearning II.
A-B	15.54*	5.09*	3.36*	1.89
A-C	9.61*	7.26*	2.79*	2.00
A-D	5.96*	6.30*	7.63*	4.64*
A-E	7.24*	7.13*	3.49*	3.21*
B-C	1.89	2.11	0.55	0.90
B-D	12.20*	16.63*	11.47*	10.16*
B-E	0.26	1.79	1.05	2.22
C-D	22.78*	13.69*	7.88*	5.62*
C-E	1.59	1.44	0.40	0.48
D-E	15.89*	13.58*	8.57*	8.23*

\* Indicates significance at the 1% level of confidence  
(n = 25)

These results may be summarized briefly as follows:

1. Under conditions B, C, and E, significant amounts of retroactive inhibition were produced as indicated by almost all measures of recall and relearning, while under condition D a significant amount of facilitation was produced.
2. Under condition E, where the only condition affecting the amount of retroactive inhibition was the changing of the

serial order of the originally learned items to make up the interpolated list, this serial position change produced a statistically significant amount of retroactive inhibition.

3. The relative serial order of the original and interpolated items when these items are pairs of synonyms did not seem to be one of the determining conditions of retroactive inhibition, there being no significant differences between the amount of inhibition produced under conditions B and C. This corroborates the findings of McGeoch and McGeoch.
4. There were no significant differences between conditions B, C, and E. In other words, condition E produced approximately the same amount of inhibition as did condition B or condition C.

From these results it would seem that the inhibitory action of changed serial position is, to a large extent, a function of the material to be learned. It has been shown that the interpolated learning of the original material in a changed order is capable of producing as much inhibition as the interpolation of synonyms either in the same or in a changed order. Thus we may say that retroactive inhibition is a function of the relative serial positions of the original and interpolated items under certain conditions, the main condition being the near identity of these items as regards formal and meaningful similarity.

These results may be interpreted in terms of the transfer theory of retroactive inhibition. This theory, holding as it does that retroactive inhibition is a function of the negative transference of the interpolated learning to the relearning of the originally learned act, can be successfully applied wherever it can be shown that the conditions productive of negative transfer were operating. According to Bruce<sup>2</sup> the major condition under which negative transfer occurs is the situation in which the individual must learn to make a new response to an old stimulus. This is, of course, merely another way of stating the familiar paradigm of Müller and Schumann, namely, that having learned to respond with response B to a stimulus situation A, it now becomes more difficult to learn a new response (K) to this same stimulus situation. It should be unnecessary to point out that since no two stimulus situations are identical it is more fruitful to speak of degrees of stimulus situation similarity rather than to deal with theoretically identical and actually different situations.

<sup>2</sup> Bruce, R. W., Conditions of Transfer of Training, *J. Exper. Psychol.*, 1933, v. 16, 343-361.

In this experiment there were three conditions under which it was necessary for the subject to learn to make a different response to a situation, during relearning, than the response which was learned to that or a similar stimulus situation during the interpolated learning. These conditions are B, C, and E. It is to be noted that these are the three conditions under which retroactive inhibition occurred. We thus may conclude that the inhibitory effects of the interpolation of the original material in a changed order of presentation may be reduced to the same theoretical basis as can almost all of the other phenomena of retroactive inhibition, namely to the transfer theory of retroactive inhibition.

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