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Retroactive Inhibition versus Proactive Inhibition as a Function of Variable Time Interval among Elementary School Children

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RETROACTIVE INHIBITION VERSUS PROACTIVE INHIBITION AS A FUNCTION OF VARIABLE TIME INTERVAL AMONG ELEMENTARY SCHOOL CHILDREN

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CHAPTER I

INTRODUCTION

Many investigators have asked whether retroactive inhibition is greater than the proactive inhibition of retention when the same materials are used to test both. The question is important because experimenters wish to know whether these two situations are measures of the same behavioral effect or whether one involves something more than the other. One classical experiment on this comparison (Melton & Von Lackum, 1941) used nonsense syllables and the technique of serial anticipation. Under these conditions retroactive inhibition was greater than proactive inhibition of retention. That is to say, an interpolated task has more inhibiting effect on the retention of an original task than an original task has on the retention of a task learned later.

If, however, a time interval is allowed between original learning and the test for retention, the difference between proaction and retroaction disappears (Underwood, 1948). The order difference between the tasks in proaction and retroaction will be slight compared with the time difference of a long retention period; if there is a long enough time lapse, the order of the tasks becomes unimportant. Thus,

while there is a difference between retroactive and proactive inhibition when the retention test is immediate or follows soon after original learning, the difference seems to disappear if the retention test is delayed. This effect, it is believed, is largely the result of recovery from retroactive inhibition rather than an increase in proactive inhibition, though some increase in proactive inhibition probably does occur after a long retention interval (Duncan & Underwood, 1953).

Atwater (1953) found that the degree to which the acquisition of a new task is aided by previous learning depends upon the amount of practice on the original task, but the greater the learning of a prior task, the more it will interfere with retention of the second task. Also, Briggs (1957) concluded that inhibition, either proactive or retroactive, grows with an increasing amount of practice on the interfering task, but that it is likely that there is a limit to this increase; it may even be that with very high amounts of practice on the interfering tasks, the inhibiting effects may decline slightly.

Melton and von Lackum (1941) hypothesized that retroactive inhibition, which presumably arises from both unlearning and competition of responses, should be greater than proactive inhibition, which is presumed to arise as a result of response competition alone. Their results showed that the amount of retroactive inhibition was significantly greater than that found for proactive inhibition. These findings held regardless of whether similar or dissimilar lists made up the

experimental material. A number of subsequent studies (Underwood, 1945, 1948; Slamecka, 1960) confirmed these findings.

Studies by Newton and Wickens (1956) and Postman and Riley (1959) called attention to evidence of the competition among generalized responses. Within this context, generalized response competition takes on the characteristics of a set to give responses to the most recent list learned. In the Postman and Riley study (1959), serial lists of nonsense syllables were used to measure both retroactive and proactive inhibition as a function of the degrees of original and interfering learning. Figure 1 presents the serial position curves for both the retroactive and proactive inhibition groups at recall. Postman (1961) pointed out that the retention decrement found in the initial portion of the list for the retroactive group could be attributed to generalized competition, which is reduced or eliminated once the context of the original list is reestablished.

In reviewing the large amount of literature, it was surprising to find that there are numerous studies that deal with proactive or retroactive inhibition singly, a fairly large number that deal with these two phenomena by contrasting or comparing them, and relatively few studies that compare the two types using variable inter-trial intervals. The notable exception to this last statement is Underwood's study (1948), and this experiment used intervals of five and forty-eight hours. Also, it was noticed that even the few studies that were done with

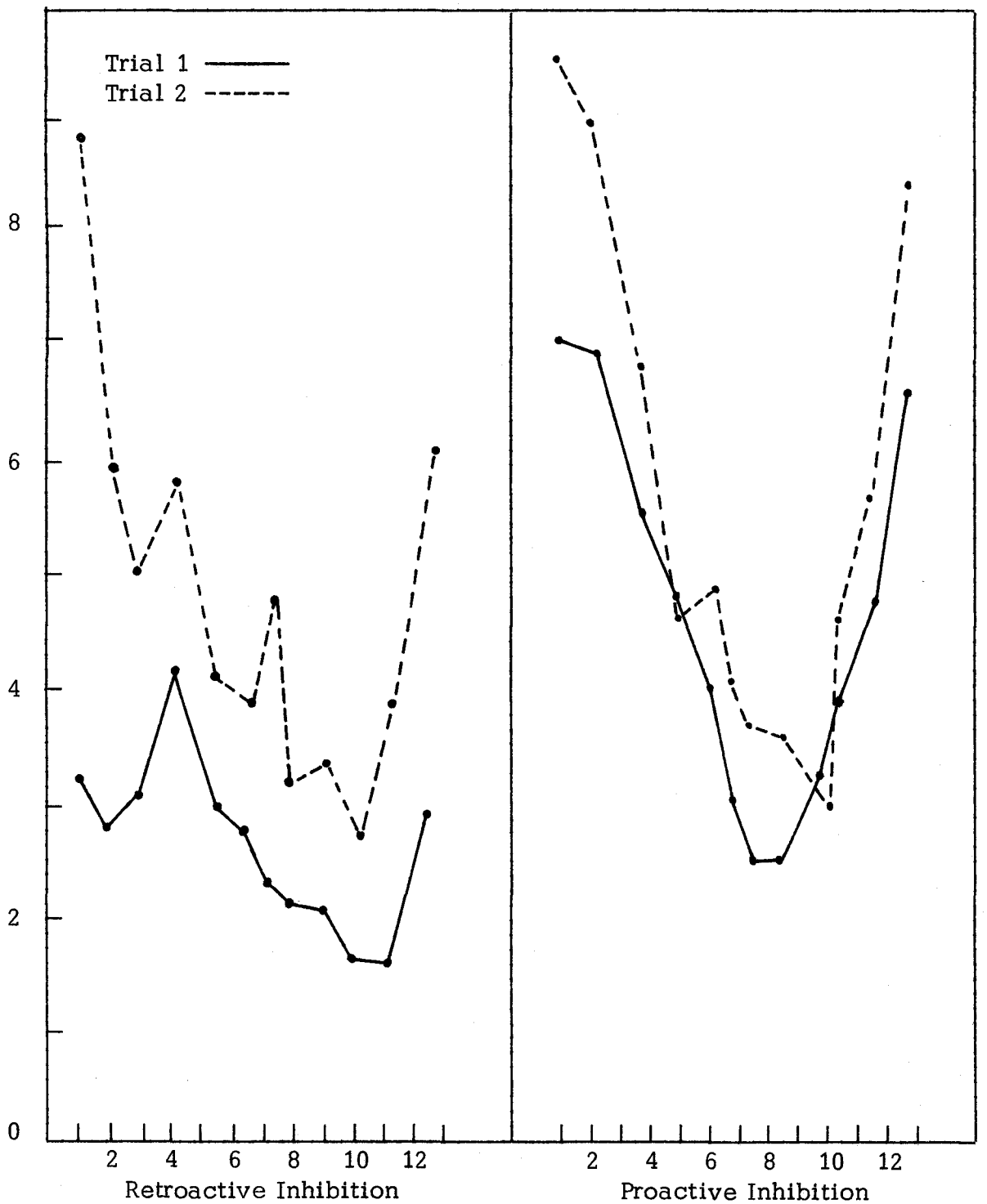

Fig. 1. Average serial position curves of retroactive and proactive inhibition groups at recall. (Adapted from Postman and Riley, 1959.)

variable inter-trial intervals were done with adult subjects, usually college students. It was wondered if the same results would occur if the subjects used were children in the ten to twelve year age bracket and if the inter-trial intervals were reduced in length.

As a study of phenomena which affect learning, the inquiry into retroactive and proactive inhibition and their varying functions should be of vital interest to both psychology and education, particularly to those educators and learning theorists who work with elementary school children. Also, it is hoped that this study will provide more reliable and statistically significant data on the question of whether retroactive inhibition is greater than proactive inhibition of retention. And, in addition, if there is a difference between retroactive and proactive inhibition when the retention test is immediate or follows soon after original learning, will this difference disappear if the retention test is delayed.

It was thought that retroactive inhibition would be greater than proactive inhibition of retention and that the difference in inhibition of retention would disappear as a longer time interval was allowed between study of items and test for retention.

CHAPTER II

METHOD

Subjects

For this experiment, 80 Ss were selected at random from among the fifth and sixth grade population of three elementary schools in Yakima, Washington. To assure randomization of selection of Ss, the E worked with the teachers of these students to select an equal number of Ss from three ability levels--above average, average, and below average. The three schools involved were selected because they represented a socio-economic cross section of the city of Yakima. All Ss were in the age group of ten to twelve years of age. Each S was randomly assigned to one of four test groups by the E so that there were 20 Ss in each group, so that there was an approximately equal number of Ss from each of the three schools in each of the test groups, so that there was an equal number of Ss from each of the three previously mentioned ability groups, and so that each experimental group had an equal number of fifth and sixth graders.

Apparatus

The apparatus consisted of 80 nonsense syllable tests, one for each S. The test consisted of four pages. The first page was a set of directions, the second a list of eight consonant-vowel-consonant trigrams, the third a different list of consonant-vowel-consonant trigrams, and the fourth a sentence of directions and a blank page. A stop watch with a second hand was used to time the performance of each S.

Procedure

The experiment began with retroactive inhibition group one (RI_1). Each S was taken individually into a room with a desk and was told that he or she was going to be given a test of verbal learning ability. The S was then given the first page of the test which was made up of directions (see Appendix). He was instructed to read the directions and to indicate if there were any questions about what he was to do. The directions indicated that two minutes would be given to study two lists of items and that the two-minute time period was for each list. Also, the directions instructed him not to turn to the second list until told to do so. When the directions were understood, the S began list one. After two minutes had passed, the S was asked to turn to the next page where list two would be found. Again, the S had two minutes to study the list. At the close of the period, the S was

instructed to turn to the last page, or page four, and read the instructions and to perform the operations they indicated. The instructions asked the S to list the items from the first page of items. Also, he was told that the items did not have to be in order and that he would be given two minutes to record his answers. All the Ss in RI_1 group followed the same procedure.

The proactive inhibition group (PI_1) used the same test as given above, except that they were asked to reproduce the second list they had learned.

In the second section of the experiment, the two test groups were labeled retroactive inhibition with interval (RI_2) and proactive inhibition with interval (PI_2). Retroactive group (RI_2) followed the same procedure as retroactive group (RI_1) and practive group (PI_2) followed the same procedure as proactive group (PI_1). The only difference in the procedure was that the last two groups, RI_2 and PI_2, had two minutes between each study period and between the last study period and the retention test, whereas the first two groups had no time between each study period or between the last study period and the retention test.

An attempt was made to control for any extraneous variables by standardizing the testing situation as much as possible. This was accomplished by: making tests for the groups alike, trigrams were the same for all groups, there was an equal number of starting consonants,

an equal number of middle vowels, and an equal number of ending consonants. Finally, time limits and intervals were equal for the first two groups, RI_1 and PI_1, and the last two groups, RI_2 and PI_2. Also, a similar testing environment was used and a randomized sample of the population (in terms of school attended, ability group, grade level, and socio-economic background) was used for test subjects in each group.

CHAPTER 3

RESULTS

The average number of items correctly remembered by group RI_1 was 2.3. The average number of items remembered correctly by group PI_1 was 3.70. The average number of items correctly remembered by group RI_2 was 2.2, and the average for the PI_2 group was 1.7. The total N for the four experimental groups was 80 with degrees of freedom equal to 79. The *t* test for independent samples run after plugging in the scores obtained for the experimental groups, yielded, contrary to previous experiments done and to the experimenter's hypothesis, that there was no significant difference between groups RI_1 and PI_1, either at the .01 or .05 levels. Further, as predicted, there was no significant difference between groups RI_2 or PI_2, either at the .01 or .05 levels. The value for the differences between the means of RI_1 and PI_1 obtained by running the *t* test was 1.62 and the value obtained for the difference between the means of RI_2 and PI_2 was .5841.

CHAPTER 4

DISCUSSION

Although the results obtained did not coincide either with the hypothesis proposed or with previous experiments alluded to in the introduction section there seemed to be some evidence for support of the hypothesis. It was hypothesized that the inhibiting effect of an interpolated task in the RI_1 group would be greater than the proactive inhibiting effect in the PI_1 group. Although the scores from these two groups did not yield a significant difference either at the .01 or .05 levels, the average or mean scores for the aforementioned groups seem significantly different when taken by themselves to at least indicate some trend in the direction hypothesized. The average score for group RI_1 was 2.3 items correct, whereas the score for PI_1 was 3.70 items correct.

There was no significant difference between the averages of RI_2 and PI_2. This same fact was hypothesized by the experimenter. However, since no significant difference was found between the RI_1 and PI_1 groups, and since the same items were also used with the RI_2 and PI_2 groups, the lack of a significant difference between these last two groups probably cannot be ascribed to the intervening two-minute

time intervals allowed between the studying of each of the lists and between studying the last list and reproducing either of the two lists of nonsense syllables. It was predicted that the presence of the time intervals would equalize the difference in the amount of inhibition of retroactive inhibition over proactive inhibition.

Previous studies referred to used longer inter-trial intervals. These intervals, in all cases, were considerably longer; one experimenter used 5 and 48 hours. It is possible that the intervals used were not long enough to allow the inhibiting effects of retroaction and proaction to equalize. Also, since all previous experiments involved the use of older Ss (usually college age), it is wondered if the younger Ss used in the present experiment may have had less ability to concentrate or a shorter attention span than the older Ss. This factor of age difference could be an important one because of the nature of the items learned. An older S, particularly those who were made aware of the fact that they were involved in a psychological experiment, might more readily study items which, in terms of their context, made little sense to them than would a relatively unsophisticated ten to twelve-year-old.

CHAPTER 5

SUMMARY

It was wondered if, as is pointed out in the literature, retroactive inhibition of retention is greater than proactive inhibition of retention. Also, it was wondered, as was pointed out in other experiments, whether if there was a difference, with retroactive inhibition being greater, that this difference in inhibiting effect would still exist if a time interval was allowed between study periods and between the last study period and a test for retention. Previous experiments had used varying amounts of time as inter-trial intervals; however, it was arbitrarily decided to try a much shorter time period than had been previously used and to use subjects ranging in age from ten to twelve years of age. The ages of the subjects used in prior studies were usually college students or older adults.

Subjects were randomly selected from the fifth and sixth grade classes in three Yakima, Washington, elementary schools. These schools were selected because they represented a socio-economic cross section of the city of Yakima. Students were assigned to groups on the following bases: (1) each of the four experimental groups had to have an equal number of students of the three ability levels--above

average, average, and below average; (2) all the students were in the ten- to twelve-year age group; (3) each of the four groups had an approximately equal number of Ss from each of the three schools; (4) each of the four groups had to have an equal number of fifth and sixth graders.

Eighty Ss were used with twenty Ss to each of four experimental groups. The groups were labelled as follows: Group 1 was RI_1, group 2 was PI_1, group 3 was RI_2, and group 4 was PI_2. The letters RI and PI stood for retroactive inhibition and proactive inhibition respectively. Group RI_1 had to study two lists consisting of ten consonant-vowel-consonant trigrams. Each list was studied for two minutes and S was then asked to reproduce the first list studied. Group PI_1 studied both lists for the same amount of time and then was asked to reproduce the second list studied. Both groups were allowed two minutes to reproduce their respective lists. Also, the lists learned were different. Group RI_2 followed the same procedure as RI_1 with the exception that each S was allowed a two-minute time interval between each of the study periods and between the last study period and the test of retention. Group PI_2 followed the same procedure as group PI_1 except that PI_2 also had the two-minute periods between study periods and between the last study period and the test for retention.

It was predicted that there would be a significant difference between the means of the scores obtained by groups RI_1 and PI_1. Also,

it was predicted that with the added two-minute interval between study periods and between the last study period and the test for retention for groups RI_2 and PI_2, there would be no significant difference between the means of the scores for these last two groups.

The results obtained after running a *t* test for independent samples were that there was no significant difference, either at the .01 or .05 levels, between the scores obtained by group RI_1 and PI_1. These results did not agree with the experimenter's hypothesis. Further, it was found that there was no significant difference between the scores for groups RI_2 and PI_2, as was predicted in the original hypothesis.

The conclusions reached were these. There seemed to be some trend in the data to support the conclusion that retroactive inhibition of retention is greater than proactive inhibition of retention when the same materials are used to test both. Also, there was no significant difference obtained between groups RI_2 and PI_2, as was predicted. However, since no significant difference was found between the RI_1 and PI_1 groups and since the same items were also used with the RI_2 and PI_2 groups, the lack of a significant difference between these last two groups probably cannot be ascribed to the intervening two-minute time intervals between the study periods and between the last study period and the test for retention.

It is felt that a time interval of longer than two minutes needs to be used. Other experiments have used intervals as long as five and

forty-eight hours. Also, it is felt that the use of nonsense syllables in a test of this kind of ability probably could be more effectively used with older Ss. It is obvious that much more research needs to be done in the area dealing with inhibition, both with young subjects and older ones and utilizing short as well as longer inter-trial intervals.

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APPENDIX

APPENDIX A

SUBJECTS SAMPLE TEST BLANK

Page 1

This is a test of verbal learning ability. You will be given two lists of items to study and two minutes to study each list.

Do not turn to the first list until told to do so or do not turn any of the other pages until told to do so.

You may turn to the first list and begin studying it if you understand what you are to do.

Page 2

Study this list:

YED
COK
TIW
LEB
KOV
XAL
ZIF
GOJ
MUB
HIV

Page 3

Study this list:

BIW
ZOX
FAL
JUZ
REL
XOT
SOH
KUV
DAJ
LIB

Page 4

For RI_1 and RI_2:

"Write down as many of the syllables from list one as you can. They do not have to be in order."

For PI_2 and PI_1:

"Write down as many of the syllables from list two as you can. They do not have to be in order."

APPENDIX B

SCORES FOR SUBJECTS BY GROUP

Subject Number	Number of Items Answered Correctly			
	RI_1 Group	PI_1 Group	RI_2 Group	PI_2 Group
1	0	2	0	4
2	0	3	1	4
3	2	4	3	5
4	6	7	1	0
5	2	2	0	2
6	3	4	2	1
7	1	6	4	0
8	3	3	4	1
9	2	4	3	2
10	3	1	0	0
11	1	1	5	2
12	1	3	5	0
13	3	3	0	1
14	3	3	1	1
15	1	4	2	0
16	1	5	8	3
17	5	3	2	2
18	2	8	2	2
19	4	3	2	2
20	3	5	2	2