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Retroactive inhibition and the simultaneous acquisition retention phenomenon

BENTON J. UNDERWOOD
Northwestern University, Evanston, Illinois 60201

The primary purpose of the experiment was to determine if simultaneous learning of A-B in the A-B,A-D paradigm reduced retroactive interferfence. Simultaneous learning was given on A-B, on A-D, or on neither list. Parallel conditions were used for the A-B, C-D paradigm. Simultaneous learning consisted of learning the paired associate list along with two free recall lists. The results showed that the magnitude of retroactive interference was not influenced by the simultaneous learning of either A-B or A-D. How simultaneous learning enhances long-term retention remains a puzzle.

When two or more lists of words are learned simultaneously, recall of each of these lists is better than if they had been learned alone. This has been called the simultaneous acquisition retention phenomenon (SARP). In seeking a cause for SARP, it seemed reasonable to presume that the simultaneous acquisition of lists in someway reduced the interference at recall. In particular, the evidence suggested that proactive interference was reduced by simultaneous learning. However, when a direct test was made of this hypothesis, it was not supported (Underwood, 1982). An A-B,A-D paradigm was used in that experiment, with the recall of A-D taken after 24 h. In one condition, A-D was acquired singly (without simultaneous learning), and in another, it was acquired under simultaneous learning procedures. The recall under the two conditions did not differ.

The present study is another test of the hypothesis that simultaneous learning reduces interference, but in this case retroactive interference (RI) is examined. The A-B,A-D paradigm is again used, and in the critical conditions, recall of A-B occurs immediately after the learning of A-D. In one case, A-B was learned singly, and in another, it was acquired under simultaneous learning procedures. The question is whether recall of A-B will be better when simultaneous learning is used than when A-B is learned singly.

Simultaneous learning may be thought of as providing a distinctive context that in some way allows for better differentiation of two interfering lists. If this occurs, it would appear that the same increase in differentiation could be produced by having A-D (the interfering list) acquired under simultaneous learning conditions. Therefore, this condition was also included.

It seemed desirable to carry out the above three conditions with an A-B,C-D paradigm, as well as with the A-B,A-D paradigm. One reason for this was related to the magnitude of interference reduction that might occur. Results for the A-B,C-D paradigm could be used as a reference for assessing the magnitude of any changes occurring in the recall of A-B for the A-B,A-D paradigm. A second reason for including the reference paradigm concerns a confounding that occurs when the interpolated list (A-D or C–D) is learned under simultaneous procedures. Because it takes longer to present the lists when simultaneous learning is involved, the retention interval for A-B is greater when simultaneous learning is used on the interpolated list than when it is not. We chose not to equate the retention intervals by using filler tasks. Rather, it was assumed that if the difference in the length of the retention interval influenced recall, it would do so equally for both paradigms. Therefore, the interaction between paradigm and simultaneous learning was used as a critical measure.

It should be emphasized that this study does not include the conditions needed to demonstrate SARP per se. Its purpose is only to determine if simultaneous learning will influence the amount of interference in RI.

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METHOD

Conditions

As indicated above, there were six conditions in the experiment. For three conditions, the A-B,A-D relationship between two successive paired associate lists was used. Condition A-B,A-D did not involve the simultaneous learning of either list. For Condition A-B*,A-D, the first list, A-B, was given under simultaneous learning procedures, the asterisk indicating simultaneous learning. In the third condition, Condition A-B,A-D*, the interpolated list was given under simultaneous learning procedures. The other three conditions paralleled those just described, except that the A-B,C-D paradigm was used. The three conditions are identified as A-B,C-D, A-B*,C-D, and A-B,C-D*.

Lists

The critical or target list (A-B) and the interpolated lists (C-D and A-D) consisted of paired associate lists of 10 pairs of two-syllable high-frequency words. The same A-B list was learned under all six conditions. When simultaneous learning was involved, two lists of 10 words each were used as free recall lists. One of the lists consisted of 10 bird names, and the other consisted of 10 names of vegetables. The paired associate lists,

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as well as the free recall lists, were presented in three different orders.

Procedures and Subjects

A study-test procedure was used for learning. When the paired associate lists were presented singly, the study interval for each pair was 2 sec. On the test trials, the stimulus terms were listed on a sheet with a blank after each word. The subjects were allowed 60 sec to insert as many correct response terms as possible in the blanks. The criterion of A-B learning was eight correct responses on a single trial. The criterion of learning for the interpolated lists was 10 correct responses on a single trial.

For simultaneous learning, we used what was called a single-item condition in an earlier study (Underwood, 1982). Under this procedure, a subject was shown one item at a time for 2 sec. Each successive block of three items consisted of one item from each of the three lists (a paired associate list and two free recall lists). The order of the words in the successive 10 blocks was random. After studying all 30 items, the subject was tested by first requiring recall for the paired associates, then free recall of the bird list, followed by free recall of the vegetable list. The recall period was 60 sec for each list. After the first study-test trial was completed, a second trial was given, and this continued until the criterion of A-B learning was achieved. The subjects were always tested on the two free recall lists on the trial on which the criterion was reached for the paired-associate list. The subjects were fully instructed as to the nature of the lists and how they would be tested.

Immediately after interpolated learning, the recall of A-B was requested, with the procedures for the test being exactly the same as the procedures used in learning. If simultaneous learning had occurred for A-B, tests for the two free recall lists followed the test for the target list. For all six conditions, a further study-test trial followed the recall trial.

A schedule of the six conditions was made up such that each condition occurred 20 times and the order of the six conditions was random within each of the 20 blocks. The 120 subjects were assigned randomly to conditions from this schedule.

RESULTS

Learning

The mean numbers of trials to learn A-B to a criterion of eight correct responses varied between 2.50 and 3.05 for the six groups (F = .28). The mean numbers of correct responses on the criterion trial varied between 8.75 and 9.10 for the six groups (F = .50). Thus, there was no evidence that simultaneous learning influenced the rate at which A-B was acquired.

The mean numbers of trials required to reach the criterion of interpolated learning (one perfect trial) on the paired associate lists varied between 2.25 and 3.65. The relative difficulty of the A-D and C-D lists is not known. However, the fact that more trials were required to reach the criterion for A-D than for C-D would be expected, and the two means (2.53 vs. 3.18) differed reliably (t = 2.83).

Recall

The mean numbers of correct responses on the recall of A-B for each of the six conditions is shown in Table 1. As indicated in the introduction, if the recall for A-B*,A-D was greater than the recall for A-B,A-D, a case could be made that SARP results from a reduction in RI. As seen in Table 1, the difference was in the proper direction, but there was only one item difference in the recall for the two conditions, and this difference was not reliable (t = 1.35).

Table 1
Mean Recall of A-B and the Standard Deviations for the Six Conditions

Condition	Mean	SD
A-B, C-D	7.35	1.65
A-B*,C-D	7.50	1.24
A-B, C-D*	5.50	2.38
A-B, A-D	4.35	1.88
A-B*,A-D	5.35	2.63
A-B, A-D*	3.50	2.75

An analysis of variance was carried out on all six conditions classified according to paradigm (A-D vs. C-D) and to simultaneous learning (no simultaneous learning, simultaneous learning on the first list, and simultaneous learning on the second list). The analysis for this 2 by 3 matrix indicated that simultaneous learning was a significant source of variance [F(2,114) = 7.97, MSe = 4.90]. An examination of the means showed that this probably resulted from the relatively poor recall for Conditions A-B,A-D* and A-B,C-D*. As described earlier, the retention interval for A-B for these two conditions was longer than that for the other conditions. The average retention interval for A-B for the two groups having simultaneous learning on the second list was 13.2 min, whereas the average retention interval for the other four conditions was 3.5 min. It is likely, therefore, that the relatively poor recall for A-B when the second list was acquired under simultaneous learning procedures has no systematic importance. The analysis of variance showed that recall was much poorer for A-B when A-D was the second list than when C-D was the second list (F = 34.78). The interaction between paradigm and simultaneous learning was not reliable (F = .59).

Following the recall trial, all subjects were given a further study-test trial. Statistically, the results for this trial were the same as those for the recall trial, but the magnitude of differences was attenuated.

This experiment asked if simultaneous learning insulates a list against RI. The answer is clearly negative. Furthermore, the data indicate that simultaneous learning of an interfering interpolated list does not reduce the interference from that list. These conclusions mean that the processes underlying the simultaneous acquisition retention phenomenon remain obscure.

REFERENCE

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