Interference in recognition memory: A replication

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The subjects were given a single presentation of lists containing A-B, A-D pairs, following which pair recognition tests were administered. Four successive lists were given each subject. For one group, the response words were the same across the four lists, for the other group, they were different. No retroactive inhibition was found in recognition, and the amount of proactive inhibition measured was very small in amount. These results confirm those reported by Bower and Bostrom (1968).

There is a growing body of evidence which indicates that associative interference is minimal in recognition-memory tests under conditions where recall-memory tests clearly demonstrate the interference. For example, it has been observed that the increase in proactive interference as successive lists are learned and recalled does not occur if recognition measures are used (Underwood, Broder, & Zimmerman, 1973). One interpretation of this disparity is to assume that the critical factor involved is the strength of the association. Thus, whereas recall requires a strong association, recognition may be mediated even by relatively weak associations. In unlearning paradigms, particularly A-B, A-D, the recall of the B terms following A-D learning may show a severe decrement, whereas a recognition or matching measure of A-B will show little if any decrement. It might be argued that even though the A-B associations have been weakened severely there is still sufficient strength to mediate recognition.

A strength interpretation runs into problems. In particular, a study by Bower and Bostrom (1968) produced results which are troublesome to a strength interpretation. The investigators presented pairs forming A-B, A-D relationships, but each pair was presented only once prior to test. They failed to show either retroactive or proactive inhibition in recognition tests. It would seem that under conditions of minimal associative strength (one presentation of a pair), some decrement should have been found if associative strength is fundamental in the differences found in recall and recognition. It might be argued that a single presentation of A-D would not be expected to produce an appreciable amount of unlearning of A-B even though the latter has been given only a single presentation. But that some measurable amount should have been produced seems beyond doubt if associative strength is important in recognition decisions. The Bower and Bostrom finding seems sufficiently critical to warrant replication and

extension, and that is the purpose of the present report.

The subjects in the Bower-Bostrom study were presented a series of pairs, one time each, and then tested on a YES-NO recognition task. The results showed that hits for both A-B and A-D did not differ from the number of hits for control pairs. This is all the more surprising, perhaps, in view of the fact that each subject was given 15 successive lists in all of which the stimulus terms were bigrams and their response terms were single-digit numbers. Therefore, the successive lists formed a series of A-B, C-B paradigms (single-digit numbers were always the response terms), and many letters of the stimulus terms were repeated across lists. However, not only did the within-list paradigms fail to influence recognition, but the authors reported that there were no differences in performance across lists. The results seem to represent an impressive documentation of the complete lack of associative interference in recognition memory. Nevertheless, the theoretical importance of the finding was judged sufficiently great to justify replication.

In the present study, each subject was given four successive lists, with recognition memory being measured after each. Each list used different words for the stimulus terms, but the same words were the response terms in all four lists. Within lists, therefore, there were pairs fitting the A-B, A-D paradigm, and between lists, pairs fitting the A-B, C-B paradigm. As a parallel condition, other subjects learned four successive lists in which no word was used in more than one list. Presumably, this should eliminate the between-list interference which might result from the A-B, C-B paradigm.

METHOD

The subject was presented 30 pairs of words on a single trial. Within the list, some of the pairs formed an A-B, A-D paradigm. For some of these sets the subject was tested on A-B (retroactive inhibition, RI), and for other he was tested on A-D (proactive inhibition, PI). There were also control pairs, nominally A-B or A-D only. Immediately after the list was presented, a YES-NO recognition test was given on pairs. By re-pairing certain of the study items, wrong or NO pairs were formed along with the intact pairs used to measure RI and PI. In the two parallel conditions, all subjects were given four successive lists, all with

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Table 1

Mean Number of Correct Recognitions for RI and PI Pairs (E) and for Control Pairs (C) for Conditions S and D

Condi- tion	RI-E		RI-C		PI-E		PI-C	
	M	SD	M	SD	M	SD	M	SD
S	5.97	1.15	6.13	1.22	5.83	1.38	6.13	1.25
D	6.73	1.36	6.63	1.24	5.67	1.71	6.37	1.46

the same structure as will be described in detail later. In one condition, the response terms remained the same across all four lists (Cond. S), with the stimulus terms differing from list to list. In the other, both the response terms and the stimulus terms differed for each list (Cond. D).

Study lists

The 30 pairs in each list consisted of 10 buffer pairs (five at the beginning and five at the end), and 20 pairs of critical interest in the body of the list. Among the first 10 in the body of the list were four A-B pairs which were followed in the second 10 by four corresponding A-D pairs (RI and PI pairs) which would later be tested for RI and PI. Two additional A-B pairs among the first 10 served as control pairs for RI, and two additional A-D pairs in the second 10 served as PI controls. The remaining positions were occupied by additional A-B, A-D pairs and unique pairs which were used in producing re-pairings to serve as incorrect or NO pairs on the test. For all lists the stimulus terms were five-letter nouns, the response terms three-letter words of varying form class. All pairings for both Cond. S and Cond. D were made randomly, and the words used in a particular list resulted from random selection. The first list for both conditions was identical.

Test lists

There were 22 pairs on a test list. Eight of these came from buffer pairs of the study list and consisted of five correct pairings and three incorrect pairings. Four of the eight were tested in Positions 1-4, four in Positions 19-22. The 14 critical pairs occupied Positions 5-18. These included two RI pairs (A-B, A-D on the study list with only A-B being tested), two PI pairs (A-B, A-D, with only A-D being tested), two RI control pairs, and two PI control pairs. One of each of the above four types occurred within Positions 5-11, one within Positions 12-18 on the test list. All of these required a YES response to be correct. The remaining six positions were occupied by re-paired words for which a NO response would be correct. It should be noted that all words occurring on the test list had also appeared on the study list. There were no true new words involved.

Procedure and Subjects

The study lists were presented at a 4-sec rate on a memory drum. Eight seconds after the last pair was removed, the word "TEST" appeared followed by the test series. Each test pair was presented for 4 sec during which time the subject responded YES or NO to indicate his decision. The subjects had been instructed that a YES represented two words which had appeared together on the study list, with NO representing two words which had not appeared together on the study list. The subjects were further instructed that they must respond to each pair, guessing if necessary. After the recognition test on the first list was completed, the second study list was presented, and so on, so that all lists were completed in a single session.

A total of 60 undergraduate students served as subjects, 30 being assigned to each condition from a block-randomized schedule.

RESULTS AND DISCUSSION

Initially, the number of correct YES responses and the number of correct rejections (NO) were summed for each subject for each list. A mean percentage correct was then determined. The values for the four lists in order for Cond. S were 73.0, 71.8, 72.1, and 75.3. It may be seen that for this condition there were no appreciable changes across lists. This confirms the finding of Bower and Bostrom (1968). For Cond. D, the successive values were 73.9, 70.3, 77.6, and 82.6. At least after the second list, performance improved. An analysis of variance with the two conditions as one variable and the four lists as the other, showed that, overall, conditions did not differ ($F = 1.11$), although the main effect of lists was significant [$F(3,174) = 9.22$, $p > .01$] as was the interaction of Lists by Conditions [$F(3,174) = 3.46$, $p < .05$]. These data seem to indicate that a small amount of interference may have resulted from the use of the same response terms in the four lists in Cond. S. Across all item types for all lists combined, there were 75.8% hits and 31.5% false alarms for Cond. S, with the corresponding values for Cond. D being 79.4% and 28.5%.

The critical data are concerned with RI and PI. It will be remembered that there were only two items of each type in each list. Therefore, the data have been combined across the four lists and the mean number of correct recognitions shown in Table 1 are out of a possible eight correct. For RI or PI to be demonstrated, performance on the control items must be higher than performance on the experimental items. For RI, it is apparent that there was no consistent difference between the E and C pairs. Under Cond. S the performance on the C items is slightly better than on the E items, while this is reversed for Cond. D. For PI, the direction of the differences for both conditions is appropriate to infer interference. Summed across both experiments, the mean difference between the E and C items for PI reaches a borderline level of reliability [$t(59) = 2.00$, $p < .05$].

In summary, there was no evidence for RI in the recognition data. This confirms the report of Bower and Bostrom (1968). There is a suggestion of a small amount of interference resulting from the PI procedures. But, however one views the data, the general conclusion must be that there is minimal associative interference in recognition memory under the present procedures.

REFERENCES

- Bower, G. H., & Bostrom, A. Absence of within-list PI and RI in short-term recognition memory. *Psychonomic Science*, 1968, 10, 211-212.
- Underwood, B. J., Broder, P. K., & Zimmerman, J. Associative matching and cumulative proactive inhibition. *Bulletin of the Psychonomic Society*, 1973, 1, 48.

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