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Strategies and the A-B, A-D design: Effects of instructions

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A study is reported using a single-trial paired-associate procedure with words pairs conforming to an A-B, A-D paradigm. Pre-input instructions were manipulated so that subjects were told that they would be tested for recall of both responses B and D, or only B, or only D, or response B or D. The results indicated that instructions to recall B and D or recall B only led to higher levels of B recall than instructions to recall B or D. Further, the recall of D responses was greatest for the D only condition, while the recall of B and D and recall of B or D were at the same level. The comparison of these data to controls suggested retroactive interference and facilitation, although the differences were not statistically significant.

Petrich (1975) recently suggested a revision of interference theory which assumes that first and second lists are stored as separate memory units. Further, first-list items may intrude during second-list learning and provide an opportunity for storage of the first-list item with both first- and second-list memory units. Retroactive interference is found when there are no special cues for list discriminators, and thus the subject is presumably unable to retrieve the first-list memory unit.

What should happen if the subject is given a list cue? Specifically, instead of using two lists, let us present a single list which contains A-B, A-D items. If the subjects are informed of the A-B, A-D items prior to input, they should set up the equivalent of list markers (e.g., Anderson & Bower, 1974). If the subject retrieves A-B when A-D is presented, additional storage of A-B should result. It follows then that on a subsequent MMFR test, more B in contrast to D responses should be recalled, i.e., if both responses were required. This result would be expected from a view proposed by Runquist (1975). He emphasizes the critical role of discriminative cues in reducing interference. In this case, it would not only be reduced but it would be reversed.

The purpose of the present study was to test the above reasoning that follows from Petrich's (1975) modification of interference theory. Further, if the subjects are told that they will have to recall only B or only D, this instruction should lead to an active attempt to inhibit or reduce the additional storage of A-B (e.g., a generalized set to suppress, Paul & Paul, 1968) when A-D is presented and reduce the difference in recall level of B in contrast to D. Additionally, if the subjects do not know which of the responses they will be required to recall, will this operation also lead to an inhibition or reduction in the additional storage of A-B?

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METHOD

Design and Material

There were two groups of subjects. The experimental group (n = 40) received five experimental lists, while the control group (n = 20) received five different control lists. The experimental group received five different lists which differed in pre-input and postinput instructions as shown in Table 1. The subjects were told prior to being given a list that they would eventually be tested for the recall of B only, of D only, of B and D, or the recall of B or D. For the latter list, each subject was told after input to recall B for one list and D for another. The five experimental lists consisted of nine pairs of A-B, A-D items. There were three primacy and three recency buffers. The lag between A-B and A-D ranged from 1-11, with each lag represented approximately the same number of times across the five lists. The material consisted of common English words with a Thorndike and Lorge (1944) frequency count of at least 10. The subjects were informed of the A-B, A-D conditions and for three of the experimental lists, were told prior to input (and reminded again prior to output) to recall: (a) only B or (b) only D, or (c) both B and D. The last two experimental lists were those on

Table 1
Proportion of Responses Recalled for the Various Conditions

		A-B, A-D Lag				
	Average	1-2	3-4	5-6	7-8	9+
Recall of B: Pre-Input Recall Instructions						
B Only	.402	.38	.49	.34	.33	.43
B and D	.357	.40	.42	.24	.38	.30
Average	.380	.39	.46	.29	.36	.36
B or D	.276	.24	.27	.29	.39	.32
Controls	.319					
Recall of D: Pre-Input Recall Instructions						
D Only	.312	.27	.32	.33	.33	.33
B and D	.168	.12	.14	.19	.16	.25
B or D	.189	.17	.17	.22	.24	.17
Controls	.319					

which subjects were told prior to input that they would have to recall either B or D. Prior to output, they were told to recall B for one list and D for the other of these lists. The control group received five different lists which had 18 A-B pairs and three primacy and three recency buffers. The A-B pairs in the five A-B, A-D experimental lists were yoked to nine of the A-B pairs in the control lists at input and nine of the A-D pairs were similarly yoked at input. Since the results of the overall and the yoked analyses were in complete agreement, only the overall analyses will be reported.

Procedure

The subjects were run in small groups of up to five. The subjects in the experimental group were given the five different experimental lists according to a 5 by 5 Latin square such that each list type occurred approximately equally often in terms of order of appearance. In addition, each word pair occurred in each of the five experimental conditions approximately equally often. The five control lists were yoked to the experimental lists such that the buffer items and 9 of the 18 word pairs were exactly the same as the buffer and A-B pairs on the experimental lists. The instructions informed subjects of study and test trials and the A-B, A-D conditions. They were told that they would be told which response they were to recall for some lists before, and for some lists after, studying the list. The word pairs were projected on a screen at a 5-sec rate. Immediately after the presentation of a list (a study trial), the subjects were informed of the nature of the test and then given a sheet with all of the stimuli from the list. The order of stimuli was random with the exception that the buffer items were always listed last. The subjects were given a short practice list that contained A-B items only. After the test on the practice list, the instructions were reread and the five lists followed. There was a 1-min break between lists.

Subjects

Sixty subjects were obtained from the introductory psychology subject pool and participated in a 30-35-min session. Forty were assigned to the experimental group. The data from three subjects were discarded for failure to follow instructions leaving 37 subjects. Twenty subjects served in the control group.

RESULTS AND DISCUSSION

Table 1 shows the proportion recalled of response B and D for the various conditions. For response B, the instruction to recall only B or both B and D prior to input had no differential effect. However, both of these conditions led to greater recall than that for the condition told to recall B or D prior to input. An analysis of variance comparing the three conditions revealed a significant condition effect, $F(2,72) = 4.86$, $p < .025$, $MS_e = 2.47$. This overall analysis was divided into two orthogonal comparisons which revealed no difference between Conditions Recall B Only and Recall B and D, $F(1,72) = 1.79$, $p > .05$, although these two conditions combined were significantly different from Condition Recall B or D, $F(1,72) = 5.93$, $p > .025$. These data suggest that with the former two conditions, subjects adopted a strategy that led to greater recall of B than the latter group. These data represent a replication of a similar finding by Robbins and Bray (1974) with a continuous paired-associate task. Table 1 also shows that the recall for the B only and recall B and D conditions combined was greater than that for the recall B or D condition for Lags 1-6 and that for longer lags the recall levels were almost identical.

Table 1 also reveals that, for Response D, the recall D only condition led to greater recall than either the recall B and D or recall B or D conditions, $F(1,72) = 11.24$, $p < .01$, $MS_e = 1.96$, with no difference between the latter two groups, $F < 1$. The failure to find a difference between Conditions Recall B and D in contrast to Conditions Recall B or D is a failure to replicate a result of Robbins and Bray (1974). In that study, a continuous paired-associate task was used, and both lag and retention interval were manipulated. Three different groups were told at the beginning of the study to either recall B or recall D or to recall both B and D. They found no differences in recall between the group instructed to recall both B and D and the group told to recall only B or only D, respectively. It is possible that, in Robbins and Bray (1974), the failure to find any differences revealed a failure for the instructions to be effective. Specifically, the subjects in all three of their groups may have attempted to remember every pair presented, thus essentially converting all conditions to a recall B and D condition. In the present study, since subjects received relatively short lists and were informed both before and after input regarding recall instructions, they may have more easily followed instructions.

Comparison of the recall level of B and D responses reveals more B responses than D responses for all conditions except for the D only condition. Table 1 also shows the recall for the control group and reveals approximately 6% more recall of B for the recall B only and recall B and D instruction conditions relative to controls, although this difference was not statistically significant, $F(1,55) = 1.46$, $p > .10$, $MS_e = 2.17$. In addition, the control group showed 4% more recall of B than the recall B or D condition, although this difference was also not statistically significant, $F < 1$.

An analysis of the error data revealed that most of the errors were of omission (a range of 78%-89% across conditions). Although the proportions are very small, there is an indication that almost twice as many competing responses were recalled in error by the recall B or D condition than the recall B only or D only conditions, 6% vs. 3%, respectively.

The superiority of the recall of B responses, for Conditions Recall B Only and Recal B and D supports the predictions generated from Petrich's (1975) theory as outlined in the introduction. Furthermore, the lower recall for the recall B or D condition of response B may be interpreted as leading the subject to a strategy that actively suppressed A-B retrieval during A-D presentation. When these conditions were compared to control values, although evidence of retroactive facilitation and interference for the former two conditions and latter condition, respectively, was

suggested, the differences were not statistically significant.

The recall of response D for the recall B or D condition should be similar to that from the recall B and D condition, since they both suffer from a loss of processing time resulting from suppression and rehearsal of A-B, respectively. Both of these conditions should lead to lower performance than the control condition, since control items are not competing with related associations for processing time, hence proactive interference results. The recall only D condition data may be accounted for if we assume that the subject adopted a strategy which counted the number of times a cue occurred. When it occurred for the second time, only then was an associative unit, A-D, stored. Thus, for this condition, the recall of D should be similar to that of controls and greater than that for Conditions Recall B or D and Recall B and D.

In summary, the results of the present study reveal large effects of different strategies inferred to be used by subjects with an A-B, A-D design such that facilitation or interference may result. The study also provides additional data in support of Petrich's (1975) recent modification of interference theory.

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