The effects of training procedure, response similarity, and number of response alternatives in multiple-choice paired-associate learning

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Abstract

Prompting and confirmation training procedures were investigated in a multiple-choice paired-associate task in which response similarity and number of response alternatives were also manipulated. There was no overall difference in the effectiveness of the two training procedures, but prompting was again seen to facilitate performance during the early training trials.

Problem

The present experiment was designed to evaluate further the effectiveness of prompting and confirmation training procedures in multiple-choice paired-associate learning when various task variables are manipulated. In a recent study (Hawker, 1965), the effects of manipulating response availability and response meaningfulness were investigated, and the results supported earlier findings (Hawker, 1964) that while prompting facilitated performance during the early training trials it showed no overall superiority in any of the measures of learning. More generally, the results suggested that the effectiveness of a particular training procedure may depend upon the nature of the learning materials, and indicated that additional information was needed regarding the effects of manipulating other task variables.

As indicated previously, the use of a multiple-choice technique permits fairly precise control over the response repertoire available to the S. Hence, a second way in which response alternatives can be manipulated is to hold response availability (i.e., total response terms available) constant, but to vary the number of alternatives available on each presentation. In addition, response similarity can be varied to see how it might interact with manipulations in the number of response alternatives.

Method

The Ss were 48 undergraduate students who participated as part of the course requirement in introductory psychology. Six Ss were randomly assigned to each of the eight experimental conditions in a 2 by 2 by 2 factorial design in which the three variables were training procedure (prompting or confirmation), number of response alternatives (2 or 4), and response similarity (high or low). Each S was run individually.

Two eight-item paired-associate lists consisting of nonsense figure stimuli and adjective responses were used. One list was the same as that used in the first study (i.e., low similarity figures and low similarity adjectives), while the second list used the same stimuli,

but with high similarity adjectives as responses (list B described in Hawker, 1964).

The experimental procedure was essentially the same as that previously described. All Ss received seven series of trials with performance measures taken on test trials interspersed after every two practice trials. The apparatus differed from that used in the previous studies, however. Instead of the self-paced memory drum, a commercially produced teaching machine, the MTA Scholar, was used. This device is self-paced and functions much like the previously described apparatus. The learning materials are printed on fan-folded program paper which fits into the machine and the S controls the rate of presentation by pushing a switch on the front of the apparatus to advance each set of materials. Each presentation consisted of a stimulus term and either two or four response terms with the letters A, B, or A, B, C, D, printed underneath, and the S would make his response by writing the letter of the response term on the answer tape enclosed in the machine. (In all conditions, only the eight response terms in the basic list were used as alternatives.) During the practice trials, each set of items was followed by a feedback frame (i.e., the stimulus term and the correct response term) so that the S could check the accuracy of his response (for the prompting groups, the correct alternative was underlined each time so that the Ss always made the correct response during the practice trials). During the test trials, however, the S received no feedback concerning his responses and answer tapes were checked by the E after the experiment to ascertain the number correct on each test trial. As before, the S received a free-recall test five minutes after the end of the experiment proper.

Results and Discussion

The mean number of correct responses on each of the seven test trials is presented in Fig. 1. Analysis of the total number of correct responses indicated only that more correct responses were given under the two than under the four-alternative condition, $F(1,40) = 5.22, p < .05$. Neither training procedure nor response similarity had any reliable effect on the total number of correct responses. A second analysis was performed by combining the scores on the first three test trials and comparing them with the combined scores on the last three test trials. As in the previous studies, this analysis yielded a significant interaction effect between training procedure and trials which showed that prompting produced more correct responses than confirmation

Fig. 1. Mean number of correct responses on each test trial.

during the first block of trials, but that the two procedures were equally effective during the last block, $F(1,40)=4.51, p<.05$. There was also an interaction between trial blocks and number of response alternatives which showed that the superiority of the two-alternative condition was confined to the first block of trials $F(1,40)=6.21, p<.05$.

The significant effect due to number of response alternatives suggests that the list was learned faster under the two- than under the four-alternative condition. However, this effect could also be due simply to the fact that the probability of a correct guess was higher under the two-alternative condition. Hence, information is needed concerning the rate of learning. Since all of the Ss reached a criterion of two consecutive errorless test trials, total trials to criterion were computed and are presented in Table 1. While the group means can be seen to differ considerably, analysis of these scores failed to indicate any reliable sources of variance due to the main effects or to the interactions. The mean trials to criterion for the two- and the four-alternative conditions were 13.50 and 14.38 respectively, but this difference was statistically insignificant ($F<1.00$), and supports the above interpretation that the significant response alternative effect may have been primarily an artifact. To determine the effect of the various variables on final performance, the free-recall scores (see Table 1) were analyzed, but these scores also failed to indicate any reliable differences among treatments. There was suggestive evidence for a significant response-

Fig. 2. Mean performance speed on each test trial.

TABLE I
Total Trials to Criterion and Free-Recall Scores

Response Similarity	Condition	Trials to Criterion		Recall Scores	
		Mean	SD	Mean	SD
LOW	P-2	10.00	5.90	6.83	1.33
	P-4	14.00	6.75	7.33	0.82
	C-2	14.50	2.26	7.17	0.75
	C-4	15.50	3.51	6.50	0.55
HIGH	P-2	13.50	5.61	6.33	2.07
	P-4	15.50	5.17	7.50	1.22
	C-2	16.00	3.10	6.17	2.33
	C-4	12.50	2.95	7.83	0.41

alternative effect, $F(1,40)=2.99, p<.10$, but the direction was opposite to that found in the analysis of correct responses; that is, more items were correctly recalled under the four-alternative condition than under the two-alternative condition. There was also some evidence for an interaction effect between response similarity and number of alternatives, $F(1,40)=3.79, p<.10$, which indicated that with low similarity response terms, the number of alternatives had little effect on the number of items correctly recalled, but that with high similarity response terms, more items were correctly recalled under the four- than under the two-alternative conditions.

Finally, the time required to complete each test trial was obtained, and these data are presented in Fig. 2. These scores were analyzed by comparing performance speed over trial blocks and, with the exception of trial blocks, none of the main effects was significant. There was suggestive evidence that the two-alternative condition led to faster performance speeds, but the obtained F-ratio was not sufficiently large, $F(1,40)=3.68, p<.10$. There was, however, a significant trials by training procedure interaction, $F(1,40)=5.57, p<.05$, which showed that prompting produced faster performance speeds than confirmation during the first block of trials, but that the two procedures produced equivalent performance during the last block of trials, and which partially supports an earlier finding (Hawker, 1964) that prompting leads to faster performance speeds.

In summary, the results of the present study are generally negative. There again was no difference in the overall effectiveness of prompting and confirmation training procedures, although prompting did facilitate performance during the early training trials. Moreover, neither response similarity nor number of response alternatives was seen to interact with the training variable, and indicates, at least on the basis of the present results, that these two task variables do not differentially affect the efficacy of prompting and confirmation training procedures in multiple-choice paired-associate learning.

References

- Hawker, J. R. The influence of training procedure and other task variables in paired-associate learning. *J. verbal Learn. verbal Behav.*, 1964, 3, 70-76.
Hawker, J. R. The effects of training procedure, response availability, and response meaningfulness in multiple-choice paired-associate learning. *Psychon. Sci.*, 1965, 3, 329-330.