The effects of training procedure and variations in the P-A paradigm on the learning of paired-associates

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The role of Prompting and Confirmation training procedures in P-A learning was investigated further by using both multiple-choice and recall methods of presenting items in a self-paced P-A task. The results again indicated no overall differences between the two procedures in number of correct responses or trials to criterion, but did show that Prompting produced faster performance speeds.

Several previous studies (Hawker, 1964, 1965a, 1965b) have only partially supported the results of other investigators (e.g., Cook, 1958; Cook & Spitzer, 1960) that a Prompting procedure is more effective than a Confirmation procedure in the learning of paired-associates. However, there have been a number of differences in the procedures used by these investigators which may account for the diverse results. In particular, the Hawker studies have used a multiple-choice technique in presenting the paired-associates (requiring response recognition) while the Cook studies have employed a traditional paired-associate paradigm (requiring response recall), and the present study was directed toward examining how these basic variations in the P-A paradigm affect the efficacy of Prompting and Confirmation training procedures.

Method

Since a Prompting procedure necessitates the use of both practice and test trials, the multiple-choice and recall response modes were used for both types of trials. Thus, the experimental design was a 2 by 2 by 2 factorial in which the three variables were training procedure (Prompting or Confirmation), practice method (Multiple-Choice or Recall), and test method (Multiple-Choice or Recall). Eight Ss, undergraduate psychology students, were randomly assigned to each of the eight experimental conditions, and each S was run individually.

All Ss learned the same list of eight pairs of two-digit numbers and adjectives. The number stimuli were selected from the list of Battig & Spera (1962) and were all of low association value (values ranged from 1.00 to 1.35, with an average of 1.17). The adjectives were selected from the high similarity lists of Underwood & Goad (1951), and have been used in previous studies (Hawker, 1964, 1965b). The materials were printed on 8-1/2 x 11 in. paper and were presented on a TMI-Grolier Min/Max III teaching machine; the task was S-paced, and the S recorded his responses in a separate answer booklet.

TYPE OF TRIAL	PROMPTING	CONFIRMATION
MC PRACTICE	S ₁ R ₁ (\$ Observes) S ₁ R ₁ R ₂ R ₃ R ₄ (\$ Responds)	S ₁ R ₁ R ₂ R ₃ R ₄ (\$ Responds) S ₁ R ₁ (\$ Observes)
Re PRACTICE	S ₁ R ₁ (\$ Observes) S ₁ (\$ Responds)	S ₁ (\$ Responds) S ₁ R ₁ (\$ Observes)
MC TEST	S ₁ R ₁ R ₂ R ₃ R ₄ (\$ Responds) S ₂ R ₁ R ₂ R ₃ R ₄ (\$ Responds)	S ₁ R ₁ R ₂ R ₃ R ₄ (\$ Responds) S ₂ R ₁ R ₂ R ₃ R ₄ (\$ Responds)
Re TEST	S ₁ (\$ Responds) S ₂ (\$ Responds)	S ₁ (\$ Responds) S ₂ (\$ Responds)

Fig. 1. Illustration of various experimental conditions.

The various experimental conditions are illustrated in Fig. 1. It will be noted for both the practice and test trials that the Multiple-Choice (MC) technique² involved the presentation of a stimulus term and four response alternatives, while for the Recall (Re) technique, only the stimulus term was presented, and the S was required to reproduce the appropriate response term. Fig. 1 also illustrates the Prompting and Confirmation techniques used during the practice trials. That is, under the Prompting technique, the S was first shown the correct S-R pair, and then made his response, while under the Confirmation procedure, he made his response and then was shown the correct S-R pair. Finally, as the figure indicates, the test trials were identical under both Prompting and Confirmation and involved simply the presentation of the eight items using either the MC or the Re technique, and the S was required to write down what he thought was the correct answer in his answer booklet. The Ss were given no knowledge of results during the test trials; all Ss received 10 series of alternating

Table 1. Mean Total Correct Responses, Trials to Criterion, and Errors per Test Trial

Group	Total Correct Mean	Total Correct SD	Trials to Criterion Mean	Trials to Criterion SD	Errors per Trial Mean	Errors per Trial SD
P: MC-MC	74.75	4.74	2.75	1.28	1.67	1.27
P: Re-MC	73.38	6.05	3.75	2.19	1.50	1.14
P: MC-Re	64.12	11.01	5.38	3.29	2.88	0.94
P: Re-Re	70.25	8.66	3.38	1.68	2.48	1.35
C: MC-MC	71.12	4.49	4.63	2.26	1.96	0.79
C: Re-MC	73.62	4.24	3.88	1.55	1.65	1.01
C: MC-Re	64.88	12.06	5.12	2.85	2.66	0.87
C: Re-Re	66.25	9.78	4.38	2.13	2.82	1.04

Fig. 2. Mean number of correct responses on each test trial.

practice and test trials, and the answer booklets were checked after the experiment to obtain acquisition data.

Results and Discussion

Summary data for each group are presented in Table 1 (the group designation is read as follows: the first letter indicates training procedure, the second set of letters indicates practice method, and the last set of letters indicates test method). Analysis of the number of correct responses on each test trial (see Fig. 2) indicated that the only significant sources of variance were those due to test method, to trial blocks, and to the interaction of test method and trial blocks. The significant test method variable indicated that significantly more correct responses were given under the MC than under the Re method ($F=11.37$, $df=1/56$, $p<.01$), but the interaction effect indicated that the superiority of the MC test method was confined to the early test trials ($F=7.48$, $df=9/504$, $p<.001$). Neither Training Procedure ($F<1.00$) nor Practice Method ($F=1.10$) had any reliable effect on the total number of correct responses or on the pattern of correct responses over test trials.

The analysis of trials to criterion and of mean errors per test trial also failed to show any differences between the Prompting and Confirmation procedures. In fact, analysis of the trials to criterion failed to indicate any significant sources of variance, while the analysis of mean errors per test trial indicated only that the error rate was lower for Ss under the MC test method than for those under the Re method ($F=14.48$, $df=1/56$, $p<.01$). All other main effects and interactions were non-significant with $F<1.00$ in all cases. Since the task was self-paced, the amount of time required to complete each test trial was recorded, and a repeated-measures analysis carried out. Prompting led to faster performance speeds than Confirmation ($F=5.01$, $df=1/56$, $p<.05$), although an interaction between training procedure and trials indicated that the superiority of the

Prompting procedure was confined primarily to the earlier trials ($F=2.01$, $df=9/504$, $p<.05$), as has been found previously (Hawker, 1964, 1965b). The Re practice mode led to faster performance speeds than did the MC practice mode ($F=4.86$, $df=1/56$, $p<.05$), but the two test methods did not affect performance speed ($F<1.00$). There were also several interaction effects noted over the series of test trials, but indicated essentially that the significant differences noted above decreased as training progressed—all groups seemed to be performing at an asymptotic level during the last few test trials.

Thus, the results of the present study indicate that the particular method of presenting paired-associates does not differentially affect the efficacy of Prompting and Confirmation training procedures. However, the task appeared to be learned quite easily, and this could have masked any differences in learning performance by the various groups. It had been anticipated that the list made of low association value digits and highly similar adjectives would be fairly difficult to learn, but apparently this was not the case, as examination of Table 1 indicates that performance was at a generally high level for all groups. A second explanation may lie in the fact that there are still several differences in the procedures used by the present writer and by Cook, which need to be examined systematically to determine those conditions which produce differences in the effectiveness of the two training procedures.

References

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Notes

1. A paper based on these data was presented at the SWPA convention in Arlington, Texas, April, 1966.
2. Under the Multiple-Choice method, for both practice and test trials, the alternative responses in all cases were made from the eight basic response terms, and these items were arranged so that each response term appeared an equal number of times as an alternative response, and the particular alternatives for a given stimulus varied from trial to trial. In addition, four different orders of presentation were used to preclude any serial learning.