

Comparison of anticipation and recall procedures in verbal-discrimination learning¹

WILLIAM F. BATTIG AND RICHARD W. SWITALSKI

UNIVERSITY OF MARYLAND

Like paired-associate (PA) and serial learning, the standard anticipation (Ant) procedure of verbal-discrimination (VD) learning was found to be inferior to a recall (Rec) VD procedure whereby presentation of all VD pairs is temporally separated from presentation of all correct items. This Rec superiority obtained both between unmixed lists and within mixed Ant-Rec lists. Subsequent PA performance showed no significant transfer for items taken from the VD list for either Ant or Rec VD procedures.

A recall procedure, whereby the presentation of items for learning precedes and is completely separated from the testing of recall performance, has been shown to be a more efficient learning and analytic technique than the standard anticipation procedure in paired-associate (PA) learning (e.g., Battig, 1965), and more recently also in serial learning wherein it possesses the even more important advantage of markedly greater sensitivity to the effects of manipulated independent variables (Battig & Lawrence, 1966). The present study attempted a similar comparison between recall and anticipation procedures in verbal-discrimination (VD) learning, which also has been limited almost entirely to an anticipation procedure in which each attempted response is followed immediately either by presentation of the correct response or right-wrong information, which are informationally equivalent in the VD task. Battig & Berry (in press), however, recently found VD learning to be extremely rapid under a recall procedure whereby all correct items were presented alone at the beginning of each trial and were followed by the presentation of each VD pair with no information as to correctness of S's responses. Using this procedure, they also found little if any negative transfer to PA learning of pairs of items that had been paired differently in the VD task, in sharp contrast with previous findings of consistent negative transfer under these conditions (Battig & Brackett, 1963; Battig, Williams, & Williams, 1962). Thus the present design also included an evaluation of subsequent transfer to PA pairs consisting of correct items from two different VD pairs.

In addition to the between-groups comparisons of anticipation and recall procedures that have typified previous studies, the present design also included the mixed-list technique recently introduced by Battig & Wu (1965), under which half of the VD pairs in each list corresponded to anticipation and recall conditions.

Method

Each of 48 Ss, all introductory psychology students fulfilling a course requirement through their participation, was assigned unsystematically to one of four groups

of 12 Ss each, half of whom were run by each of two Es. All Ss learned a 12-item verbal-discrimination (VD) list which differed for the four groups as to use of anticipation (Ant) or recall (Rec) procedures. For the Ant group, each pair presentation was followed immediately by the arbitrarily designated correct item from that pair. Each trial for the Rec group, however, began with the presentation of all 12 VD pairs, followed by presentation of all 12 correct items in the same serial order. The remaining two groups used a mixed-list (Mix) procedure, which provided that subsets of six pairs each corresponded to Ant and Rec procedures. Following Battig & Wu (1965), the test-separate (Mix-T) group began each trial with the six Rec VD pairs, followed by a mixture of the six Rec correct items among the six Ant pairs and correct items. The other mixed group, designated as the correct-item separate (Mix-C) condition, began each trial with the six Rec pairs intermixed among the six Ant pairs and correct items, after which the six Rec correct items were presented together in succession. Prior to the first trial, all groups received an initial presentation of each of the 12 correct items.

Immediately after reaching criterion (four successive errorless trials) on the VD list, all Ss learned the same paired-associate (PA) list to a criterion of two successive errorless trials or a maximum of 18 trials, using the standard PA recall procedure whereby all 12 pairs were presented prior to the 12 stimulus terms in a different serial order for attempted response-term recall. Half of the 12 PA pairs, designated as pretrained (P) pairs, were constituted from the 12 correct VD items, whereas the remaining six new (N) pairs consisted of new items not appearing in the VD list. Through the use of two different VD lists, each learned by half the Ss in each group, each subset of six PA pairs was used equally often as P and N pairs.

The single PA list was identical to the 12-pair low-similarity list of Archer (1960) 75-85% CVC pairs used in two previous VD transfer studies (Battig & Brackett, 1963; Battig & Berry, in press), and the incorrect VD alternatives were selected from those employed under the low-similarity conditions of the latter study. Inter-item similarity was kept minimal, and there was no letter overlap between the two CVCs within any VD or PA pair. Both the VD and PA lists were presented at a 4-sec. rate with a 4-sec. intertrial interval on a Lafayette memory drum, using a tape which provided four different unsystematic serial orders for each list.

Results

Trials to criterion on the VD task showed significant ($p < .05$) group differences favoring the Rec (4.67) over

the Ant (5.75) group, as well as the Mix-C (5.58) and Mix-T (6.67) groups which did not differ significantly from one another. Within the latter two groups, significantly ($p < .005$) fewer VD errors per item were made on Rec (0.13) than Ant (0.58) subsets. In contrast with the slight reduction in errors per item made by the Rec group (0.08) under unmixed than mixed conditions, the unmixed Ant group (0.22) showed a sufficient superiority over mixed conditions that the mixed-unmixed error difference was significant ($p < .05$) but the Rec-Ant group difference was not ($p < .10$). Thus the principal effect of mixing Ant and Rec items in the same list was to reduce performance on the Ant items, thereby increasing their inferiority to Rec items. Contrary to Battig & Wu (1965), however, who found no Rec-Ant difference under conditions corresponding to the present Mix-T condition, the latter showed a slightly but insignificantly greater Rec over Ant superiority (0.56) than did the Mix-C group (0.35). Both trial and error measures displayed significant differences between the two VD lists, but there were no interactions between Rec-Ant differences and lists (all $F_s < 1$).

Subsequent PA performance was closely comparable for all groups, except that the Mix-T group (52.3) made significantly ($p < .01$) more PA errors than Rec (20.9), Ant (29.8), and Mix-C (24.6) groups. For no group did performance differ on P and N pairs (all $F_s < 1$), and contrary to expectations from previous work, the Ant group showed slightly better performance on P (13.5) than N (16.3) pairs, whereas for the Rec group slightly more errors were made on P (10.9) than N (10.0) pairs. Thus there is no evidence that specific transfer from VD to PA learning even exists, much less that it becomes more negative under the Ant than the Rec VD procedure.

Discussion

As demonstrated previously for PA (e.g., Battig & Wu, 1965) and serial-learning tasks (Battig & Lawrence, 1966), presentation of the correct response immediately following S's attempted selection thereof from a VD pair represents a significant retarding influence as compared with the temporal separation of presentation of all VD pairs from that of the correct items that characterizes the present Rec procedure. This inefficacy of immediate "reinforcement" on a VD task, while somewhat surprising in view of its basic similarity to the simpler learning tasks for which delayed reinforcement has typically interfered with performance, nonetheless is consistent with recent findings of no deleterious effect of delayed feedback in human discrimination-learning tasks (e.g., Lintz & Brackbill, 1966).

The present lack of any differences between PA performance on pairs of items which had and had not

appeared in the previous VD list is also consistent with Battig and Berry's (in press) results under comparable Rec VD conditions. Moreover, the present failure to find negative transfer on P pairs under Ant VD conditions suggests that such results in previous studies (Battig & Brackett, 1963; Battig et al, 1962) may have been an artefactual consequence of the use of fewer N than P pairs and consequent facilitation of performance on N pairs when these are in the minority in a mixed list (Battig, 1966). As for the inferior PA performance by the Mix-T group, this may reflect the difficulty encountered by these Ss in adjusting to the PA recall procedure and its temporal separation of correct pairs for learning, since only the Mix-T VD procedure had involved unsystematic intermixing of all 12 correct VD items among the six Ant VD pairs. Thus further support is added to an interpretation of the greater learning efficiency under the Rec procedure as due to its complete separation of learning and performance functions (e.g., Battig, 1965; Battig & Wu, 1965).

References

- Archer, E. J. A re-evaluation of the meaningfulness of all possible CVC trigrams. *Psychol. Monogr.*, 1960, 74 (Whole No. 497).
- Battig, W. F. Procedural problems in paired-associate learning research. *Psychon. Monogr. Suppl.*, 1965, No. 1.
- Battig, W. F. A shift from "negative" to "positive" transfer under the A-C paradigm with increased number of C-D control pairs in a mixed list. *Psychon. Sci.*, 1966, 4, 421-422.
- Battig, W. F., & Berry, J. K. Effects of number and similarity of of pretraining alternatives on paired-associate performance on pretrained and new items under correction and noncorrection procedures. *J. exp. Psychol.*, in press.
- Battig, W. F., & Brackett, H. R. Transfer from verbal-discrimination to paired-associate learning: II. Effects of intralist similarity, method, and percentage occurrence of response members. *J. exp. Psychol.*, 1963, 65, 507-514.
- Battig, W. F., & Lawrence, P. S. The greater sensitivity of the serial recall than anticipation procedure to variations in serial order. Paper read at Midwestern Psychological Association, Chicago, 1966.
- Battig, W. F., Williams, J. M., & Williams, J. G. Transfer from verbal-discrimination to paired-associate learning. *J. exp. Psychol.*, 1962, 63, 258-268.
- Battig, W. F., & Wu, R. D. Comparison of recall and anticipation paired-associate procedures within mixed aurally-presented lists. *Psychon. Sci.*, 1965, 3, 233-234.
- Lintz, L. M., & Brackbill, Y. Effects of reinforcement delay during learning on the retention of verbal material in adults. *J. exp. Psychol.*, 1966, 71, 194-199.

Note

1. This research was supported by Public Health Service Research Grant HD-01062 from the National Institute of Child Health and Human Development. The authors are also indebted to Janet A. Lambert for assistance in running this experiment.