

Differential retroactive inhibition effects with pictures and words*

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Picture and word lists were manipulated in a retroactive inhibition design to investigate possible differential interference effects in free recall. Retroactive inhibition was demonstrated for both picture and word material, and the results also suggest that pictures produce less interference than words. Interlist similarity effects were also found where recall was better when one list consisted of pictures and the other list of words as compared to when both lists were pictures or words.

It has been found consistently that free recall of pictures is superior to that of words (e.g., Scott, 1967; Paivio, Rogers, & Smythe, 1968; Paivio & Csapo, 1969). One aspect involved in the superiority of picture over word recall might be that pictures produce less interference than words. Evidence from mnemonic imagery studies (e.g., Bugelski, 1968; Morris & Reid, 1970) suggests that when Ss repeatedly form images in a paired-associate task, there is little interimage interference.

The purpose of the present study was to investigate interference effects with picture and word stimuli in a free recall task. A retroactive inhibition (RI) design was used, involving four experimental groups and two control groups. Ss in the experimental groups learned two lists of stimuli and then had to recall the first list. Both lists consisted of pictures (Group P-P) or of words (Group W-W), or List I was pictures and List II was words (Group P-W), and vice-versa (Group W-P). The two control groups learned one list of stimuli, worked on a filler task, and then recalled the original list. The list consisted of pictures (Group P-X) or words (Group W-X). Comparison of recall between Groups P-X and P-P would show whether any RI occurs with the pictorial stimuli. The same comparison can be made for the word groups, W-X and W-W. A comparison of the magnitude of difference between Groups P-X and P-P with that of Groups W-X and W-W would assess whether there are any differential interference effects.

METHOD

Subjects

Sixty undergraduates of both sexes at the University of North Carolina at Greensboro served as Ss in fulfillment of a course requirement. They were assigned randomly to six groups of 10 Ss each.

Materials

Four 15-item lists were used; two of the lists consisted of colored pictures of common nouns and the other two lists consisted of typed words corresponding to the same common

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nouns. The stimuli were 2 x 2 slides and were presented by a Kodak Carousel projector controlled by a Davis timer.

Procedure

Ss in the experimental groups were first exposed to a list of either pictures or words, each item being presented for 4 sec with a 1-sec interstimulus interval. After each complete presentation of the list, there was a free recall period in which S was allowed to write responses until a 30-sec interval had elapsed without further recall. Presentation of the list was continued until S reached a criterion of 13 out of 15 correct. A second list of 15 different nouns was presented for three trials. Stimulus presentation and recall times were the same as used for the first list. Following List II learning, Ss were given a 3-min free recall period to write down List I items.

Ss in the two control groups learned a list of either pictures or words to a criterion of 13 out of 15 correct. Then they worked on arithmetic problems for 8 min, which approximated the time that Ss in the experimental groups spent on List II. The control Ss were then given 3 min for List I recall.

RESULTS

For the trials to criterion data of List I, a 2 (pictures or words on List I) by 3 (filler task, pictures, or words on List II) analysis of variance revealed no significant effects. The mean number of trials to criterion for the picture and word groups were 2.73 and 3.07, respectively.

For List II learning, a 2 (pictures or words on List I) by 2 (pictures or words on List II) by 3 (trials) analysis of variance revealed the following significant effects: trials, $F = 186.60$, $df = 2/72$, $p < .01$; List II, $F = 10.38$, $df = 1/36$, $p < .01$; List I by List II, $F = 5.24$, $df = 1/36$, $p < .02$; Trials by List I, $F = 3.35$, $df = 2/72$, $p < .05$; and Trials by List II, $F = 5.51$, $df = 2/72$, $p < .01$.

Table 1 gives the mean number of correct List II items per trial for each of the four experimental groups. It can be seen that performance was better when List II stimuli were pictures (Groups W-P and P-P) as compared to when they were words (Groups P-W and W-W). It was also found that performance was better when List I stimuli differed from List II stimuli than when both lists consisted of the same type of stimulus materials. That is, Group W-P performed better than Group P-P, and Group P-W performed better than Group W-W. A follow-up analysis revealed no significant simple effects for this interaction. In the Trials by List II interaction, performance in the picture groups was better than in the word groups on all three trials, the largest difference

Table 1
Mean Number Correct on List II

Group	Trials		
	1	2	3
W-P	11.30	13.50	14.00
P-P	9.30	12.70	13.60
P-W	8.30	12.80	13.40
W-W	8.00	11.80	12.50

Table 2
Mean Number Recalled on List I

List I	List II		
	X	P	W
P	13.1	9.2	9.8
W	13.5	11.8	8.0

occurring on the first trial. This latter difference and also the increases in number correct for both pictures and words from Trial 1 to Trial 2 were found to be significantly different (Scheffé least significant difference = 1.29, $p < .05$). The Trials by List I interaction indicated that List II performance was better on Trial 1 when List I consisted of words rather than pictures, while the opposite was true on Trials 2 and 3. The only significant simple effects were the performance increases for both List I picture and word groups from Trial 1 to Trial 2 (Scheffé least significant difference = 1.29, $p < .05$).

For the List I recall data, a 2 (pictures or words on List I) by 3 (filler task, pictures, or words on List II) analysis of variance revealed significant effects for List II ($F = 18.33$, $df = 2/54$, $p < .01$) and the List I by List II interaction ($F = 4.42$, $df = 2/54$, $p < .05$). Examination of Table 2 indicates that both control groups (W-X and P-X) recalled more List I items than did the four experimental groups. Comparisons among the experimental groups show that recall was best in Group W-P and worst in Group W-W. A follow-up analysis of the List I by List II interaction revealed that recall performances of Groups W-X and P-X were significantly greater than that of Group W-W and that recall for Group W-X was also significantly greater than that of Group P-P (Scheffé least significant difference = 4.17, $p < .05$).

DISCUSSION

The overall pattern of recall differences in Table 2 suggests that pictures produce less interference than words. Recall for Group P-X was better than it was for Group P-P, and recall for Group W-X was better than it was for Group W-W. Therefore, RI occurred with both picture and word stimuli. In addition, the RI effect was smaller for pictures than for words. That is, the performance decrement between Groups P-X and P-P was smaller than the decrement between Groups W-X and W-W. Thus, an interpolated list has a detrimental effect upon recall of original learning, and the recall decrement is smaller when the interpolated list consists of pictures rather than words.

The recall data in Table 2 shows a strong interlist similarity effect. Group W-W recalled fewer items than Group W-P, and Group P-P recalled fewer items than Group P-W. Thus, when the two lists are similar (Groups W-W and P-P), recall is poorer than when the lists are different (Groups W-P and P-W). This finding corresponds with similarity effects found using other kinds of stimulus materials (e.g., Wickens, Born, & Allen, 1963; Postman, Keppel, & Stark, 1965). It should also be pointed out that the similarity effect was less pronounced for pictures than for words. The difference in recall between Groups P-W and P-P was less than that between Groups W-P and W-W.

It would seem that the best account of the recall data is an interpretation that combines the effects of interlist similarity with the notion that pictures produce less RI than do words. Comparisons among the experimental groups (see Table 2) shows that recall was best in Group W-P, where interlist similarity was relatively minimal and where pictures were the interpolated material. On the other hand, recall was poorest in Group W-W, where the interlist similarity was greater and where words were the interpolated material.

Although the primary concern of the present study was to investigate interference effects in retention, a RI design also provides information concerning transfer effects. That is, what effect does learning List I have on List II performance? Examination of the List II data reveals a similarity effect where performance is poorer with high interlist similarity than with low interlist similarity. This can be seen from the superior performance of Group W-P over Group P-P, and of Group P-W over Group W-W (see Table 1). Since it was also found that List II performance was better with picture than with word material, perhaps pictures are less susceptible to detrimental transfer effects. However, it should be pointed out that the lack of appropriate control groups (e.g., X-P and X-W) prevents assessment of whether positive or negative transfer was involved in the present study.

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