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"FATE" OF FIRST-LIST ASSOCIATIONS IN TRANSFER THEORY

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Theorists who attempt to arrive at an accounting of the facts of transfer and retroactive inhibition in verbal materials must inevitably make a decision concerning "what happens" to first-list associations when a second list is learned. The present study was designed to gather data which would make such decisions easier. Two transfer paradigms were used. One of these, A-B, A-C, is normally associated with production of negative transfer. In the other paradigm, A-B, A-B′, stimuli are identical with responses highly similar; such an arrangement normally produces positive transfer.

The data from the present study allow an evaluation of three different conceptions concerning the fate of first-list (hereafter called List 1) associations during the learning of the second list (hereafter called List 2). These three positions will be examined first as they apply to the A-B, A-C paradigm.

1. List 1 associations are unlearned or extinguished during the learning of the second list. While A-B, A-C is more comparable to the operations of counterconditioning than to extinction of conditioned responses, the term extinction will be used here in keeping with past practice. As a theoretical position, the unlearning or extinction hypothesis is associated with Melton and Irwin (1940) who used it to explain certain facts of RI. They suggested that at least part of RI could be accounted for by the loss of associative strength of List 1 responses resulting from extinction. It might also be assumed that negative transfer results from the interference accompanying the extinction process. A rather impressive amount of evidence could be marshalled in support of this extinction hypothesis. For present purposes, however, only an illustration of this evidence will be given. At various points in learning the second list, Briggs (1954) presented the stimuli common to both lists, one at a time, and asked *S* to give the first of the two responses which came to mind. The results showed that during the learning of List 2 there is a gradual decrease in frequency of List 1 responses, the curve being not unlike an extinction curve. A phenomenon analogous to spontaneous recovery of the List 1 responses was also found when retention was measured at various intervals of time after List 2 learning. Such evidence appears quite in line with the extinction hypothesis. However, as Briggs points out, a certain amount of ambiguity remains; the extinction curve does not necessarily mean that List 1 associations are extinguished in the sense that they are no longer available for recall. His results may mean only that List 2 associations become stronger than List 1 associations, hence, occur more and more frequently in recall. Such an increase in frequency of List 2 associations must necessarily be accompanied by a decrease in frequency of List 1 associations at recall. The question still remains,

therefore, as to whether or not the A-B association is available after A-C is learned and this is one question the present study attempts to answer.

2. The system of associations in List 1 (A-B) remains relatively independent and intact throughout the learning of the associations in List 2 (A-C). This will be referred to as the independence hypothesis. The verbal stimuli are, of course, identical in the A-B, A-C paradigm, but there are other possible differentiating cues (e.g., first list vs. second list) which would provide a means of having two independent response systems attached to the same apparent stimulus. Negative transfer could be said to occur in the process of establishing the independent response systems early in learning A-C. Retroactive inhibition could be attributed to loss of differentiation so that response competition occurs.

3. A third possible conception makes use of mediation. Having learned A-B in List 1, *S* retains this association so that List 2 items are learned with B as the mediator; *S* learns A—B—C. Negative transfer and RI could occur as a consequence of confusion on the part of *S* as to which response is used as the mediator and which response is mediated.

In the present study, different groups of *S*s were stopped at various points in learning List 2 and were asked to give *both* List 1 and List 2 responses to each stimulus. If (as degree of List 2 learning increases) there is an increasing inability to give List 1 responses (over and above normal forgetting), the extinction hypothesis would be favored. If there was no such loss either the independence hypothesis or the mediation hypothesis would be favored. Provisions were included in the design to choose between these latter two if it became necessary. For example, if the mediation hypothesis is tenable it should be found that B is given before C more frequently than C before B when *S* is asked to write down both responses. The independence hypothesis would not predict such an ordering in response recall.

Turning next to the paradigm in which stimuli are identical but responses highly similar (A-B, A-B′), the present study should again provide bases for choice among the three hypotheses.

1. Because retroactive facilitation is expected with this paradigm (e.g., Young, 1955) it might appear than an extinction hypothesis is not tenable. However, by the use of extinction plus other factors it is possible to account for retroactive facilitation. It is a fact that more List 1 instrusions occur in the learning of List 2 for this paradigm than for the A-B, A-C paradigm. Thus, the nonreinforcement of these responses makes extinction a very plausible mechanism. So, it could be assumed that in learning A-B′, A-B is extinguished. Retroactive facilitation could then be accounted for by mediation. It is known that highly similar items have high associative connection (Haagen, 1949). When *S* is asked to recall A-B after learning A-B′, even if A-B is extinguished the mediation sequence in recall could be A—B′—B, since there has been no extinction of the strong association between B′ and B. However, without the addition of still more factors the positive transfer in learning A—B′ cannot be accounted for. Since the results of the present procedures do not make the extinction hypothesis a reasonable one for this paradigm, no attempt will be made here to suggest the additional factors needed to account for the positive transfer produced by this paradigm.

2. The independence hypothesis, used in conjunction with a theory of response generalization (Underwood, 1951), can be employed to account for both positive transfer and retroactive facilitation in the A-B, A-B′ paradigm.

3. The mediation hypothesis also provides an attractive alternative for this positive transfer paradigm. As noted above, items which have high similarity have high associative connection. Thus, having learned A-B, the learning of A-B-B′ should be very simple since B and B′ are already strongly connected. Therefore, positive transfer should occur. In learning List 2, if mediation occurs *S* will be given additional practice on A-B; hence, this association will be further strengthened during List 2 learning, and retroactive facilitation would be expected to occur.

In summary, two paradigms are used, one associated with the production of negative transfer, the other

with production of positive transfer. By requiring *S* to recall both List 1 and List 2 responses at various points in the learning of List 2, it was expected that choice could be made among three conceptions (extinction, independence, mediation) of the fate of List 1 associations during the learning of List 2.

METHOD

General.—Two parallel experiments were conducted, one using the A-B, A-C transfer paradigm and one using the A-B, A-B′ paradigm. Within each experiment there were four groups of *S*s. All *S*s learned a first paired-associate list (List 1) of eight pairs to one perfect trial. Then List 2 was presented for a specified number of trials, namely 1, 5, 10, and 20 anticipation trials for the four groups in each experiment. After the specified number of trials for a given group, the memory drum was stopped, *S* was provided a sheet of paper on which the eight stimuli were printed, and he was asked to write down the two responses (one from the first list and one from the second) which were associated with each stimulus. This written recall provided the major source of data.

Lists.—Eight nonsense syllables of from 60% to 73 % association value (Glaze, 1928) were used as stimuli for all lists. Intra-stimulus similarity was low in that no consonant was repeated, and four vowels were used twice each. The responses were two-syllable adjectives taken from Haagen (1949). In the A-B, A-C lists there was no apparent interlist response similarity and intralist response similarity was as low as careful inspection procedure will produce. In the A-B, A-B′ lists the responses again had low intralist response similarity but high interlist response similarity. The responses from each list which were paired with the same stimulus had similarity ratings ranging from .9 to 1.4 by Haagen's scale. These high-similarity response pairs were as follows: *insane—crazy; barren—fruitless; complete—entire; royal—regal; double—twofold; afraid—scared; tranquil—peaceful; spoken—verbal.* Three different pairings of stimuli and responses were used for both experiments to avoid the possibility that fortuitous associations between stimulus and response would bias the results. An equal number of *S*s in each group was given each pairing. For each experiment for each condition a given list was used as List 1 for half the *S*s and as List 2 for the other half. Four orders of items were used to minimize serial learning.

The lists were presented on a Hull-type drum at a 2:2-sec. rate. The intertrial interval was 4 sec. Anticipation learning was used for List 1 and for List 2 to the point at which written recall was given (after 1, 5, 10, or 20 anticipation trials). A 1-min. interval separated the learning of the two lists.

Subjects.—A total of 192 *S*s was used. There were 24 *S*s in each condition for each experiment, the conditions being the point at which *S* was asked for written recall. All *S*s had previously served in at least one verbal-learning experiment. However, no other experiment had been run in which *S* was asked to recall responses from both lists, so there is no reason to believe that *S* anticipated that he would be asked for such recall. It should be emphasized that each *S* was asked for written recall only once so that it is not believed that *S*s made any special attempt to remember List 1 responses. In assigning *S*s, a listing of 192 entries was made such that each of the eight conditions occurred 24 times. Within these limits the ordering was random and *S*s were successively assigned in order of their appearance at the laboratory.

Written recall.—When the specified number of trials on List 2 had been given, the memory drum was stopped and the sheet for written recall given to *S*. The stimuli were listed on the sheet with two blank spaces under each. The *S*s were first instructed to write down the responses from the two lists below the appropriate stimuli. They were further told to write these down as they came to mind, and not to attempt to recall all the responses from one list first and then all those from the other. Two minutes were then allowed for this initial recall. Following this, they were instructed to go through the responses they had written, and indicate, by assigning the numbers 1 and 2, from which list the responses had come. An additional 2 min. were allowed for this. The *S*s were also told to write down any additional responses which they might think of while they were assigning list numbers.

After the recall papers were collected, a series of questions was asked to determine: (*a*) if *S* had written the responses as they came to mind or if there was deliberate attempt to recall the adjectives from a given list first, (*b*) whether or not *S* had used first-list responses to mediate the learning of the second-list responses.

RESULTS

Transfer.—The major concern in the present paper is with the written recall results. However, it will be worthwhile to note briefly the transfer facts and to show that random assignment of *S*s to groups was effective. For all eight groups combined, the mean number of trials to learn List 1 to one perfect trial was 10.36, with the means for groups ranging from 9.17 to 12.00 trials. The F was less than 1. Lacking a precise control for transfer, some indication of the effects can be obtained by comparing the learning of List 1 with that of List 2. The total correct responses for the first three trials of the two lists were used as the response measure for the three groups having 5, 10, and 20 trials on List 2. For the A-B, A-B′ paradigm, more correct responses were given on List 2 than on List 1, indicating positive transfer. For all three groups combined, the mean number correct on the first list was 9.84, and for the second, 14.35. The t was 8.55. For A-B, A-C the mean number correct on the first list was 9.64, and on the second, 8.57. This t was 1.67. This result indicates that in a statistical sense no negative transfer was present, but this is not an unusual finding for this type of comparison since learning-to-learn and warm-up would counteract the negative effect. Finally, in keeping with previous studies (e.g., Underwood, 1951), the number of overt intrusions of List 1 responses during the learning of List 2 was much greater for A-B, A-B′ than for A-B, A-C.

Written recall.—There were several alternative ways by which the written recall could be scored. The most stringent method would be to count a response as correct only if it were placed with the appropriate stimulus and also correctly identified as to list. The most liberal method would be to count an adjective correct if recalled, regardless of whether it was placed with the correct stimulus and correctly identified as to list. The results for both methods are shown in Table 1. An inspection of this table will show that the differences produced by the two scoring methods are relatively small. The implication is that if *S* wrote down a response, he usually identified it correctly with stimulus and list.

Turning first to the results for the A-B, A-C paradigm, the results for the stringent scoring method have been plotted in Fig. 1. As would be expected, as the number of learning trials on List 2 increases, the number of correct responses given from this list increases. Responses from the first or A-B list, however, show a gradual decline as the number of trials on List 2 increases. It is as if

TABLE 1

MEAN NUMBER OF RESPONSES RECALLED FROM EACH LIST FOR EACH TRANSFER PARADIGM AS SCORED BY TWO METHODS[a]

Method	List	Point of Written Recall (Trials)			
		1	5	10	20
Paradigm A-B, A-C					
1	1	6.67	5.38	5.00	4.12
	2	3.46	6.29	7.33	7.38
2	1	6.96	5.58	5.42	4.29
	2	4.12	6.71	7.71	7.42
Paradigm A-B, A-B′					
1	1	7.67	7.21	7.12	6.92
	2	7.21	7.25	7.83	7.79
2	1	7.75	7.33	7.25	7.08
	2	7.38	7.29	7.96	7.83

[a] In Method 1 the response is counted correct only if correctly identified with stimulus and list. In Method 2 it is counted correct if merely recalled.

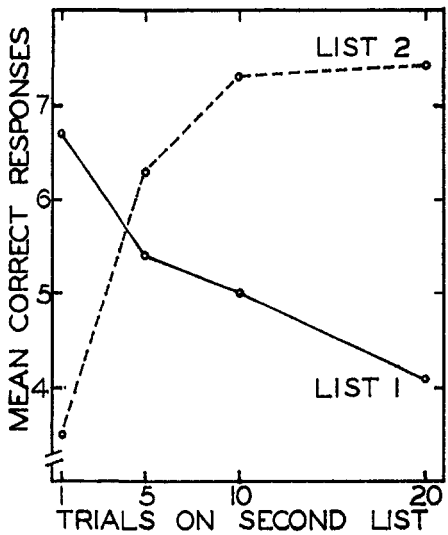

FIG. 1. Mean number of responses correctly recalled and identified with stimulus and list in the A-B, A-C paradigm.

the A-B associations are weakened or extinguished during the learning of A-C. The loss as a function of number of A-C trials cannot be attributed to a few *S*s losing many responses since most *S*s showed the decline. An analysis of variance of the four recall points for A-B gave an F of 8.86 ($F = 4.88$ for $P = .01$ with 3 and 92 *df*).

It was noted that Fig. 1 suggests that the A-B associations are extinguished. It might be suggested, furthermore, that not only are these associations extinguished, but also that the response per se is not available. This could be deduced from the fact that the two scoring methods did not differ much, implying that if *S* knew the response, he also knew what stimulus and what list it went with. However, this conclusion cannot be reached with complete confidence. The reason is that the instructions to *S* stressed the recall of the responses to the specific stimuli; he was never told to put down a response even if he didn't know with which stimulus it was paired. It is therefore possible that *S*s did not put down responses unless they were reasonably confident of its stimulus.

The objection might be raised that the decline in A-B associations seen in Fig. 1 is not to be attributed to the learning of A-C but rather represents simple forgetting. To make sure that this would not be a valid objection, a control group of 12 *S*s was run. This group learned List 1 to one perfect trial and then rested for a period of time equivalent to that spent in learning A-C by the group given 20 trials. This period was 13 min. (including the 1 min. between lists). The rest interval was filled with *S* working on a pyramid puzzle. After the rest, *S*s were given a written recall for the responses to the stimuli in the list they had learned. Counting only those responses which were appropriately paired with their stimuli, the mean recall was 7.75. Hence, it can be concluded that the decrement in recall of A-B associations as a function of trials on A-C cannot be attributed to simple forgetting, but must result from the learning of A-C.

The results for the A-B, A-B′ paradigm as given in Table 1 are quite different from those of A-B, A-C. It may first be noted that the recall of List 2 responses (A-B′) is nearly perfect after only one anticipation trial and, of course, remains high throughout 20 trials. Indeed, by both scoring methods the median recall for all groups at all points is 8.0 items. The first-list associations (A-B) show no appreciable decline. By the stringent scoring method the mean recall, even after 20 trials on A-B′, is nearly seven.

Order of recall.—The facts concerning the order of recall of the two

responses can be used as evidence for or against a mediation hypothesis, as this hypothesis was discussed in the introduction. If *S* tends to recall List 1 responses first, it could be taken as evidence in support of a mediation hypothesis. Contrariwise, it would be evidence against mediation if List 2 responses tend to be recalled first. In this analysis data were not used from 12 *S*s who admitted under questioning that they attempted to write down all responses from one list first and then all from the other. Of these, seven had learned A-B, A-C, and five, A-B, A-B′. Obviously, only cases in which both responses were recalled could be used. For A-B, A-B′, there were 161, 159, 170, and 162 pairs of responses recalled for 1, 5, 10, and 20 trials, respectively. The corresponding percentages for the List 1 response being recalled before the List 2 response are 79%, 62%, 58%, and 53%. For A-B, A-C, the number of cases where both responses were recalled was 79, 113, 109, and 95 for 1, 5, 10, and 20 trials, respectively. The percentages of List 1 responses recalled first are 81%, 49%, 40%, and 43%. Assuming chance order as 50%, it can be seen that (excepting the conditions where only one trial was given on List 2 and where List 1 would be much stronger than List 2) with A-B, A-C the List 1 responses tend to be recalled first with chance or less than chance frequency. For A-B, A-B′ first-list responses are recalled with greater than chance frequency although after 20 trials this frequency has nearly reach 50%.

Subject reports.—Of the 96 *S*s who learned the A-B, A-B′ paradigm, 94 said they had used the List 1 responses to mediate the learning of List 2. These *S*s further reported that they tended to drop the use of these mediators as List 2 learning progressed. Of those 96 *S*s who had learned A-B, A-C, only two reported attempts to use the B response to mediate A-C learning; both *S*s further reported that this merely confused them.

Discussion

The A-B, A-C paradigm.—Three conceptions of what might "happen" to A-B during the learning of A-C were given in the introduction. These three conceptions were extinction or unlearning, the maintenance of two independent S-R systems, and mediation. The present data give strong support to the conception of extinction and at the same time argue against the other two conceptions. The recall of List 1 associations decreased progressively throughout the learning of A-C with nearly a 50% loss after 20 trials on A-C. A hyperbolic equation fitted to this curve predicts an asymptote at 3.46. Thus, it does not seem that all items would be extinguished, even with an extremely large number of trials on A-C. This conforms to the fact that forgetting in the RI paradigm has not been shown to be complete with very high degrees of interpolated learning. Thus, while the present data strongly support an extinction hypothesis they do not indicate why all items are not, nor are likely not to be, extinguished.

It seems reasonable to reject the independence hypothesis. If this hypothesis is to be retained, some mechanism will have to be added to account for the loss in the A-B associations over and above normal forgetting. If it is said that the A-C associations were so dominant that *S* was unable to recall the A-B associations, then the conception becomes very similar to an extinction hypothesis.

The mediation hypothesis cannot be seriously considered in light of the evidence. If List 2 responses are learned through mediation of B (A—B—C) the A-B association should not be lost from *S*'s repertoire. If it is said that the

mediators drop out, then something like extinction must also be added to account for their loss from *S*'s repertoire. Furthermore, *S*s' reports did not indicate that mediation had taken place (as was true of the reports for A-B, A-B'). All in all, the results give strong support to an extinction-like process; they do not give much support to an hypothesis of independence nor one of mediation.

It was noted that if *S* could recall a response he could usually identify it correctly as to list. On the surface, such evidence seems contrary to conceptions which say that some RI may be attributed to competition resulting from a lack of differentiation as to which response belongs in which list (e.g., Underwood, 1949). However, two additional facts must be noted which are relevant to this matter. First, in the present study essentially unlimited recall time was given so that identification of responses with lists should be more accurate than when recall is paced by a memory drum at a 2-sec. rate. Secondly, this differentiation is assumed to be very high when recall is given immediately after interpolation; differentiation is assumed to decrease as a function of time between interpolated learning and recall (Underwood, 1949). It is quite possible that the high accuracy of identifying responses with lists would be lost even with the present method if, say, a 24-hr. interval occurred between interpolation and written recall. Nevertheless, the present results would strongly suggest that nearly all RI could be accounted for by unlearning or extinction if unlimited recall time is given immediately after interpolated learning. The lack of differentiation, leading to competition between responses, should become an additional component in RI only after the passage of time since interpolated learning. Indeed, in view of the findings suggesting spontaneous recovery of extinguished associations (Briggs, 1954), it can be held that after the recovery is complete, all RI is due to competition. This two-component conception of RI will incorporate the major facts.

The A-B, A-B' paradigm.—The data for this paradigm have shown that the A-B associations were maintained at a high level throughout the learning of A-B'. The very slight decline noted over 20 trials could be attributed to the extinction of the A-B responses for those cases in which *S*s did not know the meaning of a word or words, hence, similarity of the responses was ineffective and the results were the same as an A-B, A-C paradigm. However, while accepting this possibility, it can be omitted from further consideration. The question still remains as to whether it is or is not likely that the A-B associations were extinguished while *S* learned A-B' even when similarity was effective. It was noted in the introduction that such an hypothesis was a plausible one; indeed, looking only at the basic results it remains plausible.

The possibility that A-B could be extinguished and the present results still be obtained (no apparent loss in the A-B associations) may be handled by mediation in which after learning A-B' (and extinguishing A-B), *S* recalled the B response because of its high associative connection with B'. Thus, when asked to recall, the associations were A to B' and then B' to B. If this took place, A-B could be extinguished and the present basic results would still be obtained. However, other findings argue against this interpretation and tend instead to support mediation in which A leads to B and B leads to B' at recall.

1. If B is recalled via B', B' should be recalled before B. The data indicate that B is more often recalled first. It is true that after 20 trials B and B' were recalled first about equally often. So, it is still possible that with high degrees of A-B' learning, some extinction of A-B did occur.

2. Nearly all *S*s report using B as a mediator to learn A-B'; none reported that B' was used as a mediator in the recall of B. However, they did report that the use of B as a mediator tended to drop out as learning of A-B' proceeded. Some extinction of A-B might have been a concomitant or cause of this drop out. But, the fact that the percentage of times in which A-B was recalled first (before A-B) never drops below 50%

suggests that if extinction was occurring it was much less in amount than that which occurred in A-B, A-C.

The conclusion is, therefore, that while the possibility of extinction of A-B in the A-B′ paradigm cannot be completely ruled out, it does not appear as compelling an interpretation as does the mediation hypothesis in which A-B mediates B′.

Finally, what about the hypothesis of independent response systems in which response generalization is used to account for positive transfer and retroactive facilitation? The use of response generalization to explain certain facts of transfer has been of considerable help in organizing the facts of transfer. One particular statement of this formulation can be briefly summarized (Underwood, 1951). It is assumed that when A-B is being learned, all responses similar to B likewise develop some associative strength to A. The amount of such strength, developed through what has been called parasitic reinforcement, is directly related to similarity of the response with the B response. Positive transfer occurs, therefore, because less learning has to occur in the second list than in the first. Thus, in the present situation, if A-B′ develops some associative strength as a consequence of learning A-B, positive transfer should occur when *S* is asked to learn A-B′. Retroactive facilitation would occur, since during the learning of A-B′ the A-B association would be further strengthened. It should be noted that this hypothesis deals only with the associations between A and B, and between A and B′; it does not deal in any way with the already well-established association between B and B′ which forms a central part of the mediation hypothesis.

The present evidence suggests that the response-generalization accounting of certain facts of transfer may well be abandoned in favor of a mediation hypothesis. The mediation hypothesis will account for the same general facts as will response generalization; furthermore, certain facts of the present experiment seem difficult to reconcile with the response-generalization hypothesis.

1. Almost without exception, *S*s report mediation. While it may be possible to extend the theory of response generalization to account for this fact that *S*s report mediation, the mediation per se can be used to account for the results, without further elaboration.

2. It was noted that after only one anticipation trial, recall of List 2 was nearly perfect. The theory of response generalization assumes a generalization gradient decreasing rather sharply as similarity decreases. The generalized association is not assumed to grow in associative strength at a rate comparable at all to the directly-reinforced association (A-B). To account for the extraordinarily rapid learning of A-B′ would mean that there is essentially no gradient between B and B′, or to say this another way, the gradient is flat. In previous experiments, no such rapid learning of A-B′ was noted; learning was more rapid than for a control condition but nothing like that shown here in the written recall. Indeed, in the present study for the groups having 5, 10, and 20 trials (before written recall), the mean number of items recalled on the second anticipation trial (comparable to the point at which written recall was asked for in the group having only 1 anticipation trial) was 5.04. This is to be contrasted with 7.75, obtained on written recall at the same point. The reason for this discrepancy, it is believed, is that under the standard procedures of anticipation learning *S* does not have time to mediate all items. Given more time, recall is nearly perfect right at the start of "learning" the second list. This finding is not compatible with the theory of response generalization.

The conclusion is that mediation of B′ through A-B is a more appropriate formulation than response generalization to account for positive effects in transfer and retention when response similarity is involved with identical stimuli. As similarity between responses decreases, the associative connection between them will likewise decrease; thus, a gradient-like phenomenon will appear in transfer. With moderate similarity between responses, the associative connection between the two will be less than in the present case, and additional strengthen-

ing of the associative connection will be necessary before mediation is completely effective. Thus, positive transfer will be less than when the responses are highly similar. It is apparent that since no evidence for mediation could be found in A-B, A-C, the mediation hypothesis must be abandoned when the responses reach a certain level of dissimilarity (or a low level of similarity). It is at this point that extinction begins to occur with consequent negative transfer.

SUMMARY

The A-B, A-C and the A-B, A-B′ transfer paradigms were studied in order to evaluate three conceptions concerning the fate of first-list associations in learning a second list; namely: extinction of first-list associations, maintenance of two independent S-R systems, and mediation of the learning of the second-list response by the first-list association. For each paradigm, different groups of 24 *Ss* each were stopped after 1, 5, 10, or 20 anticipation trials on List 2 and were asked to write down *both* List 1 and List 2 responses to the stimuli. Both lists contained eight pairs of nonsense syllables and two-syllable adjectives. List 1 learning was carried to one perfect trial.

For the A-B, A-C paradigm there was a gradual reduction in reproduction of List 1 responses as degree of List 2 learning increased. A control condition showed that this reduction could not be accounted for by normal forgetting. No successful mediation of the C response via A-B was reported. It was concluded that of the three alternative conceptions, extinction of the List 1 responses was clearly to be preferred. It appears that nearly all retroactive inhibition measured immediately after interpolated learning may be due to extinction or unlearning of first-list responses during the learning of the second list.

For the A-B, A-B′ paradigm, the List 1 responses showed no appreciable loss over 20 trials and List 2 was given nearly perfectly after one anticipation trial. Of 96 *Ss*, 94 reported the use of the A-B association to mediate the B′ response. The rapid learning of List 2 is understandable by the mediation hypothesis, but some extinction of the A-B association in the A-B, A-B′ paradigm cannot be ruled out completely by the present data. The A-B association may be extinguished and then mediation of the List 1 response occurs via A-B′-B. However, considering all evidence, it seemed most probable that mediation occurs most frequently in the order A-B-B′. Finally, the evidence suggests that transfer effects produced by variation in response similarity can be more simply accounted for by mediation than by a theory using response generalization.

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