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ROLE OF RESPONSE AVAILABILITY IN TRANSFER AND INTERFERENCE[1]

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Transfer and retroactive inhibition (RI) were compared under two conditions of practice. In Cond. R (recall method) presentations of a list of paired associates were alternated with test trials in which the responses to each of the stimuli were to be recalled. In Cond. MC (multiple-choice method) *S* was required on the test trials to choose the correct response from a set of alternatives all of which were responses in the list. The paradigms of transfer were A-B, C-D; A-B, C-B; A-B, A-Br; A-B, A-B′; A-B, A-C. For the paradigms in which the responses remain the same (C-B and A-Br) as well as A-B′ there were shifts in the direction of greater negative transfer in Cond. MC than in Cond. R. In Cond. R there was significant RI for A-Br, A-B′, and A-C; in Cond. MC only for A-Br. It is concluded that (*a*) a positive component of response availability may mask associative interference and (*b*) RI, and presumably unlearning, is primarily a matter of response loss with specific associations in general highly resistant to interference.

When experimental paradigms of transfer (e.g., A-B, A-C; A-B, C-B; etc.) are compared with the control paradigm (A-B, C-D), the observed differences in performance typically represent the combined effects of several factors. Depending on the conditions of similarity, the components of transfer may include not only forward and backward associations but also stimulus differentiation and response availability (cf. Martin, 1965; Postman, 1962). For a given paradigm, the direction and amount of associative transfer, i.e., transfer attributable to the prior learning of specific S-R associations, remain uncertain as long as the magnitude of the effects produced by the other components is not known. The consequent problems of interpretation are highlighted when such other components and specific S-R associations influence performance in opposite directions. Thus in the A-B, C-B paradigm response availability is a source of positive transfer whereas first-list backward associations are a source of interference. The net transfer effect depends on the balance of these components, being positive for responses of low meaningfulness which are difficult to integrate (Jung, 1963) and negative for responses of high meaningfulness (Twedt & Underwood, 1959). The negative effects are brought out clearly when responses are made fully available and *S*s are forced to use them (Johnston, 1968). A shift in the direction of negative transfer as a function of response meaningfulness also occurs for the A-B, A-Br paradigm in which old stimuli and old responses are re-paired (Merikle & Battig, 1963). In view of these findings the further possibility suggests itself that the positive effects observed in the early stages of transfer for the A-B, A-B′ paradigm (old stimuli and synonymous responses) may be a matter of enhanced response availability which masks the presence of associative interference. Such interference should, indeed, be greater for similar than for dissimilar responses (A-B, A-C).

A systematic analysis of transfer requires the experimental separation of the component factors which contribute to the net effects on performance. The present study focuses on the assessment of the component of response availability. In the present context response availability refers to the acquisition of the repertoire of responses included in the transfer task. In this sense the concept of availability applies both to responses requiring integration and to units in *S*'s preexperi-

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mental vocabulary. The latter type of unit (English words) was used in this study. To assess the role of response availability, a comparison was made between the transfer effects obtained under two conditions of practice: (*a*) the recall method in which presentations of a list of paired associates was alternated with test trials on which *S* attempted to recall the responses to each of the stimuli, and (*b*) the multiple-choice method in which presentation trials alternated with test trials on which *S* chose the correct response term from a set of alternatives all of which were responses in the list. Response availability is an essential prerequisite of correct performance under the recall method but not under the multiple-choice method. It should be noted that the latter procedure has been used successfully in studies of mediated transfer (e.g., Schulz, Weaver, & Ginsberg, 1965).

The two methods of practice were compared for the following paradigms of transfer: A-B, C-D; A-B, C-B; A-B, A-Br; A-B, A-B′; and A-B, A-C. For the paradigms in which the responses remain the same (C-B and A-Br) the nature of the test should have a systematic influence on the net transfer effects relative to the control condition (C-D). Since response availability is a positive factor, there should be a shift in the direction of greater negative transfer when there is a change from the recall to the multiple-choice method. To the extent that synonymity of the responses in the first and second list increases the availability of the latter, the same shift should occur for the A-B, A-B′ paradigm. Thus there should be systematic differences between the patterns of transfer effects obtained under the two methods of practice. Moreover, with the component of response availability eliminated, the results of the multiple-choice procedure may be regarded as providing a close approximation to measures of associative transfer per se. It is true that stimulus differentiation may be an additional source of transfer under the multiple-choice as well as the recall procedure. However, recent evidence shows that the influence of this component is likely to be minimal (Underwood & Ekstrand, 1968).

The two methods also may be expected to yield systematic differences in the relative amounts of unlearning shown on a test of retention for the first list. In the analysis of unlearning it has been useful to distinguish between two sources of retention loss, viz., reduced availability of responses and forgetting of specific associations. These two types of losses have been attributed to the extinction of contextual and specific S-R associations, respectively (McGovern, 1964). There are strong indications that interpolated learning under conditions of negative transfer (A-B, A-C) rapidly reduces response availability whereas associative losses develop slowly and remain relatively minor. This conclusion is based on the results of experiments in which the successive lists were learned under conditions requiring response recall (usually the anticipation method) and retention was tested either by an unpaced recall procedure or by associative matching (Garskof & Sandak, 1964; Postman, 1965; Postman, Stark, & Fraser, 1968; Sandak & Garskof, 1967). However, such findings are not conclusive since there may have been differences in the degree of overlearning of the first list with respect to the requirements of the two test procedures. To the extent that a given criterion of performance is attained more rapidly for associative matching than for recall, a difference in favor of the former is to be expected when retention is tested after a constant amount of practice. A critical evaluation of the relative retention losses can be made only if the degrees of learning with respect to the two types of performance are comparable. Moreover, the potentially adverse effects of a shift in the mode of responding between acquisition and recall should be avoided. An attempt to meet these requirements was made in the present study which was designed to compare both transfer and retroactive inhibition (RI) under the recall and multiple-choice procedures.

Method

Design.—There were 10 transfer groups representing the factorial combination of five paradigms and two conditions of practice. The paradigms were A-B, C-D; A-B, C-B; A-B, A-Br; A-B, A-B′; A-B, A-C. The two successive lists were learned either by the recall method (Cond. R) or the multiple-choice method (Cond. MC). All transfer groups were tested for retention of the first list after the end of second-list learning. In addition, there were two RI control (rest) groups, one under each condition of practice, which were tested for retention of a single list. Thus the total design comprised 12 (10 transfer and 2 rest) groups.

Lists.—The learning materials were lists of 10 paired associates, with single letters as stimuli and four-letter adjectives as responses. All adjectives were one-syllable words. There were two sets of stimulus terms and four sets of response terms which were used to generate 8 basic lists. With two different S-R pairings per list, there were 16 different lists. The first and second lists were fully counterbalanced. Under all paradigms each of the 16 lists was used once as the first task and once as the second task. The lists also were used once each under the control treatments. Since the same lists were used in the first and in the second task, it was possible to evaluate differences in both transfer and RI, with materials held constant.

Several rules were observed in the construction of the S-R pairs: (*a*) the stimulus letter and the first letter of the response were different; (*b*) there was no phonemic overlap between the name of the stimulus letter and the response term, i.e., pairs like U-*mute* were excluded; (*c*) there was no apparent associative connection between the stimulus letter and the response. Additional restrictions applied to corresponding pairs in the two successive lists: (*d*) when the same response was paired with different stimulus letters, as in the C-B paradigm, the two letters did not form a word; (*e*) different responses to the same stimulus, as in A-C, did not begin with the same letter; (*f*) meaningful response similarity was minimized except as required in the A-B′ paradigm. The B and B′ terms were synonyms obtained from a dictionary of synonyms and a thesaurus.

Procedure.—In both Cond. R and MC study trials and test trials were alternated. The pairs were presented in four different orders on the study trials, and four other orders were used on the test trials. The rate of presentation was 1.5 sec. on study trials and 3 sec. on test trials. The interval between a study and a test trial was 3 sec., and that between a test trial and the next study trial was 1.5 sec. The first list was learned to a criterion of 10/10 correct and was followed by 10 trials on the second list. The time interval between lists was 2 min.

The two conditions of practice differed only with respect to the procedure on the test trials. In Cond. R each stimulus term was exposed for 3 sec. and *S* was required to supply the correct response. In Cond. MC four alternative responses were presented with each stimulus and *S* had to call out the correct one during the 3-sec. exposure interval. The *S*s were instructed to respond each time.

All alternatives in the MC test items were responses from within the list. The set of incorrect alternatives accompanying a given correct response changed from one test order to the next. Repetition of individual alternatives could not be avoided; however, no two distractors were ever repeated together. Within test orders each of the 10 responses appeared once in each of the four multiple-choice positions; each of the positions was correct at least twice but no more than three times. Over the four test orders a given correct response appeared once in each of the four positions. These restrictions were applied uniformly to the construction of test items under all paradigms. It should be noted that during second-list learning in the A-B, A-Br condition the first-list response to a given stimulus occurred among the incorrect alternatives in 35% of the cases.

Retention of the first list was tested 3 min. after the end of second-list learning. The 14-min. retention interval was filled by a series of mathematical problems for the control groups. There were three successive test trials. For both Cond. R and MC the procedure on the test trials was the same as during acquisition, i.e., without feedback, except that the presentation of the stimulus terms was *S* paced. The successive trials followed each other at 3-min. intervals which in all cases allowed sufficient time for completion of the tests. The starting order of the test trials was the one which would have occurred next if List 1 acquisition had continued.

Subjects.—There were 16 *S*s in each of the 12 groups. The *S*s were undergraduate students at the University of California, Berkeley, who were not necessarily naive to rote-learning experiments. The assignment to conditions was in blocks of 12, with 1 *S* from each condition per block. The running order within blocks was determined by means of a table of random numbers as was the assignment of *S*s within conditions to specific combinations of lists.

Results

First-list learning.—The mean number of trials to criterion on List 1 was 9.6 for Cond. R and 9.2 for Cond. MC. The individual means in the two conditions ranged from 7.8 to 11.6, and from 7.7 to 10.2, respectively. There are no significant variations in speed of acquisition either between or within the two conditions of practice, nor is there an interaction of methods by paradigms, all $F\text{s} < 1.29$. It should be noted that the same criterion was reached at essentially equal speeds under the two methods of practice.

Although *S*s in Cond. MC were instructed to respond to every test item, they occasionally failed to do so. The mean percentage of such cases (to the base of the total number of test presentations) was 10.8, with the means of individual groups ranging from 7.4 to 12.5. In Cond. R the mean percentage of failures to respond was 26.8, with a range from 22.8 to 29.5.

Transfer.—The mean numbers of correct responses on each of the 10 trials of List 2 learning are plotted in Fig. 1. Comparison of the two sets of learning curves makes it apparent that the initial level of performance is higher for Cond. MC than for Cond. R, but the two conditions converge as practice continues. Although the mean numbers of trials to the final criterion on List 1 were the same, the early criteria were likewise reached faster under the MC than under the R method. In the early stages of practice recognition of the correct associations builds up at a faster rate than recall of the prescribed responses.

The differences among paradigms in Cond. R exhibit a fairly typical pattern. Relative to the C-D base line, A-C and A-Br yield substantial negative transfer which is greater for A-Br. The separation between A-C and A-Br is small at first but increases sharply thereafter. The A-B′ paradigm shows some positive transfer on the initial trials but falls below C-D as learning progresses. The relative decline of A-B′ has been attributed to failures of differentiation between mediators (B) and mediated terms (B′) (Postman & Stark, 1964). There is essentially zero transfer for C-B; the very slight effects which are present are in the positive direction. In experiments using the anticipation method small amounts of negative transfer are usually obtained; this suggests that response availability may carry greater weight under the recall procedure.

The picture is quite different in Cond. MC. First, the transfer effects for all four experimental paradigms are now negative. There is a clear shift in the negative direction for C-B and an even more pronounced one for A-B′. Second, as a consequence of these shifts there is a change in the rank order of the paradigms such that A-B′ now falls below A-C. Third, the sharp divergence of A-C and A-Br on the early trials is no longer present; a clear separation between these groups is in evidence from the beginning. These changes in the relative positions of the paradigms are fully apparent on the early transfer trials. There is little difference between the two conditions on the later trials. Apart from ceiling effects, which are undoubtedly present, such a convergence would be expected in the later stages of acquisition once response recall in Cond. R becomes uniformly high.

Statistical analyses were carried out on (*a*) the numbers of correct responses on Trial 1 which provide measures of early transfer and (*b*) the total numbers correct on Trials 1–10. Prior to analysis the MC scores were

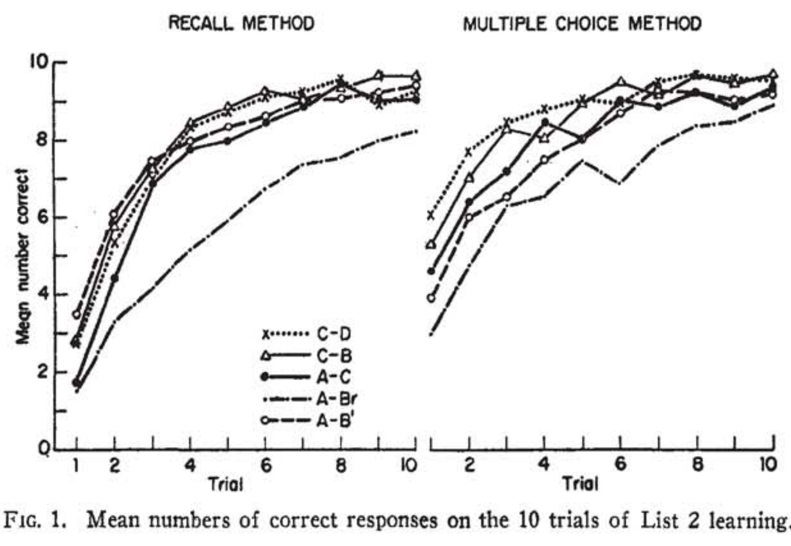

FIG. 1. Mean numbers of correct responses on the 10 trials of List 2 learning.

TABLE 1

MEAN NUMBERS CORRECT IN LIST 2 LEARNING ON TRIAL 1 AND TRIALS 1–10

Trial	Cond. R					Cond. MC				
	C-D	C-B	A-C	A-Br	A-B′	C-D	C-B	A-C	A-Br	A-B′
1	2.8	2.8	1.8	1.5	3.5	6.1 (5.1)	5.3 (4.1)	4.6 (3.3)	2.9 (.9)	3.9 (2.4)
1–10	78.6	80.5	73.9	58.1	79.2	87.6 (84.7)	85.2 (81.9)	80.2 (75.2)	68.2 (60.1)	77.6 (72.3)

Note.—Values in parentheses are scores corrected for guessing.

corrected for guessing. The formula used to obtain the corrected scores was $R - \frac{W}{3}$, where R and W are the numbers of right and wrong choices, respectively. The relevant means are presented in Table 1.

The results for Trial 1 will be considered first. The overall level of performance is higher in Cond. MC than in Cond. R, F (1, 150) = 5.13, $p < .05$. The variation among paradigms and the Paradigms × Conditions interaction are significant, F (4, 150) = 8.54 and 4.31, respectively, $p < .01$ for both. Orthogonal comparisons show that the condition of practice interacts with the difference between the control and the combined experimental treatments ($p < .01$) and also with the differences among the experimental paradigms ($p < .02$).

The two conditions do not differ reliably in the total number of correct responses on Trials 1–10 ($F < 1$), i.e., the overall advantage of Cond. MC over Cond. R is transitory. For the total scores paradigms remains a significant source of variance ($p < .01$) but the interaction Paradigms × Conditions does not ($p > .05$). The fact that the interaction is no longer significant reflects the progressive convergence of the transfer effects under the two conditions. Thus as practice continues A-B′ falls below C-D, and A-Br becomes clearly inferior to A-C in Cond. R as well as in Cond. MC. The convergence is essentially complete at the end of the first half of the transfer trials. As would be expected on the basis of these temporal changes, an analysis of the linear trends over Trials 1–5 yields a significant interaction of Conditions × Paradigms, F (4, 150) = 4.24, $p < .01$. The same orthogonal comparisons as described above show both components of the interaction to be significant at the .02 level.

In Cond. MC the percentages of omissions ranged from 3.5 to 6.5. The percentages are inversely related to the numbers of correct responses but the variation among paradigms is not significant. The same inverse relation obtains for Cond. R, with the percentages ranging from 18.3 (C-D) to 30.1 (A-Br).

Interlist intrusions.—In Cond. R the frequencies of List 1 responses given to the appropriate stimuli during List 2 learning were as follows, with the numbers of *S*s contributing these errors given in parentheses: A-C—4(2); A-B′—14(6); A-Br—64(14). In the case of the A-Br paradigm these errors cannot be classified unequivocally as intrusions since they also are misplaced responses from within the list. The higher frequency of intrusions for A-B′ than for A-C confirms previous findings (Postman & Stark, 1964). The fact that the number of intrusions for A-B′ increases over the early trials—from 1(1) on Trial 1 to 4(4) on Trial 4—is consistent with the view that they represent failures to differentiate between mediators (B) and mediated terms (B′).

When MC test items during the acquisition of the A-Br transfer list include the first-list response among the incorrect alternatives, a failure to discriminate between the old and the new association can become a source of error. Such failures of discrimination should be reflected in the distribution of incorrect choices, the first-list response being chosen more frequently than the other two wrong alternatives. The percentage of choices of the first-list response to the base of opportunities (total frequency of incorrect choices on test items in which the successive responses were juxtaposed) was determined for each *S*. The mean percentage is 37.5, which is above the value expected by chance (33.3) but not significantly so ($t = .70$). However, the overall percentage masks a trend over trials. When the errors of all *S*s are pooled, the percentage of choices of the first-list response is 28 on Trial 1, 30 on Trial 2, 65 on Trial 3, and 54 on Trials 4–10. The latter trials were grouped in the interest of stability of estimates in view of the progressive decreases in the numbers of errors. It appears that at the beginning of the transfer task first-list responses are more likely to be discriminated as incorrect than other distractors, probably on the basis of their past frequency of occurrence. A bias in the opposite direction develops as learning continues and the first-list and second-list associations approach each other in strength.

First-list retention tests.—The mean numbers of correct responses on the three successive tests of retention of the first list are presented in Table 2. The MC scores corrected for guessing are given in parentheses. The amounts retained by the two rest groups are the same, so that evaluation of absolute and relative RI leads to the same conclusions.

Consider the first test trial. The results of Cond. MC may be taken as providing estimates of the associative losses produced by interpolated learning. The scores of the C-D and the rest group are identical. The only experimental paradigm showing an appreciable amount of RI is A-Br. The amounts are small for the remaining paradigms and in no case exceed 10%. The fact that the classical paradigm of unlearning, A-C, yields only 5% RI is especially noteworthy. Thus the retention losses attributable to interference from forward and backward associations, and from related and unrelated responses, are all of the same small order of magnitude.

In Cond. R correct performance depends not only on the integrity of specific associations but also on the availability of the appropriate responses. All of the transfer groups fall below the rest group, with the amount of RI varying widely as a function of paradigm. The interference is greatest for A-C, followed in order by A-Br, A-B′, C-B, and C-D. For all paradigms RI is greater on the recall test than on the multiple-choice test. The difference is smallest, and in fact negligible, for C-B and largest for A-C; it is greater for A-B′ than for A-Br. In general, the increases are greater (*a*) when the responses in the two lists are different than when they are the same, and (*b*) when the stimuli remain the same than when they change.

Analysis of variance of the retention scores (with the MC scores corrected for guessing) yields a significant interaction of Conditions × Paradigms, $F\ (5, 180) = 8.19$, $p < .01$. Orthogonal comparisons show that the interaction with condition is significant at the .01 level for both the difference between the rest group and the combined transfer groups and for the differences among the latter. There are reliable variations in the amount of RI as a function of paradigm within each condition ($p < .01$). The difference between the appropriate rest group and each transfer group was evaluated by Dunnett's test. In Cond. MC the only paradigm yielding a sig-

TABLE 2

MEAN SCORES ON TEST OF LIST 1 RETENTION

Trial	Cond. R						Cond. MC					
	Rest	C-D	C-B	A-C	A-Br	A-B′	Rest	C-D	C-B	A-C	A-Br	A-B′
1	9.7	9.0	8.5	4.7	6.2	7.1	9.7 (9.6)	9.7 (9.6)	8.8 (8.4)	9.2 (8.9)	7.4 (6.5)	8.8 (8.4)
2	9.6	8.9	8.9	5.6	6.6	7.7	9.6 (9.4)	9.8 (9.8)	9.3 (9.1)	9.6 (9.4)	8.2 (7.8)	9.5 (9.4)
3	9.8	9.1	9.1	5.9	7.1	7.6	9.7 (9.6)	9.8 (9.7)	9.6 (9.5)	9.5 (9.3)	8.5 (8.0)	9.5 (9.4)

Note.—Values in parentheses are scores corrected for guessing.

nificant difference is A-Br ($p < .01$). In Cond. R there is reliable RI for A-C, A-Br, and A-B′, $p < .01$ in each case.

When the protocols in Cond. R are scored leniently, i.e., credit is given for the number of different responses from the list regardless of whether they were paired with the correct stimulus, the mean increases over the stringent measures shown in Table 2 are as follows: Rest—0; C-D—0; A-C—.4; A-Br—1.2; A-B′—.3. The amount of RI remains significant at the .01 level for the same paradigms as before. There is also a significant Paradigms × Conditions interaction ($p < .01$) when Cond. R is represented by lenient rather than stringent scores. The variation in the magnitude of the differences between lenient and stringent scores cannot be interpreted unequivocally because the opportunities for improvement were far from the same for all groups. It is worth noting, however, that the difference is largest for A-Br. Paradigm A-Br yields a significant amount of RI although the responses may be assumed to be fully available. Thus the observed retention loss must be attributed entirely to interference with specific associations; the relatively large difference between lenient and stringent scores reflects the high level of response availability.

In agreement with other studies (cf. Richardson & Gropper, 1964), there is an upward trend in the retention scores on the successive tests in spite of the absence of feedback or reexposure to the correct pairs. The trends for the stringent and the lenient scores are parallel, and only the former will be considered. The relevant scores are presented in Table 2. The gains are such as to eliminate all apparent RI on the final MC trial, with the sole exception of the A-Br paradigm. In Cond. R the amount of RI is reduced but remains substantial. A trend analysis shows that the overall increases in performance are reliable, $F(1, 180) = 31.22$, $p < .01$. The differences in the amount of gain between conditions and among paradigms cannot be evaluated adequately because of unequal opportunities for improvement.

Interlist intrusions at recall.—On the first test trial in Cond. R there were five appropriately paired intrusions from List 2 for A-C (three *S*s) and six for A-B′ (four *S*s). The corresponding numbers of inappropriately paired intrusions were five and two, each given by a different *S*. The total numbers of intrusions remained approximately the same on the subsequent test trials. Some of the first-trial errors were eliminated but new ones were introduced; the relative frequency of appropriate errors tended to increase.

In Cond. MC the test items of the A-Br group which included the List 2 responses as distractors provided an opportunity for errors analogous to interlist intrusions. Out of a total of 15 errors made on such items on the first test trial, 5 were choices of List 2 responses. There were 6/13 and 4/8 such choices on the second and third test trials, respectively. The total frequencies are too low to be considered reliable, but there appears to be a trend for the choices of List 2 responses to increase above the initial level which is exactly at chance. Such a trend would be expected if the discrimination between old and new associations is based, at least in part, on relative recency.

Discussion

The differences between Cond. R and MC in List 2 learning provide clear evidence for the systematic effects of response availability on transfer. The shifts in the direction of greater negative transfer in Cond. MC show that a positive component of response availability may mask, wholly or in part, the associative interference characteristic of a given paradigm of transfer. The shifts occur not only for the paradigms in which the responses in the two lists are identical (C-B and A-Br) but also for A-B′ in which the responses are synonymous. The initial positive transfer for A-B′ in Cond. R must, therefore, be attributed to the ready availability of the synonyms of List 1 responses. When the advantage derived from this positive component is eliminated in Cond. MC, the detrimental effects of response similarity become apparent from the very beginning of practice on the transfer task, just as they do in the later stages of acquisition in Cond. R. Thus A-B′ actually falls below A-C in Cond. MC. It may be noted that this finding is contrary to the basic principle of Osgood's (1949) surface which states that associative transfer becomes less negative as response similarity increases. This principle received apparent support from results obtained with the A-B′ paradigm which can now be seen to produce somewhat heavier associative interference than the A-C paradigm.

The transfer results support the following general conclusions: (*a*) The factor of response availability summates with other components of transfer. When recall of the prescribed responses is required, the relative position of different experimental paradigms does not, therefore, necessarily reflect the order of associative effects in transfer. (*b*) Under conditions which minimize the contribution of response availability, any task requiring new associations to old terms produces negative transfer. (*c*) Other things being equal, associative interference increases as a function of response similarity.

The results of the retention tests give additional weight to the importance of the distinction between associative and response components in the analysis of transfer and interference. The present data show that specific associations are highly resistant to interference and that RI is largely a matter of reduced response recall. The A-Br paradigm provides the only exception to this generalization.

Since the test of List 1 retention was unpaced, it is likely that specific response competition in Cond. R was minimized. Interlist intrusions were infrequent, and those which occurred may well have been a consequence rather than a cause of forgetting (cf. Conrad, 1960). McGovern (1964) also used an unpaced test of List 1 recall and obtained amounts of retention loss comparable to those found in MMFR tests in which recall of the responses from both lists is required. It is possible, therefore, to restate the present findings as showing substantial unlearning of responses but little unlearning of specific associations. Even if the amount of unlearning in Cond. R is overestimated somewhat, it is a fact that all but one of the paradigms in Cond. MC failed to yield significant RI, i.e., there was no unlearning of the specific associations.

Within the framework of current assumptions about the components of unlearning (McGovern, 1964) one would have to conclude from these results that RI at recall is primarily, and in most cases entirely, attributable to the unlearning of contextual associations. While such a conclusion may at first appear to be tenable, it gives rise to serious difficulties of interpretation: (*a*) There is no ready theoretical explanation for the apparent finding that contextual associations are unlearned far more rapidly than specific ones. Response learning must precede the establishment of specific associations. Moreover, specific associations are more subject to intralist interferences; both misplaced and correct responses during acquisition should contribute to the growth of contextual associations. Thus, contextual associations receive more practice and should be more resistant to unlearning than specific ones. But the opposite is in fact true. (*b*) It is not possible on the basis of current assumptions to account for the nature of the interaction between conditions and paradigms. Consider in particular the C-D and A-C paradigms. The difference between the amounts of RI observed in Cond. R and MC is substantially greater for A-C than for C-D. (The same interaction, although less pronounced, is apparent in McGovern's results.) Yet the difference should be of the same order of magnitude since it is assumed to reflect the same component in both cases, viz., the unlearning of contextual associations. The same interaction obtains when C-D and A-B′ are compared, and since there is apparent unlearning of first-list responses in the latter paradigm, it poses the same interpretative problem. If one agrees with McGovern that the response loss in the C-D paradigm provides an independent estimate of the amount of forgetting attributable to the unlearning of contextual associations, it follows that the decline in response recall under conditions of negative transfer must reflect at least a quantitatively, and perhaps a qualitatively, different process.

It has been suggested elsewhere (Postman, Stark, & Fraser, 1968) that the mechanism responsible for unlearning operates primarily, if not exclusively, on the entire repertoire of first-list responses rather than on individual S-R associations. Specifically, it was proposed that unlearning may be the consequence of the operation of a mechanism of response selection (cf. Underwood & Schulz, 1960) under conditions of negative transfer. The major steps in the argument are as follows: (*a*) During the acquisition of List 1, *S* rapidly comes to restrict his responses to items from within that list. He is able to do so because the selector mechanism serves to activate the appropriate responses and to inhibit the occurrence of inappropriate ones. Relative recency of occurrence in the situation as well as formal and semantic similarities among the prescribed items define the category of appropriate responses and thus provide the criteria for selective arousal. (*b*) When the required responses are changed in the transfer task, new criteria of selective arousal are established. Relative recency again provides an immediately effective criterion to which is added the relative frequency of occurrence of old and new responses in the experimental situation (cf. Ekstrand, Wallace, & Underwood, 1966). However, to the extent that the criteria of relative recency and frequency are fallible, the greater the formal and semantic similarity between the responses in the successive repertoires the more difficult is the establishment of distinctive new criteria, and the more likely errors of selection become. The probability of inappropriate first-list responses actually being elicited as errors will be a function of stimulus similarity; thus, it will be greater under the A-C than the C-D paradigm. As errors occur, the criteria of selection must become more restrictive, i.e., increasingly specific to the new set of responses. The outcome is functionally equivalent to the suppression of the first-list repertoire. Given the difference in the probability of elicitation of errors, such functional suppression of first-list responses will be greater for A-C than for C-D, and in general will be directly related to the degree of negative transfer. (*c*) The selector mechanism is characterized by a certain amount of inertia. The most recently established criteria of selection persist in influencing *S*'s output in the experimental situation even after the end of practice. Thus, at the time of recall an immediate shift back to the criteria in force during the acquisition of the first list is difficult. The more complete the functional suppression of the first-list repertoire has been the more difficult will be the shift. Given the persistence of the second-list criteria, only the first-list responses which have had the highest frequency in the situation, i.e., the easy or strong items, are likely to be rearoused and recalled.

The reduced availability of first-list responses is thus seen as reflecting the inertia of the selector mechanism, i.e., the persistence of the criteria of response selection established and reinforced during interpolated learning. This interpretation is, of course, closely related to the hypothesis of generalized response competition advanced by Newton and Wickens (1956). A formulation in terms of the operation of a selector mechanism may, however, have the advantage of focusing on the continuity of the processes in acquisition, transfer, and recall.

The fact that the A-Br paradigm yields significant RI in both Cond. R and Cond. MC remains to be considered. This finding brings up the possibility that a process akin to the unlearning or extinction of individual S-R associations may supplement the suppressive action of the selector mechanism. First-list associations which continue to be elicited during interpolated learning because of failures of the selector mechanism may be weakened progressively. It is too early to say, of course, whether the assumption of such a dual mechanism is necessary. It may be more parsimonious to view the apparent extinction of specific associations as the limiting case of a highly restrictive selector process. When individual first-list associations continue to be elicited, the criteria of selection in transfer may have to be extended to become specific to the corresponding responses in the second list or to those responses in the presence of particular stimuli. Thus individual first-list associations would come to be suppressed. Since both the stimuli and the responses in the successive lists remain the same under the A-Br paradigm, there are no common characteristics of the second-list pairs which permit them to be distinguished from the first-list pairs. The temporal trends in the distributions of incorrect choices of the A-Br group in Cond. MC do, indeed, show that *S*s progressively lose their ability to discriminate between old and new associations. The elimination of persisting interferences may, therefore, become contingent on the suppression of specific first-list associations. While these suggestions are highly speculative, the general point which may warrant further consideration is that the mechanism responsible for unlearning initially operates on the total repertoire of first-list responses and on specific associations only in the face of persistent interference.

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