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EFFECTS OF INSTRUCTIONS TO FORGET IN SHORT-TERM MEMORY [1]

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Two short-term memory experiments investigated the effects of instructions to forget. In Exp. I, proactive interference (PI) was reduced when *S*s were cued to forget the first of two trigrams; but there was no reduction in retroactive interference when *S*s were cued to forget the second. The residual amount of PI depended upon the acoustic similarity of the two trigrams. In Exp. II, PI was reduced when *S*s were cued to forget the first 6 words in a 12-word sequence. A subsequent recognition test, however, showed that the to-be-forgotten words were recognized as often as words taken from sequences with no forget cue. The results supported a hypothesis that the effects of a forget cue are due to differential storage and retrieval of to-be-remembered and to-be-forgotten items.

Forgetting is usually considered to be an inevitable, undesirable result of the processing, storing, and retrieving of similar to-be-remembered material. It is possible, however, that in experiments on human short-term memory (STM), the existence of proactive interference (PI) and retroactive interference (RI) is partly a consequence of the instructions, or lack of instructions, given to *S*s on how to process and store the experimental material. That *S*s might be able to reduce the amount of interference (either PI or RI or both) by adopting a different instructional set is a matter of considerable practical and theoretical importance.

Bjork, LaBerge, and Legrand (1968) found that the amount of PI produced by an item was reduced if *S*s were cued, prior to the presentation of a second item, that they would not be asked to recall the first item, and so could forget it. Bjork et al. proposed three general types of hypotheses which could account for this reduction in PI; these hypotheses will be discussed briefly. (*a*) The *S*s may have been able to respond to the forget cue by immediately and selectively erasing information from STM, thereby reducing the amount of PI. Whether or not complete erasure is possible is an empirical question; the data of Bjork et al. indicate that if information in STM can be erased, the erasure is only partial. It should be noted that current theories of memory do not consider the possibility of an erasure mechanism. This hypothesis will be referred to here as the "erasure hypothesis." (*b*) The *S*s may have been able to rehearse the second item more

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effectively on those trials on which they were cued that they would not have to remember the first item. This possibility will be called the "rehearsal hypothesis." (*c*) The *S*s may have been able to use the forget instruction in order to actively tag or code one of the two items (or both) in a way that reduces the amount of interference between them. In other words, *S*s may have separated the items into two functionally different groups. This explanation will be referred to here as the "differentiation hypothesis," since it postulates a process which may involve factors similar to those involved in list differentiation.

According to the various authors' interpretations, recent experiments concerning the effects of instructions to forget have not consistently supported any one of these three hypotheses. Weiner and Reed (1969), for example, interpreted their results by postulating a mechanism of "retrieval blockage" somewhat akin to the clinical concept of repression. However, the unusual procedure that was used—*S*s were repeatedly cued to forget trigrams, but then to recall them—makes this study difficult to compare with ones in which the retention of noncued material is measured following a forget cue. Turvey and Wittlinger (1969), Elmes (1969), Reed (1970), and Bruce and Papay (1970) all tended to favor a rehearsal interpretation; Bjork (1970) favored an interpretation in terms of a combination of rehearsal and grouping (differentiation) hypotheses; and Elmes, Adams, and Roediger (1970) favored a differentiation interpretation. Most of these experiments, however, did not eliminate the possibility of an erasure mechanism, and almost all are open to interpretation in terms of both rehearsal and differentiation hypotheses. In some of them (e.g., Reed, 1970), an additional problem was present: recall differences between the interference and forget conditions can arise from a confounding of the conditions with different amounts of material to be recalled.

The two experiments reported in this paper represent an attempt to decide which of the hypotheses is most able to account for the observed effects of cues to forget in STM tasks. It should be noted that these hypotheses are not necessarily mutually exclusive.

Experiment I

The design of Exp. I was based on the paradigm used by Bjork et al. (1968), but certain modifications were introduced in an attempt to decide which of the three hypotheses described above was most tenable. One major modification of the design allowed the determination of whether or not RI, like PI, could be reduced by providing *S*s with an appropriate cue to forget. Specifically, this modification introduced the possibility that a forget cue could follow the presentation of the second item (indicating that *S* should attempt to forget the second item, since he would not be asked to recall it), as well as the possibility that the forget cue could follow the presentation of the first item (as in the Bjork et al. study). The reason for this modification was that the erasure hypothesis might expect a reduction in RI on trials on which a cue to forget the second item is presented. On the other hand, both the rehearsal and differentiation hypotheses predict that the forget cue, in order to be maximally effective, should be presented before the to-be-remembered item is presented. The rehearsal hypothesis makes this prediction because it holds that the presentation of the forget cue enables *S*s more effectively to rehearse the to-be-remembered item. The differentiation hypothesis makes the prediction because it holds that the presentation of the forget cue enables *S*s to tag or code the two items in functionally different ways, and that it should be easier for *S*s to differentially tag or code the to-be-remembered item at the time of presentation. (This interpretation is different from Bjork's, 1970, interpretation of the differentiation hypothesis.)

It is now a well-established finding that the acoustic similarity of the to-be-remembered information is a major factor responsible for the presence of PI and RI in STM tasks (e.g., Conrad, 1962, 1964). For this reason, it was decided to study the effects of this variable on the ability of *S*s to take advantage of a cue to forget. The erasure hypothesis predicts that since *S*s are able to selectively erase information from STM upon demand, and since there is no reason to assume that acoustic similarity will affect this ability, performance on those trials on which a forget cue is presented might be expected to be unaffected by the acoustic similarity of the two items. According to the rehearsal and differentiation hypotheses, on the other hand, one might expect that the more acoustically similar the two items are, the more difficult it would be to maintain differential tagging or rehearsal of the two items following a cue to forget one of them.

Method

Subjects.—The *S*s were 24 paid volunteers obtained from the University of Oregon Employment Office.

Materials and design.—Sequences were presented on a Lafayette memory drum. Each sequence consisted of a random series of single digits, with one or two consonant (CCC) trigrams inserted in the digit series. Each digit was randomly colored either red or black. Each trigram was composed of either a subset of consonants ending with the /ē/ sound (B,C,D,G,P,T) or the set of those beginning with the /ĕ/ sound (F,L,M,N,S,X). The trigrams were always colored black.

There were three main types of sequences: probe (P), forget (F), and control (C). In P sequences, two trigrams were presented. The first trigram in the sequence was composed of three randomly selected consonants from one of the two phonemically similar subsets. The second trigram was composed of either the other three consonants from the same subset (interitem similarlity, or S) or the corresponding three consonants from the other subset (interitem dissimilarity, or D). The order of the consonants within each trigram was randomly determined. Each sequence was composed of the following: two sets of asterisks (a warning signal), two digits, the first trigram, two more digits, the second trigram, four more digits, and finally a recall cue. The recall cue was either "ITEM 1" or "ITEM 2," indicating which trigram was to be recalled. Thus, there were four types of P sequences: P1-S (probed recall of the first item, with interitem similarity), P2-S (probed recall of the second item, with interitem similarity), P1-D, and P2-D.

The F, or forget, sequences were formed in the same way as the P sequences, with the following exception. In the F sequences, black dashed lines appeared to the left and right of the digit which occurred either 2 sec. after the first trigram (hence, immediately before the second trigram) or 2 sec. after the second trigram. The dashed line served as a signal to *S* that he should attempt to forget the immediately preceding trigram, since he would be asked to recall the other one. Thus, there were four types of F sequences: F1-S (forget the second item, recall the first item, with interitem similarity), F2-S (forget the first item, recall the second item, with interitem similarity), F1-D, and F2-D.

The C, or control, sequences were formed in the same way as the F sequences, except that the to-be-forgotten trigram was replaced by another colored digit. On those trials in which the first trigram was replaced by a digit, a dashed line appeared in the same place as in the F sequences (i.e., 2 sec. after the first item would have appeared if it had been presented). The word "ITEM" served as a recall cue at the end of each C sequence. Thus, there were two types of C sequences: C1 (recall the first item, with the second item omitted), and C2 (recall the second item, with the first item omitted).

Each of the 10 types of sequences was presented four times to every *S*, once in each of four blocks of sequences. The order of sequences within each block was random, and the four blocks were counterbalanced across *S*s. In addition, the trigrams were rotated across the three main types of sequences (P, F, and C) across *S*s.

Procedure.—The *S* was first shown examples of the types of sequences used in the experiment and told the meaning of the dashed lines. He was instructed to call out (shadow) the color and value of each digit and the three letters of each trigram. The instructions emphasized the importance of shadowing correctly at the time each digit or trigram appeared, since the memory drum was set at a fast rate. The presentation rate for both the digits and the trigrams was one per second. Recall was spoken, and there was no set time limit on recall. The *S* was required to guess if he was uncertain about the correct consonants or order of the consonants. Approximately 10 sec. separated recall of the trigram and the start of the next sequence. Each *S* was given 6 practice sequences, then 40 or more experimental sequences. Data were not analyzed for sequences on which more than one digit or either trigram was incorrectly shadowed. Instead, following the end of the last block of sequences, the types of sequences on which a shadowing error had been made were repeated, using alternate sequences constructed in the same way. All shadowing errors were recorded by *E*.

Results

Recall performance was analyzed using two different measures. On the stringent measure, each consonant was counted as correct only if it was recalled in the correct order within the trigram. On the lenient measure, each consonant was counted as correct regardless of whether or not it was recalled in the correct order. Following an

TABLE 1
MEAN PERCENTAGE RECALLED AND INTRUDED (EXP. I)

Type of sequence	Recalled	Intruded
P1-S	44.1	26.4
F1-S	45.1	18.1
P1-D	49.0	14.9
F1-D	46.2	18.8
C1	75.7	
P2-S	58.4	20.2
F2-S	74.6	10.8
P2-D	79.5	4.2
F2-D	87.9	2.1
C2	84.4	

arc-sine transformation of the data, the data were subjected to an analysis of variance which made planned pair-wise comparisons. Similar patterns of results and comparable levels of significance of the planned comparisons were obtained according to the two measures of recall performance, so all data reported here are based on only one of the measures, the stringent measure. Furthermore, the fact that the results obtained according to the two measures were similar indicates that the differences between the types of sequences are not necessarily attributable to differences in order information, but mainly to differences in information about the correct consonants.

Recall performance is shown in Table 1 as the mean percentage recalled on each of the 10 types of sequences. In the analysis of recall on the RI conditions, there were no significant differences either between P1-S and F1-S sequences or between P1-D and F1-D sequences, both Fs < 1. Performance on both F1-S and F1-D sequences was significantly worse than on C1 sequences, $F(1, 23) = 26.0$ and 45.6, respectively, both ps $< .001$. (In this experiment there were no large differences between the two levels of similarity when the first item was tested; although in a pilot study using only P sequences, performance was significantly worse on P1-S than on P1-D sequences.)

In the analysis of recall on the PI conditions, there was a significant reduction in the amount of PI on F sequences as compared to P sequences. Both the difference between P2-S and F2-S sequences and the difference between P2-D and F2-D sequences were significant, $F(1, 23) = 5.94$, $p < .05$, and $F(1, 23) = 7.99$, $p < .01$, respectively. Finally, there was no significant difference between F2-D and C2 sequences, $F < 1$, although performance was significantly worse on F2-S than on C2 sequences, $F(1, 23) = 15.0$, $p < .001$.

Table 1 shows also the mean percentage of intrusions of consonants from the other presented item (based on the same stringent measure) on each of the 10 types of sequences. A comparison of intrusions on P2-S and F2-S sequences suggests that the forget cue produces its effect by reducing the amount of response competition attributable to the proactive items at the time of retrieval. This conclusion, however, is only weakly supported by a comparison of P2-D and F2-D sequences.

Finally, there were no consistent differences in the mean percentage of shadowing errors between the main types of sequences, position of the to-be-recalled item, or inter-item similarity; so it seems reasonable to conclude that differences in shadowing difficulty cannot account for the differences in recall performance reported in Table 1.

Discussion

It can be seen that the results obtained under the PI conditions essentially replicate the findings of Bjork et al. (1968) that there is a significant reduction in PI following the presentation of a cue to forget. When the two items were acoustically dissimilar there was a complete reduction in PI, since performance was the same on the forget (F2-D) and control (C2) conditions. However, when the two items were acoustically similar there was only a partial reduction in PI, since performance on the forget (F2-S) condition was worse than on the control (C2) condition.

The results obtained under the RI conditions show that no reduction of RI occurs when a forget cue is presented following the retroactive material. It should be noted that this finding is not consistent with recent experiments of Bjork (1970, Exp. III) and Reed (1970, Exp. II), both of which found a significant decrease in RI in a forget condition as compared to a probe condition (differences in recall performance of about 10%). However, a subsequent experiment (Reed, 1970, Exp. III) failed to replicate this difference between the two types of conditions.

In terms of the erasure hypothesis, the results of the PI conditions demonstrate that only partial apparent erasure of to-be-forgotten material is obtained under certain circumstances. The results of the RI conditions, however, do not support the erasure hypothesis. Either the rehearsal or differentiation hypothesis could account for the results; however, since the shadowing task was designed greatly to reduce rehearsal, the differentiation hypothesis would appear to be the preferable alternative.

Experiment II

Experiment II was designed as a further test of the erasure hypothesis, as well as a test of some predictions of the rehearsal and differentiation hypotheses which seem to separate the two.

One of the most direct tests of the three hypotheses would involve a retention test on the material *S* was instructed to forget. Obviously, one encounters methodological problems if one attempts repeatedly to test the retention of this material. One way to avoid this problem would be to test the retention of the to-be-forgotten material only once, at the end of the experimental session. (Recently, Elmes et al., 1970, and Bruce & Papay, 1970, have reported using this type of procedure, although they tested only the retention of items from the last sequence of the session.)

The design of the previous experiment was, therefore, modified considerably. Since the largest effects of the forget cue were observed in the PI conditions with a high degree of acoustic similarity, sequences analogous to the P2-S, F2-S, and C2 sequences of Exp. I were used; and in order to ensure that *S*s would attempt to remember the proactive material, sequences analogous to the P1-S and C1 sequences were included.

Each P1, P2, and F2 sequence was 12 words long. The *S* was informed whether or not he could forget the first 6 words by the color of a cue presented along with the last 6 words. Immediately following the last trial, *S* was given a recognition test consisting of the proactive words from the P2 and F2 sequences, along with new words that had not been presented.

The erasure hypothesis predicts that since the proactive words in the F2 sequences are erased from STM, they should be recognized about as frequently as the new words, but much less frequently than the proactive words from the P2 sequences (which were presented but presumably not erased). The rehearsal hypothesis holds that after the forget cue is presented, *S* devotes all rehearsal activity to the to-be-remembered material (the last six words here), but when no forget cue is presented, *S* devotes some further rehearsal activity to the proactive material (the first six words) as well. Thus, the rehearsal hypothesis predicts that the proactive words on the F2 sequences should be recognized less frequently than the corresponding words from P2 sequences. And, if rehearsal is limited to immediately preceding words, then the recognition of words immediately preceding the forget cue should be especially depressed. Finally, the differentiation hypothesis holds that the proactive words on the F2 sequences are neither erased nor rehearsed; instead, the proactive words are somehow differentiated from the to-be-remembered words, and vice-versa. Thus, the proactive words from F2 sequences should be recognized as frequently as those from P2 sequences.

Method

Subjects.—The *S*s were 20 paid volunteers obtained from the same source as in Exp. I.

Materials and design.—Sequences of words were presented on a Lafayette memory drum. The words used were 180 pairs of common, one-syllable nouns, selected so that the two were acoustically similar, differing only in the initial phoneme (e.g., RHYME and TIME). Thirty 12-word sequences were constructed by randomly assigning 1 of the words from each pair to one of the first six positions (x) in one of the sequences and the other to the corresponding position (x + 6) in the second half of the sequence. The first 6 words in each sequence were designated List 1, and the last 6 words were designated List 2.

As in Exp. I, there were three general types of sequences: probe (P), forget (F), and control (C). Each sequence was preceded by two sets of asterisks to serve as a warning signal. In P sequences, a colored line appeared to the left of the List 2 words. At the end of each P sequence either the words "List 1" or "List 2" appeared, serving as a cue to recall either the first six words or the last six words. Thus, there were two types of P sequences: P1 (probed recall of List 1) and P2 (probed recall of List 2). F sequences were similar to P sequences, except that a line of a different color than in the P sequences appeared to the left of the List 2 words, indicating that *S* should attempt to forget the List 1 words, since he would not be asked to recall List 1. The colors of the lines were red and green. For half of the *S*s, a red line designated P sequences and a green line designated F sequences; the colors were reversed for the other half of the *S*s. F sequences were always followed by the words "LIST 2," indicating that *S* should attempt to recall the last six words. Thus, there was only one type of F sequence: F2 (forget List 1, recall List 2). There were two types of C sequences. In Type C1, the last six (List 2) words were not presented; in Type C2, the first six (List 1) words were not presented. In C2 sequences a line of the same color as in F2 sequences appeared to the left of the six words presented, informing *S* that List 1 was not presented. C sequences were always followed by the word "LIST," the recall cue.

Each of the five types of sequences was presented six times to every *S*, once in each of six blocks of sequences. The order of the sequences in each block was random. The first block consisted of five practice sequences which were not scored. The order of presentation of the five experimental blocks was counterbalanced across *S*s.

Two sheets of paper were used for written recall by each *S*. Blank spaces on the recall sheets were numbered from 1 to 6 for each trial. The recognition test sheet was constructed by typing all 90 of the List 1 words from the P2, F2, and C2 sequences in a random order in three columns. Since the List 1 words from the C2 sequences had never been presented, those words served as distractor, or new, items. The same recognition test form was used for all *S*s.

Procedure.—Each *S* was first given appropriate shadowing instructions. He was then given practice shadowing a continuous sequence of 48 words. Then *S* was shown examples of the five types of sequences used in the experiment and told the meaning of the colored lines accompanying List 2 words. The *S*s were given free position recall instructions (cf. Crowder, 1969): They could write down their best guess as to the correct words in any order they chose, as long as the ultimate position of the words on the recall sheet corresponded to their best guess of the order in which the words had been presented. The *S* was told to write down 6 words on every trial, guessing as to the correct words or order if uncertain. The memory drum was set at a rate of presentation of .6 sec/word. The intertrial interval was self-paced; each trial started about 10 sec. after *S* indicated that his recall for the previous trial was completed. All shadowing errors were recorded by *E*.

Immediately following the last trial, *S* was given the recognition test sheet. He was told to indicate whether or not each word had been presented in the first part of the experiment, regardless of whether he had been previously cued to forget the word.

In order to insure that *S*s understood the meaning of the colored lines to the left of the List 2 words, *S*s were asked to explain the meaning of the two colors both at the start and at the end of the experiment. All *S*s correctly reported the meanings of the colored lines.

Results

Recall performance was analyzed by using the stringent and lenient measures that were used in Exp. I. Following an arc-sine transformation, the data were subjected to an analysis of variance which made planned comparisons. Except where noted, similar patterns of results and comparable levels of significance of the planned comparisons were obtained according to the two measures; so all recall data reported here, like in Exp. I, are based on the stringent measure.

The mean percentages recalled were 19.2, 40.7, 58.3, 46.3, and 60.3 on P1, P2, F2, C1, and C2 sequences, respectively. Recall performance was significantly worse on P2 sequences than on F2 sequences, $F(1, 19) = 62.4$, $p < .001$, indicating a reduction in PI contingent upon the presentation of the forget cue. The difference between F2 and C2 sequences was not significant according to the stringent measure, $F(1, 19) = 3.03$, $p > .05$, but it was marginally significant according to the lenient measure, $F(1, 19) = 5.34$, $p < .05$. In addition, performance was worse on C1 sequences than on C2 sequences, $F(1, 19) = 43.1$, $p < .001$.

Figure 1 illustrates recall performance on each of the five types of sequences as a function of the presentation position. There was a significant interaction between performance on P2 and F2 sequences and the presentation position of the tested words, $F(1, 19) = 11.6$, $p < .01$. There was also a significant, but smaller, F2 and C2 Sequences × Presentation Position interaction, $F(1, 19) = 4.42$, $p < .05$. These interactions, as well as the overall differ-

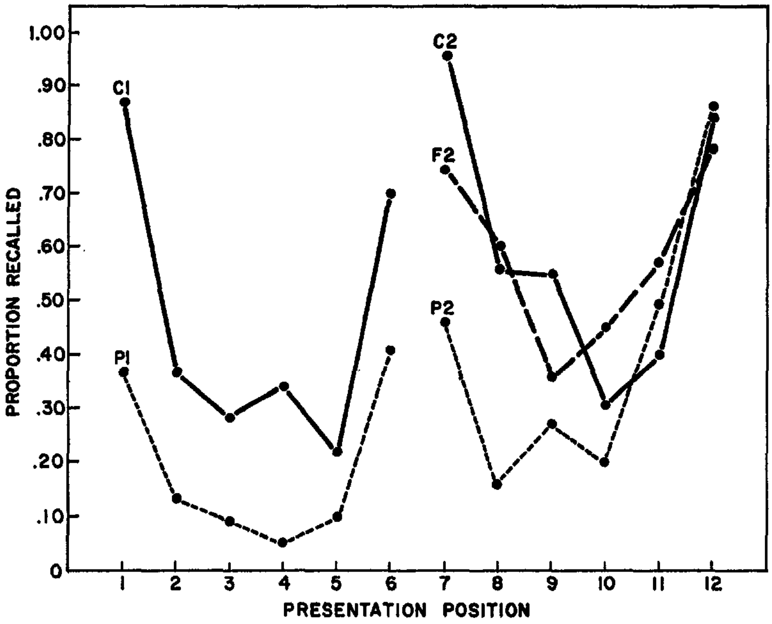

FIG. 1. Mean proportion recalled as a function of presentation position, Exp. II.

ences between P2, F2, and C2 sequences, seem to be primarily due to the differences in magnitude of the primacy effect which was observed. The primacy effect of the recalled words on F2 sequences was greater than the primacy effect on P2 sequences, but slightly less than the effect on C2 sequences.

Recognition performance was analyzed by using the d' measure (cf. Elliott, 1964), which was based on whether or not each *S* correctly called each P2 (List 1) or F2 (List 1) word old and whether or not that *S* erroneously called each C2 (List 1) word old. For each *S*, there were 30 observations of each of these three kinds of words. There was almost no difference between *S*s' recognition of words which had appeared as List 1 of the P2 and F2 sequences; the mean of the individual *S*s' d' values was .63 for the P2 words and .60 for the F2 words.

Recognition performance is shown in Fig. 2 as a function of the presentation position of the words. The P2 and F2 words show a significant linear primacy effect, $F(1, 19) = 18.4$, $p < .001$. However, there was no indication of any interaction between the P2 and F2 curves as a function of presentation position, $F(1, 19) < 1$.

The mean percentage of words incorrectly shadowed was less than 2% on all types of sequences. Thus, differences in misperceptions and, by inference, shadowing difficulty of the words cannot account

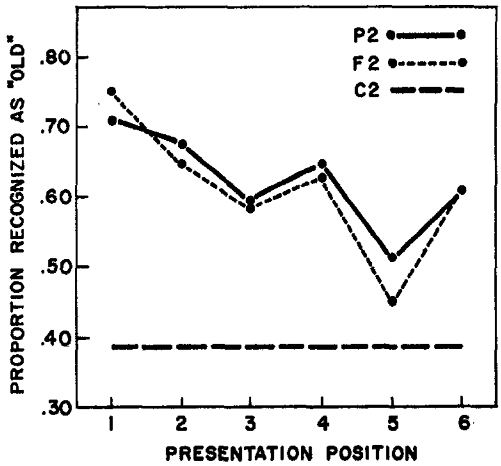

FIG. 2. Mean proportion recognized as "old" as a function of presentation position, Exp. II.

for the observed differences in recall performance.

Discussion

The results of Exp. II are a further replication of the findings that *S*s are able to reduce the amount of PI from preceding material on those trials on which a forget cue is presented, since the mean percentage recalled was greater on F2 sequences than on P2 sequences. This effect shows up most clearly in this experiment when one considers the retention of the several words immediately following the onset of the forget cue.

The erasure hypothesis as previously stated is clearly not supported by these results. The recognition data show that the strength of the to-be-forgotten material (List 1 words from F2 sequences) is comparable to that of the material (List 1 words from P2 sequences) which presumably had not been erased (since no forget cue was presented). However, a form of the erasure hypothesis could be retained by assuming either (or both) of the following: (*a*) Recall and recognition are based on entirely different mechanisms, and the proactive material on F2 sequences was erased only to the recall mechanism; or (*b*) in this experiment, recall was based on the short-term availability of the presented material, recognition was based on the long-term strength of the proactive material, and the proactive material was erased only in the short-term store. Both assumptions, however, unparsimoniously assume that the recall and recognition tests tapped entirely different mechanisms.

The rehearsal hypothesis is also not supported by these results. There was no significant decrement in recognition of the List 1 words from F2 sequences as compared with P2 sequences. The rehearsal hypothesis, like the erasure hypothesis, could be retained by assuming either (or both) of the following: (*a*) Recall and recognition are based on different mechanisms, and recognition performance was unaffected by further rehearsal (or the lack of further rehearsal) of the proactive material; and (*b*) in this experiment, recognition was based on the long-term strength of the proactive material, and further rehearsal (or the lack of further rehearsal) of the proactive material affected the short-term availability, but not the long-term strength, of the material. These assumptions are almost identical to those suggested for the erasure hypothesis, and the same objection based on parsimony applies.

Of the three hypotheses originally proposed, only the differentiation hypothesis is entirely consistent with the results. The strongest evidence favoring the differentiation hypothesis over the other two is the finding of no difference in the recognition of the proactive words from P2 and F2 sequences. In addition, it was found that the recall serial position curve obtained on F2 sequences was more similar to that of C2 than that of P2 sequences—the difference being mainly in the magnitude of the primacy effect. Since the differentiation hypothesis states that the presentation of the forget cue allows *S*s functionally to separate the to-be-forgotten material from the to-be-recalled material, and since the serial position curve on C2 sequences is what is observed when there is no to-be-forgotten material, the differentiation hypothesis seems to be able to account for the recall serial position curves which were obtained.

As previously mentioned, Elmes et al. (1970) and Bruce and Papay (1970) recently used procedures similar to that of the present experiment. The present findings, like those of Elmes et al., support only the differentiation hypothesis, while the findings of Bruce and Papay support either the rehearsal hypothesis or a combination of rehearsal and differentiation hypotheses. The apparent inconsistency may be due to the fact that a relatively slow presentation rate was used by Bruce and Papay, allowing considerable opportunities for rehearsal. The present findings demonstrate that there are dramatic effects of presenting a cue to forget even when opportunities for rehearsal are greatly reduced.

One additional piece of evidence which will have to be explained by any hypothesis concerning active forgetting and remembering in STM is the difference in recall performance between the C1 and C2 sequences. This finding is clearly inconsistent with the rehearsal hypothesis, since C1 and C2 sequences had the same number of to-be-remembered words. It does, however, support the differentiation hypothesis. Specifically, the finding suggests that *S*s can take advantage of the knowledge that a certain set of material will definitely have to be recalled (such as the C2 words and the F2 [List 2] words) in such a way as to more efficiently store that material in memory than material which may or may not have to be recalled (such as the C1 words and the P2 [List 2] words). This notion holds that *S*s can differentially store and, later, retrieve information in STM depending upon whether or not *S*s know that the information will have to be recalled.

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