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Recognition memory as a function of length of study list

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Previous work indicates that when appropriate methods are used, recognition memory for words does not differ as a function of the length of the study list (Schulman, 1974). There are theoretical reasons for believing that recognition errors and length of study list should be directly related. In Schulman's study, only the first 25 words in the study lists of different lengths were tested. In the present study, only the last 20 words in the lists of different lengths were tested. Recognition errors increased as length of study list increased. The theoretical reasons for expecting this outcome were not supported by internal analysis of errors. The discrepancy between the present finding and that of Schulman may indicate that the relationship between length of list and errors occurs only when proactive effects can influence the words tested, although just what these proactive effects might be is unclear.

Suppose a study is to investigate recognition performance as a function of the length of the study lists of words. Suppose further that there are two list lengths, 25 words and 100 words, and that a forced-choice recognition test is used. If all words in both lists are tested, there are obvious confoundings. First, the retention interval will be directly related to the length of the list. This should favor the memory for the short list. Second, insofar as the act of testing may interfere with memory for subsequent items, the shorter list should again be favored.

A search indicates that there may be only one published study that has appropriately handled the methods problems noted above. In the study by Schulman (1974), there were three list lengths, namely, 25, 50, and 100 words. Each word was presented for 2 sec on the study trial. In order to equate the length of the retention interval for all list lengths, two steps were taken. First, differences in the retention interval associated with differences in the length of the lists were eliminated by using a filler task. The subjects having the 25-word list were given the filler task for 250 sec between the presentation of the 25th word and the start of the recognition test. The group having the 50-word list was given the filler task for 200 sec, and the group having the 100-word list was given the filler task for 100 sec. Thus, all three groups had a period of 250 sec falling between the study of the 25th word and the recognition test. The second step taken by Schulman to equate the retention interval was to test all subjects initially on the first 25 words studied. Thus, all three groups had the same retention interval and differed only on the number of words that followed the initial 25 in the study list.

Schulman's (1974) results indicated that the length of the study list had no influence on recognition memory as measured by a forced-choice test on the first 25 words studied. However, Schulman's data also showed that recognition performance on successive groups of 25 words fell sharply for the subjects having 100 words in the study list. These data suggested that retroactive interference was not operating on the study trial; had there been retroactive inhibition, the performance on the first 25 words in the study list would have been poorer for the long list than for the short list. On the other hand, Schulman interprets his data to mean that proactive interference was present, either proactive interference of early items on late items during study or interference of early recognition judgments upon later judgments.

Schulman's failure to find any influence of the number of items in the study list on subsequent recognition is somewhat puzzling. Theoretically, it would seem that the greater the number of items in the study list, the greater the probability that a so-called new item would be judged old. This could be true because of orthographic-acoustic relationships between items in the study list and new items, or because of associative relationships between the items in the study list and new items. In any event, the present study also examined recognition as a function of length of the study list, but used different means for keeping the retention interval constant as the study list increased in length.

METHOD

Design

There were four lengths of the study lists, 24, 40, 60, and 80 words. Recognition memory was measured by a two-alternative forced-choice test in which only the last 20 words were tested, regardless of the length of the study list. Thus, the length of the retention interval was the same for all list lengths, being essentially zero.

Lists

The words were all of four letters and differed widely in frequency. A total of 284 words was required. Of these, 204 were assigned randomly to four sets of 20 words each and to four other sets of 4, 20, 40, and 60 words. Adding 20 words to these latter four sets makes the study lengths as indicated above (24, 40, 60, and 80 words). The four sets of 20 words were paired randomly with the remaining 80 words to form four sets of test pairs. These test pairings remained fixed for all subjects. However, the four sets of 20 study words used as the last 20 words in the lists were rotated across list lengths. Thus, when the data were combined across subjects, each test set occurred equally often with each list length.

Procedure and Subjects

The subjects were fully instructed concerning the nature of the recognition test and were further told that only a portion of the words in each list would be tested. The study lists were presented at a 2-sec rate, and the 20-pair recognition test was unpaced, being presented in a booklet. The subjects circled the word in each pair that they thought had been in the study list. All subjects were given all four lists. There was a total of 60 subjects, tested in small groups. Four subgroups of 15 subjects were used for balancing purposes. The four lists were given in four different orders so that each list length occurred once at each of the four positions. Yoked with these four different orders was the rotation of the four sets of 20 critical items each across the four list lengths.

RESULTS AND DISCUSSION

The forced-choice tests were scored to determine the number of errors made as a function of list length. These errors, expressed as percents, are shown in Figure 1. Errors increased directly as list length increased, and although the absolute increase is not large, it is highly reliable statistically [$F(3,168) = 5.92$, $p < .01$].

As noted earlier, list length and recognition errors were expected to be associated, because the longer the list, the greater the likelihood that a word in the study list would be related to a new word on the forced-choice test. Errors should increase correspondingly. If this is responsible for the increase in errors seen in Figure 1, certain expectations must follow about the particular items on which errors were made. The items

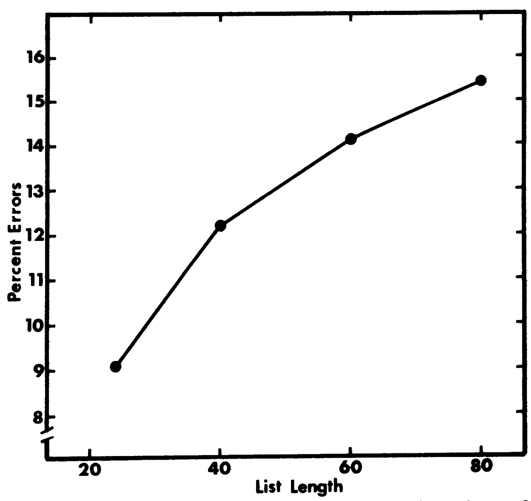

Figure 1. Percent recognition errors as a function of the length of the study list.

on which errors were made should change as the study list becomes longer. To consider an extreme case as an example, assume that the word "boat" occurs as a new word in the 20-pair test. As these 20 pairs are rotated across the lists of increasing lengths, the probability increases that the word "dock" will occur in the study list. Because "dock" and "boat" are associated, the occurrence of "dock" in the study list may be a source of error on the new word "boat." If errors increase because of such mechanisms, the particular items on which many and few errors are made should change as the lists get longer. Such changes could be detected by correlating the errors by items for the 20 test pairs. The correlations must be low to support the expectations from the theory. Because there were a number of items with zero errors for a given list, the errors were combined for List Lengths 20 and 40 and for List Lengths 60 and 80. Product-moment correlations were then calculated for the errors on the 20 test pairs. There were four sets of 20 pairs, hence four correlations were calculated. The resulting values were .70, .71, .73, and .77. On an absolute basis, these values indicate high stability of item difficulty. As a further step, the number of zeros in the distributions were ignored and correlations calculated for the errors for the 20 items for List Lengths 24 and 80 for the four sets. The values were .63, .57, .46, and .62. The stability of item difficulty across all list lengths makes it quite unlikely that the increase in errors shown in Figure 1 can be attributed to associative or orthographic-acoustic relationships between old items and new items.

As pointed out earlier, Schulman (1974) suggested that during study early items may proactively influence encoding of later items. This could account for the present results and for Schulman's results. It will be remembered that Schulman did not find the list length to be a relevant variable when the first 25 items from the lists (of different lengths) were tested. For such tests, proactive effects could not be involved, although these effects could be present in the current data because only the last 20 items for each list were tested. The longer the list, the greater the amount of proactive influence on the last 20 items. What is not apparent, however, is the nature of the proactive effects. When formal interference paradigms are used, there is very little evidence for either proaction or retroaction in recognition memory (Bower & Bostrom, 1968; Underwood & Brown, 1975). Is it possible that matters of attention are involved? It could be assumed that the longer the study list, the greater the likelihood that attentional lapses will occur on the last 20 items of the list. Since these lapses would presumably be unrelated to particular items, the stability of item difficulty would remain high across all list lengths. As an explanation, loss of attention lacks elegance, but it may be close to the truth.

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