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An effect of context on free recall of categorized words*

SUSAN KARP MANNING
Hunter College of the City University of New York, New York, New York 10021

The effects of context on the learning of specific items in a list was studied by embedding 15 words from three categories in lists containing 15 additional items from the same three categories. These additional items were either high- or low-level associates to the category names.

A three-trial study, using 48 college students, showed enhanced recall on Trials 1 and 2 of experimental words when embedded in the list containing words of low associative level. The results were interpreted as evidence for a contextual dependency view of item learning and a result of the effects of a limited processing capacity.

One basic issue in understanding the storage and use of events in verbal learning is whether the single events are processed independently or in combination (Kintsch, 1970; Wood, 1972). Following the independence view, it may be predicted that the probability of recall is determined solely by the number of times the event is presented regardless of context. A dependency view states that contextual effects are important in the learning of given items.

The dependency view is supported by demonstrations of organizational interference. Deficits, or interference in learning, often occur when a list or groupings of words which tend to be organized in a given way are relearned in a new or changed list in which the first organization is not optimal (e.g., Bower, Lesgold, & Tieman, 1969; Tulving, 1966). However, the results of such experiments have not always been clear or consistent (see Wood, 1972).

This study specifically manipulated the associative value of the words in which the test items were embedded. Two lists were constructed, each containing 30 words divided evenly into the three taxonomic categories "a color," "a four-footed animal," and "an article of clothing." All words used for the lists were high- (h), medium- (m), or low-level (l) associates to the category name, as determined from the Battig and Montague (1969) norms. The high-associate list (H) consisted of 15 h associates, five from each category, while the low-associate list (L) consisted of 15 similar l words. Both lists contained the same 15 words of medium associative value.

It has been demonstrated that when h words are compared to l words, both learning and clustering (degree of contiguous recall) are greater in the former case (Bousfield, Steward, & Cowan, 1964).

This situation then provides a test of the independence vs dependence hypotheses of item learning. If the m word learning is significantly changed by whether the list is embedded in the H or L list, respectively, it is evidence for a contextual dependency view of list learning. The learning of a given set of items is effected by the particular other items present in the list.

In addition, if enhanced learning of m words occurs in the L vs the H list, it is evidence for the effects of a limited processing capacity. Assume that the learning of a single item takes some amount of processing capacity and that the amount of capacity available for learning a list is relatively fixed on each trial. Since h words are more easily learned as compared to l words, it follows that the capacity remaining for the m words on the H list should be less than that remaining for the same words on the L list. Thus, enhanced learning for the m words on the latter list is predicted by this view.

METHOD

Subjects

The Ss were 35 female and 13 male Hunter College students who were required to participate in the experiment during class time.

Design and List Construction

Three sublists, containing five words each from the Battig and Montague (1969) categories "a color," "a four-footed animal," and "an article of clothing," were constructed. The h, m, and l sublists contained words mentioned by 51%-99%, 16%-46%, and 3%-9%, respectively, of the Battig and Montague sample. Thus, the frequency of association to the category name varied considerably for the three sublists and no overlap was present.

The three sublists were used to construct the H and L lists, the former consisting of the 15 h and 15 m words and the latter of the 15 l and 15 m words.

The 30 words making up the H and L lists were randomly arranged in three different orders, with the restriction that no word from a given category could follow another word from the same category. Each S received a booklet with instructions (typed on the front cover), the three lists, and blank pages for recall trials. The three lists were arranged equally often in the six possible orders to control for possible differences in list difficulty and for order effects.

Procedure

The instructions stated that the booklet contained three different orders of the same list. The Ss were given 1½ min to study each list and 1½ min to write down all the words in the order they remembered them.

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RESULTS

The mean number of correct responses over the three trials is shown in Table 1 for Sublists l, m, and h within Lists L and H. The number of correctly recalled m sublist words for Lists L and H was compared over their three trials. An analysis of variance showed that the lists effect was not reliable [$F(1,46) = .98$, $p > .05$]. However, the trials main effect and the Trials by Lists Interaction were significant [$F(2,92) = 26.41$ and 4.11, $p < .01$ and $.05$, respectively].

Examination of Table 1 clarifies these results. As expected, there is a steady increase in learning of all words over trials. More interesting, though, is the presence of enhanced learning of the m sublist when embedded in the L list. This effect is evident on Trials 1 and 2 and is responsible for the significant interaction.

Further analysis was done on the sublists within the H and L lists, respectively. For the L list the sublist and trials main effects were significant [$F(1,23) = 44.76$ and $F(2,46) = 32.73$, both $ps < .01$], while the interaction was not [$F(2,46) < 1$]. A similar pattern was evident for the H list, although the differences were smaller. Again both the sublists and trials main effects were significant [$F(1,23) = 4.37$, $p < .05$ and $F(2,46) = 34.05$, $p < .01$, respectively]. As before, the interaction was not reliable, $F(2,46) < 1$. These results are evidence for the expected difficulty levels of the respective sublists.

Additional analysis showed no significant list effect or Trials by Lists interaction when the entire H and L lists (including sublists) were compared, $F(1,46)$ and $F(2,92)$ both < 1. The trials effect, however, was significant [$F(2,92) = 119.32$, $p < .01$]. Apparently, the enhancement effect for the m sublist partially overcame overall difficulty factors for the H and L lists.

In order to get at some of the accompanying organizational effects, clustering scores were obtained for the H and L lists over trials. The measure used was the adjusted ratio of clustering (ARC) developed by Roenker, Thompson, and Brown (1971). This measure varies between −1 and +1 and is a measure of the proportion of above-chance clustering present as compared to the amount possible for a given recall list.

The mean ARC scores over trials are shown for the two lists in Table 2. An analysis of variance shows the trials main effect to be significant [$F(2,92) = 4.15$, $p < .05$] and ascribable to the steady increase in clustering over trials. The list effect was marginally significant [$F(1,46) = 3.65$, $p < .10$], suggesting greater clustering for the H vs the L list. The interaction did not reach significance, $F(2,92) < 1$.

Table 1
Mean Number of Words Learned Over Trials

	Trial 1	Trial 2	Trial 3
L List			
l Sublist	6.71	8.12	10.29
m Sublist	8.70	10.17	10.42
H List			
m Sublist	7.79	9.25	10.50
h Sublist	8.67	9.87	10.92

Table 2
Mean ARC Scores for H and L Lists Over Trials

	Trial 1	Trial 2	Trial 3
H List	.107	.220	.431
L List	−.063	.197	.329

DISCUSSION

The enhanced learning of the m sublist on Trials 1 and 2 evidenced by the Ss learning the L list demonstrates the effects of context on item learning. Apparently, the ease with which the m sublist was learned was influenced by the other items in the list.

These results may be explained in terms of a limited capacity view of item learning. There appears to be a limit on the number of items that can be learned per trial. If this were not the case, the m sublist items would be learned equally well in both the H and L lists. Apparently, what is happening is that the m sublist items are the easier items in the L list. Thus, the processing capacity may be regarded as more available than in the H list, where these items are relatively more difficult. This could account for the enhancement effect.

The finding that the enhancement effect disappears on Trial 3 is also of interest in explaining processes that occur in verbal learning. The statistical analysis and the data in Table 2 indicate that clustering is at a maximum on Trial 3 for both lists. Further, although the differences between the clustering indices for the two lists are only marginally significant, they show no signs of diminishing. Thus, while the amount of organization has increased for both lists along with the learning, differences in association value to the category name appear less important. Perhaps on later trials individual and organizational factors become more relevant than item familiarity in determining which items are recalled.

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