Processes of verbal memorization revealed in correct and erroneous recall of words and paralog¹

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Abstract

Paralog (C-V-C-V-C) distortions of real words were memorized in mixed lists no better than randomly generated paralog¹s. Reversed words apparently were unrecognized by most Ss. Error patterns permit inferences concerning memory encoding processes.

Problem

Although it is established that meaningful words are more readily memorized than nonsense syllables or paralog¹s, an intermediate case in which paralog¹s are created by distortions of real words needs to be studied. If the distortions were detected by Ss, then transformation back to real words might occur as a useful aid to memory storage. Errors may be studied as a basis for inferring techniques of memorization and retention used. The utility of error study has been repeatedly demonstrated, e.g., by Jensen (1962) who found a serial position effect in spelling errors, by Rozov (1959) who noted lawful verbal processes in recall and recognition errors, and by Underwood & Hughes (1950) who found generalization gradients in recall errors based on semantic similarity.

Method

Ss were 35 female students from introductory psychology. They were run as a group, being asked to memorize a mixed list of 32 verbal items, each of the form C-V-C-V-C. The list consisted of 8 real words, 8 reversed-word paralog¹s, 8 paralog¹s created by randomly changing one letter of a real word, and 8 randomly generated paralog¹s. A constraint on randomness was the non-use of j, k, q, x and z.

With two items of each type randomly placed in each of four columns, the list was projected for the Study stage of each of the five acquisition trials. Each trial consisted of four stages: Study, 3 min.; Retention, 1 min.; Written Recall, 3 min.; Rest, 3 min. During Retention, Ss sat quietly until instructed to open their folders for Recall during which they printed the items they could recall, incidentally continuing to study these. Folders were closed after 3 min. and were exchanged for blank ones during Rest, which functioned as the conventional intertrial interval.

In anticipation of error analysis, E encouraged Ss to strive for recall even where unsure of an item in its entirety: "You will receive partial credit for items that are partly correct, so if you recall an item with some uncertainty, print the part which you know and complete the item with your best possible guess as to its spelling. Full credit will be given for those items which are correctly spelled."

Ss were asked to return the next day for "another experiment in the series." They were actually given a 24-hr. unaided recall test, with partial credit again being offered for partial successes.

Results

As seen in Fig. 1, the meaningful words were more readily memorized and retained than were the three types of paralog¹s. However, the paralog¹s derived from real words by either reversal or one-letter change were no more readily acquired and remembered than were the paralog¹s generated randomly. The statistical significance ($p < .05$) of the superiority of real-word learning and of the lack of difference among the paralog¹ types was established by analysis of variance.

Post-experimental inquiry revealed that only 8 of the 35 Ss had noticed that some of the paralog¹s were real words reversed. These Ss who noticed this showed some superiority in learning the 8 reversed-word paralog¹s. On Trials 2 and 3, they averaged 1.4 and 1.5 more of these items correct, respectively, than the 27 Ss who

Fig. 1. Acquisition curves for real words and three types of nonsense paralog¹s. (N = 35)

Table 1

Number of Ss Making Each Type of Error, Compiled by Locus within Paralog, Over All Trials plus Retention Test

Type of Error	Locus Within Paralog				
	C ₁	V ₁	C ₂	V ₂	C ₃
a. One letter only	9	41	42	61	60
b. Vowel transposition		18		18	
c. Consonant transposition			2		2
d. Both vowels wrong		18		18	
e. Two consonants wrong	4		13		11
f. Vowels transposed, wrong consonant	1	6	3	6	2
g. Prefix wrong	4	4			
h. 2-letter suffix				22	22
i. 3-letter suffix			16	16	16
j. One vowel, one consonant		6	7	3	2
Total per locus:	18	93	83	144	115

did not report noticing this fact. On Trials 1 and 4, and on recall, their margin of superiority was less and on Trial 5, the non-noticing group did slightly better on these 8 items. Statistical significance for the general superiority on these items of the noticing group was demonstrated in an analysis of variance. A *t* test indicated significance of difference on Trial 2 ($t=2.04$; $df=33$; $p<.05$), while differences on other acquisition trials and on recall were not significant. The group noticing reversed-word paralog did not exceed the non-noticing groups when performance over all 32 items was assessed.

Post-experimental inquiry showed that 16 of the 35 Ss had noticed that some of the paralog were real words except for a one-letter change. However, they did no better at the memory task, either on this type of item or over all items, than the 19 Ss who did not report noticing this type of item.

Erroneous written recall of paralog, encouraged by instructions to strive for partial credit, occurred with a frequency great enough to permit some inferences about techniques of encoding for purposes of retention. The specific errors made at some point by 15% or more of Ss were as follows: COMEN instead of COMEM ($N=8$ Ss), More common terminal letter, perhaps induced by easier covert vocalization; YAWUT instead of YOWUT ($N=7$ Ss), Ambiguity of covert vocalization; YACES instead of YACED ($N=6$ Ss), Change in ending of the nonsense verb YACE; WAGIN instead of WIGON ($N=6$ Ss), One letter different from real word, wagon; SOBER instead of SOBOR ($N=6$ Ss), Loss in encoding after item was noted to resemble sober, possibly induced by covert vocalization; LORAC instead of LAROC ($N=5$ Ss), Vowel transposition.

An empirical tabulation of the locus within paralog of all errors was compiled. Data were included from both the memorization trials and the retention test but errors made repeatedly by the same S were counted only once. The numbers of Ss making each type of error, tabulated by locus, are shown in Table 1.

There appears to be an increasing error gradient from the first to the last portions of the paralog. Errors at the initial letter locus are relatively infrequent. This suggests a directory-style approach operative in either

memory encoding or memory search, or both. Out of 322 paralog represented in Table 1, the first letter was in error only 18 times, final letter errors being about 6 times as frequent. Suffix errors were about 9 times as numerous as prefix errors.

Secondly, there appears to be greater lability in the retention of vowels than in consonants, particularly in transposition errors which were 9 times as frequent for vowels as for consonants. The use of pronunciation techniques in memorizing might partly account for this since vowels tend to be more nearly interchangeable in sound than do consonants chosen at random. Also, consonants may have been studied more carefully by Ss since it is well known that consonants give words their structure with vowels carrying less of the information.

Discussion

The strongly limited tendencies of Ss to notice paralog of the reversed-word and letter-change types are likely to have been due in part to the mixed-item nature of the list. Real words were perceptually salient but the special paralog intermixed with the randomly generated ones were less apparent. Either special type, if intermixed with real words alone, might be more readily perceived and specially encoded.

Errors were induced with sufficient frequency to permit some statistical tabulation as well as examination of specific recurrent responses. Relatively common errors such as WAGIN and SOBER were partly a function of the list mixture which invited these forms as plausible responses. The within-item serial position effect in error locus is strong evidence for a directory-style approach to memorizing. These observations provide reference points for predictions when list mixture is varied in additional research.

References

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Note

1. This research was performed during the junior author's tenure as an NSF Undergraduate Research Participant.