The effects of syntactical violation and practice on the free recall of verbal materials in children

LAWRENCE W. LEZOTTE AND JOE L. BYERS, *DEPARTMENT OF EDUCATIONAL PSYCHOLOGY, MICHIGAN STATE UNIVERSITY, East Lansing, Mich. 48823*

The objective of this experiment was to determine whether free recall differs when sentences of varying degrees of syntactical violation were presented to fifth grade and college students. Three levels of syntactical violation were employed. The Ss were asked, after each of the six presentations of the stimulus materials, to recall as many stimulus words as possible. Syntactical violation was found to significantly affect recall; however, words totally lacking in grammaticalness were recalled significantly better than words from the semi-grammatical condition.

The purpose of this experiment was to demonstrate that fifth grade students are able to use "syntax" to aid them in learning and recalling a set of verbal materials. A series of studies, initiated by Epstein (1961) have been reported which demonstrate that learning and recall of verbal materials is facilitated if the material is presented in a syntactical manner. In examining these studies it was noted that in all cases the Ss had been college age students.

Epstein (1961) made the observation that syntactically structured material was learned more easily than matched unstructured material if the other factors such as meaningfulness, familiarity, and transitional dependency were absent or equated. In a second study Epstein (1962) was able to replicate his original findings, except in the condition where the materials were presented serially. In this case, no differences in recall were found. He suggested that syntactical facilitation depends on the structure of the series as a unit rather than sequential or semantic associations.

Miller & Isard (1963) followed with a study in which they systematically violated linguistic rules and found that the presence of such violations made the perceptual task more difficult. More recently, Marks & Miller (1964) reported a study in which semantic and syntactic rules were violated independently. They found that sentences were recalled at a higher rate and with fewer errors than random word lists. In addition, they also found that word strings in which either semantic or syntactic rules were violated were recalled more easily than random strings of words.

The present study most nearly replicates the Marks and Miller study in that sentences, anagrams (that is, scrambled sentences), and random word strings were used as stimulus materials. The essential difference between this and the Marks and Miller study was that "syntactical facilitation" was examined using fifth-grade rather than college-age students as Ss. Also, to establish greater generality, three modes of presentation, aural, visual, and aural-visual combined, were used.

Following the reasoning and data of Marks and Miller it was predicted that the overall recall of sentences should be significantly higher than anagrams which should be significantly higher than random strings. Also, on the early trials anagram recall should not differ significantly from random string recall, and on later trials anagram recall should not differ significantly from sentence recall.

Method. The Ss consisted of 36 fifth-grade students randomly selected from each of three elementary schools in a midwestern school system. The Ss from School A were known to have scored significantly below the students from Schools B and C on the Iowa Test of Educational Development (ITED). The mean ITED score for the Ss from the various schools was A = 35 percentile, B = 54 percentile, and C = 57 percentile.

Twelve six-word sentences were constructed from 72 different high frequency words according to the following syntactical structure: Adjective-Noun-Adverb-Verb-Adjective-Noun.

The following procedures were used to create increasing degrees of syntactic violation: sentences, anagrams, and random strings. Four sentences were randomly selected from the basic set of 12 and presented intact, constituting sentence list (s), (e.g., strong boys usually build large boats). Another four sentences were randomly chosen from the remaining eight and

scrambled thus creating four sentence anagrams (a), (e.g., ideas new find children little always). Finally the last four sentences (24 words) were scrambled and regrouped into four six-word strings such that it was impossible to construct a sentence or phrase within any of the strings. These were designed as the random string list (rs), (e.g., now thin good pleasant families really).

Each list type was presented to each S six times, once in each block of trials. A trial consisted of a list of 24 words divided in four six-word strings. The lists were presented at a 1 sec pace with a 2 sec pause between each six-word string. Following exposure the Ss were given a 2 min recall period in which to write the stimulus words just presented. A 1 min rest period was given after each block of three trials. To prevent confounding of list type with practice effects the order of list presentation within blocks of trials was systematically varied so that each list appeared equally often in the first, second, and third position within a block. To reduce possible serial effects within the s, a, and rs list types, the order of presentation within each of the four strings within a list type was randomly varied across the six trials. The Ss were tested in groups and the words were presented at a 1 sec rate. A 2 sec pause appeared at the end of each string.

A response was scored correct if the word had appeared anywhere within the 24 words to which the S had just been exposed. A factorial analysis of variance procedure and the Scheffe Method of Post Hoc Analysis were used to analyze these data.

Results and Discussion. The overall recall for the Ss from the school with the lower measured achievement was significantly less than that for the other two school groups. Also, a significant List by Trial by School interaction was found. Examination of Fig. 1 suggests the following interpretation of this interaction. For all three list types, the recall of the Ss with lower measured achievement was below that of the other Ss, and on sentences and random strings their improvement in recall, although less, tended to progress in a manner similar to the Ss with high measured achievement. However, a careful examination of the graph illustrating anagram recall suggests the Ss with lower measured achievement recalled less on the sixth trial than on the second trial. The suggested implication is that resolution of the anagram may be viewed as a problem solving task requiring strategies which are different from those needed for both sentences and random

Fig. 1. Mean recall for each school on each list type and trial. (Mean ITED school percentiles: A = 34, B = 54, and C = 57.)

Table 1
Mean Recall by List Type on Each Trial
 (College Students N = 32, Fifth Grade Students N = 108)

Trials	Sentences		Random String		Anagrams	
	Fifth	College	Fifth	College	Fifth	College
1	12.9	19.6	7.8	12.4	6.4	10.4
2	16.9	22.3	10.1	16.6	9.3	16.3
3	19.1	23.8	12.2	18.9	9.2	16.7
4	19.8	23.6	12.1	18.8	9.9	18.2
5	19.9	23.4	12.6	20.3	10.9	20.7
6	20.4	23.8	14.4	22.3	10.6	21.3

Scheffe critical mean difference for Fifth Grade Students is 1.24, and for College Age Students is 2.57.

strings. One may conclude that low achieving students either lack such necessary strategies or they possess them but employ them inappropriately. Further research could be planned to determine which, if either, of these two interpretations is most plausible.

The main effect of list type was found to be significant ($F = 202.20$, $df = 2/180$, $p < .005$). However, examination of Table 1 reveals that the predicted rank order of mean recall for the three list types was not substantiated. The mean recall of sentences was significantly higher than anagrams and random strings, but contrary to the prediction and previous research, anagram recall was found to be significantly below that of random strings on five of the six trials. On Trial 2 no significant difference between anagrams and random strings was observed. The absolute improvement in mean recall of anagrams across the six trials was approximately one half that found for sentences and random strings.

Several subsequent questions were asked in attempting to explain the unpredicted reversal in anagram and random string recall. The first was: would the same results be found using the same stimulus materials with college-aged Ss? The study was replicated using college sophomores as Ss. Again a significant List type by Trial interaction was found ($F = 121.90$, $df = 10/310$, $p < .005$). The mean recall for each list type on all trials is presented in Table 1. Examination of this table reveals that sentence recall was significantly higher than anagram and random string recall on all

trials. However, no difference between anagram and random string recall was found. Although the anagram recall of college students was not different from their random string recall the direction of the difference was still opposite that predicted on five of the six trials.

Even though the materials were assigned to list type and scrambled randomly, it was thought that maybe the word order was such that a higher index of sequential dependence between the words had inadvertently "slipped" into our random string lists. A careful examination of the Entwisle (1966) associative frequency norms for fifth-grade children was conducted. This effort led to the conclusion that no such difference in sequential dependency was evident. However, this observation should be accepted with caution because not all the words in the study were included in the Entwisle norms.

Finally, one further analysis of the data was conducted to test the notion that the Ss were recalling words from the random strings in an unsystematic fashion, but were concentrating their efforts on one or two entire anagram strings at the expense of the others. The effect of such a strategy could be that the total recall for all four strings contained in a list type might be the same but in actual fact the pattern of individual string recall would be quite different across the two list types. In examining the recall for each string in the anagram and random string conditions on the last trial (the point where such a strategy would likely be most evident), little support was found for the notion that different strategies were being employed by the Ss as they tried to recall the two list types.

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