Sentence Imitation by Retardates as a Function of[1]
Span Ability and Memory Load: A Brief Report

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Bachelder, Harris, Doss, and Roberto (Note 1) found that the word spans of retarded subjects correlate .79 with the size of sentences they can imitate perfectly. The sentences of the Bachelder *et al.* study were somewhat artificial in that the articles (a, an, and the) were not used and the words were all single syllable. The present experiment used sentences which were not so constrained and were likely to be familiar to the subjects or at least likely to occur in their natural school and living environment. In addition a memory load condition was investigated such that the subjects had to remember digits while they imitated the sentences. It was expected that a load condition would reduce sentence spans.

Method

Subjects. The subjects were 22 residents of Western Carolina Center, a residential facility for the mentally retarded. Of these 22 subjects, three were unable to complete testing on the memory load condition (for reasons not related to the experiment) but contributed data on word span and sentence span. Two more attempted both conditions but were unable to perform correctly under the load condition; that is, they could imitate sentences but could never imitate even a short sentence and then recall the load digits correctly. The characteristics of the 22 subjects were, mean CA = 20.02 yrs.; mean IQ = 56.04; mean word span = 4.02; mean period of institutionalization = 6.7 yrs.

Apparatus. A Bell and Howell Language Master was used to present the sentences and the word span tests.

Materials. The word span test used randomly generated word sequences of common single syllable words such as grass, tree, shoe, and doll. The sentences ranged in size from 1 word to 20 words. Some examples are: "Go.", "Bring it to me.", "I should see if I have enough money to go shopping.", and "When you eat pancakes you might like to put some butter and maple syrup on them for a sweet taste."

Procedure. Word spans, sentence spans, and the sentence spans under the load condition were measured by the staircase span technique described by Bachelder (Note 2). The three spans were measured in fixed order; word span, sentence span, then sentence span under a load condition. This procedure confounded practice with the experimental variable but since

considerable data indicate that there is little or no practice effect in the span paradigm this should cause little problem of measurement. A subject never attempted a specific sentence more than once which further minimized a possible practice effect. In addition, any improvement with practice should have run counter to the expected effect of the load conditions, that is, the load condition was expected to reduce scores while practice would be expected to improve scores.

In the sentence span condition the subjects began by imitating one-word sentences, two-word sentences, and so on in ascending fashion until they missed two sentences in a row (performance had to be perfect on each sentence). Once the ceiling of performance was estimated, 10 staircase trials were presented beginning with a sentence equal in number of words to the longest sentence achieved in the beginning ascending trials. During the staircase trials, if a subject imitated a sentence perfectly he attempted a new sentence one word longer; if he erred he attempted a new sentence one word shorter. His score was the mean of the number of words in the 10 sentences actually presented for imitation during staircase trials.

In the load condition each subject first heard from one to three digits randomly generated, then he heard the sentence. He then attempted to imitate the sentence, then he attempted to recall the digits. If he imitated the sentence and recalled the digits perfectly he was scored completely correct and then attempted a longer sentence. If he missed the sentence but recalled the digits it was counted as an error and on the next trial he attempted a sentence one word shorter. If a subject recalled a sentence perfectly but failed perfect recall of the load digits the trial was simply discarded and he attempted another sentence of the same number of words with a new set of load digits. The size of load was determined for individual subjects by dividing their word span by two and rounding down to a whole number of digits. Thus if a subject had a span of 4.7 his load was 2 digits.

Results

Sentence spans ranged from 3.1 to 16.1, and correlated .82 with word span, $N = 22$, $p < .0005$. The mean sentence span was 7.76 and the mean sentence span under load conditions was 6.66, $N = 19$. The sign test (Siegel, 1956) was used to test the significance of the load effect. Thirteen subjects performed lower under load conditions than without, five performed higher under the load condition, and one subject performed the same in both conditions. This result is significant at the .048 level.

Discussion

The results confirmed the hypotheses of the experiment. Individual differences in span ability are closely correlated with individual differences in the ability to imitate complex sentences. When the subjects were also required to simultaneously retain verbal information the length of sentence they could imitate was reduced.

These results are relevant to the teaching and training of the mentally retarded because knowledge of span ability will allow the prediction of relative abilities to imitate sentences as might be required in programs of language development or in any classroom situation in which the student is trying to learn verbal expression of new knowledge. In addition, the results of the

load condition point out the increased difficulty of imitating sentences while at the same time trying to retain other information, a situation which is common in the classroom. Note that this experiment does not indicate that retardates cannot perform these two tasks simultaneously. On the contrary, the subjects of this experiment, with the exception of two low-span subjects (word spans = 2.7 and 2.9), were quite able to perform under the load condition. Nevertheless, the sentences they could imitate under load were shorter. Since efficient training involves minimizing errors (Denny, 1966), the skilled teacher must consider the student's span ability, the amount of information load, as well as the length of sentence to be imitated to ensure that the student is able to practice and learn the material.

Finally, the present results bear upon the theoretical relation between span ability, intelligence, and language development. It is clear that language is developed in part through imitation of language. Both young normal children and retarded children and adults have span abilities which are smaller than those of normal adults. This fact, coupled with the present results, suggests that immature language may result in part from small span abilities.

Reference Notes

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