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ABSTRACT

Research on massed practice (MP) and distributed practice effects to preschool children in free recall tasks is reported. A total of 40 kindergarten children were randomly assigned to High Frequency and Low Frequency word groups. No significant differences were found between the two groups on the dimensions of IQ and age. Lists of 32 high frequency or low frequency words were presented for a single trial by magnetic tape at a 5-second rate to individual subjects. Number of words recalled served as the major dependent variable. The results show that although some increase in recall occurs with repeated presentations under MP, the recall curves clearly confirm the superiority of a DP schedule at all levels of repetition. To the extent that educators can control the presentation to young children of words to be learned, it would appear that well-distributed, more frequent presentations should be utilized if more effective recall is the goal. (DB)

EFFECTS OF MASSED VS. DISTRIBUTED PRACTICE AND WORD FREQUENCY ON YOUNG CHILDREN'S FREE RECALL

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The relative effects of massed (MP) versus distributed (DP) practice on learning and retention has recently come under re-examination. One view holds that amount learned is a direct function of study time regardless of how that time is distributed. Waugh (1967) has demonstrated that the number of unrelated words recalled increases as a function of the total amount of time taken to present the list, and the probability that a given word will be recalled increases in direct proportion to the total number of seconds for which it is presented. Cooper and Pantle (1967) have labelled this phenomenon the "total-time hypothesis" and feel it holds in cases where nominal and effective study time bear a positive linear relationship to one another. In addition, Zachs (1969) has shown that this hypothesis holds for conditions of practice in which S has control over the temporal distribution of his study activity, as well as for standard learning procedures.

An opposing view that recall following DP is greater than recall following an MP schedule despite equivalence in total time of presentation has also received wide-ranging support. Greeno (1964) employing paired-associate procedures, Rothkopf and Coke (1966) utilizing a free recall of sentences design and Underwood (1969) and Landauer (1969) examining the free recall of words and nonsense syllables have found superior performance under DP conditions. Underwood (1970) has eliminated rate of presentation, low meaningfulness of words, and certain types of intervening processing between repetitions as variables accounting for the facilitating effect of DP on free recall.

The free recall paradigm seems to characterize the approach to learning taken by young children prior to their enrollment in formal schooling where learning trials and teacher-controlled practice is first introduced. Recent ETV approaches oriented toward young children (as examplified by Sesame Street) make substantial use of DP and MP presentations of letters and numbers as well as more hierarchical concepts. For these reasons, it appears necessary to extend research on MP - DP effects to pre-school children in free recall tasks.

Of additional interest to this study was the question of whether frequency of occurrence in standard speech patterns would interact with type of practice schedule. Underwood (1969) has argued that a word presented under MP "behaves" as if it had been presented less frequently than in fact it had, that is there is a discrepancy between nominal and effective study time which accounts for decreased recall for MP. A reduction in attention to an MP word during and after presentation or a form of verbal satiation to the repeated word have been suggested as possible explanations of this phenomenon by Underwood. It could be argued that highly novel, infrequent words might inhibit satiation, especially for young children. If this is the case then performance under MP for low frequency (novel) words should be superior to that of high frequency words.

Method

Subjects

Forty kindergarten children were randomly assigned to High Frequency and Low Frequency word groups. High Frequency (HF) Ss possessed a mean IQ of 103.91 and a mean age of 5.62 years. Low Frequency (LF) Ss had a mean IQ of 103.50 and a mean age of 5.57 years. No significant differences were found between the two groups on the dimensions of IQ and age.

Materials

HF Ss were presented a 32 word list of one and two syllable nouns occurring more than one thousand/million according to Thorndike and Lorge (1944), i.e. mother, horse, table. LF Ss were provided the same number of one and two syllable nouns occurring below 35/million in the Thorndike and Lorge tables, i.e. witch, candy, monkey. In addition, words were selected for this list on the basis of whether they were subjectively judged as having high "stimulus value" for kindergarten children. Four words were used to absorb recency effects and four to absorb primacy effects, while six were presented once within each list. Nine words were presented under MP, with three words at each of the three frequency levels--two, three, and four repetitions. The remaining nine words served exactly the same function under a DP schedule. Words were randomly assigned to repetition levels, and DP words were placed throughout each list so that each word had at least three others occurring between it and its repetition. Each list contained 68 positions.

Procedure

Lists were presented for a single trial by magnetic tape at a 5-sec. rate to individual Ss. Instructions were as follows: "We are going to play a word game. I am going to see how many words you can remember. I am going to turn the tape recorder on and you will hear a voice saying many words. I want you to listen carefully and when the tape is over, I will want you to tell me what words you heard. There will be many words, so I don't expect you to remember all of them--just try to remember as many as you can, O.K.?" Immediately after the last word was presented, Ss were asked to recall as many words as they could remember, and these were recorded by E.

Results

Number of words recalled served as the major dependent variable. Words serving as primacy and recency buffers, as well as words presented only once within each list were not included in the statistical analysis. Analysis of variance of the recall scores revealed no significant differences between HF and LF groups ($F = 1.93$, $df = 1,38$), indicating that Thorndike-Lorge word frequency rating was not related to performance. Analysis of frequencies 2, 3, and 4 demonstrated that recall increased with greater frequency of repetition ($F = 11,81$, $df = 2,76$, $p < .01$). Type of practice schedule was also highly significant ($F = 56.56$, $df = 1,38$, $p < .01$) with DP leading to greater recall. No significant interactions were found.

Percent recall as a function of the three variables is shown in Figure 1. Mean percent recall ranged from 15 for two repetitions to 27 for four repetitions of MP words and from 29 for two repetitions to 50 for four repetitions of DP words. Although some increase in recall is shown with repeated presentations under MP, the recall curves clearly confirm the superiority of a DP schedule at all levels of repetition, as well as further reject the hypothesis that LF words aid MP recall. If anything, the curves reveal a trend for HF words to be recalled at a greater rate with increasing frequency of repetition.

Insert Figure 1 here

Discussion

The results substantially support and extend the findings of Underwood's Experiment III (1970) which employed children between the ages of nine and fourteen, although Underwood found a significant interaction between schedule and frequency of repetition. Lack of an interaction in this study is due to

the fact that with a minimum of two repetitions DP was already clearly superior to MP, and continued to be with increased frequency of repetition. The striking effect of DP found here provides further refutation of the total-time hypothesis in free recall learning. To the extent that educators can control the presentation to young children of words to be learned, it would appear that well-distributed, more frequent presentations should be utilized if more effective recall is the goal.

Frequency of word occurrence in standard speech was found to have little effect on performance and the hypothesis of novel, infrequent words inhibiting satiation for young children was abandoned. Of course, frequency of occurrence is not the only way to conceptualize novelty; and it is entirely possible that other stimulus dimensions may inhibit satiation to MP words for young children. In any case, the strength of the DP effect illustrated here makes it unlikely that factors depressing recall under MP will completely account for MP-DP differences. Rather there may be some dimension of DP that is crucial to the learning of young children.

One possible explanation may be that DP evokes more frequent attentional or mediational responses as a function of the variability it introduces into the task. Berlyne's research on curiosity motivation (1960) has indicated that young children show spontaneous interest in those parts of the environment that they perceive as variable. Odom and Guzman (1970) have found that variability is perceptually more salient than constancy for kindergarten Ss in visual discrimination tasks, and suggest that the learning of young children should be facilitated by techniques that employ variability or change rather than constancy. Obviously, research is needed before it is known whether hypotheses useful in explaining kindergarten Ss performance in visual discrimination experiments can be extended to free recall tasks employing the auditory modality.

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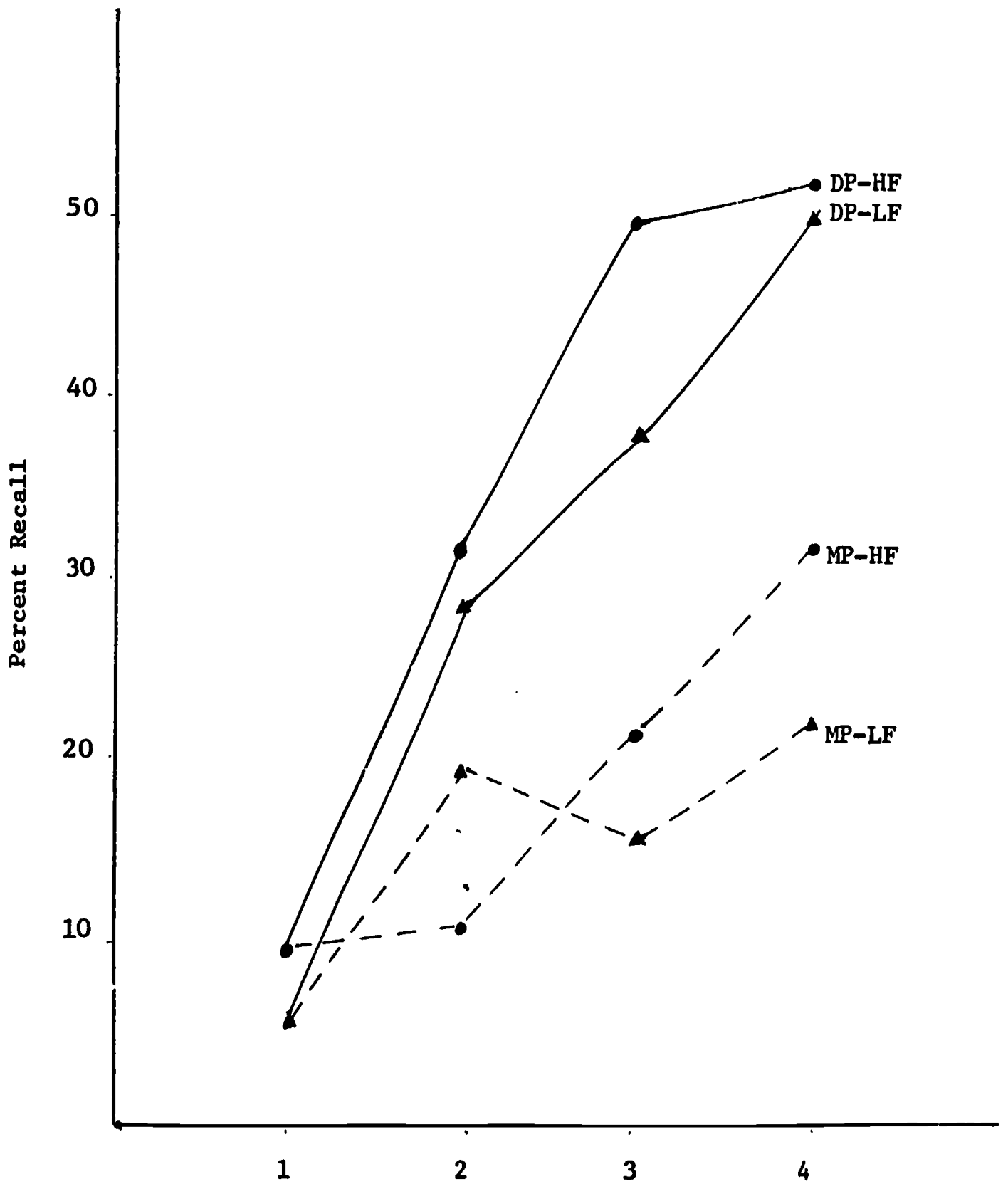

Figure 1. Free recall of words as a function of frequency of repetition, schedule and frequency of occurrence.