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ABSTRACT

The effects of different levels of rehearsal quality on serial recall, over and above simple labeling, were studied in a sample of 104 kindergartners. Subjects were randomly assigned to four experimental conditions. In one condition the subject and experimenter rehearsed together; in a second condition only the experimenter rehearsed; in the third the subject rehearsed alone. A control group received no assistance. All subjects (including the control group) received the same baseline and generalization instructions to remember pictures in the correct order. Subjects were given a practice trial followed by nine experimental trials. The pictures to be recalled were labeled on all trials for all subjects. Serial recall was facilitated only when the experimenter rehearsed and the child remained silent. In addition, rehearsal by the subject tended to interfere with recall. It was suggested tentatively that requiring young children to overtly produce the labels of pictures may cause an interference in memory for order. (Author/MS)

Rehearsal as a Mediational Strategy for Kindergartners: Production Deficiency, Inefficiency, and Efficiency

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Abstract

The effects of different levels of rehearsal quality on serial recall, over and above simple labeling, were studied for kindergartners. A sample of 104 children were randomly assigned to four experimental conditions. In one condition the subject and experimenter rehearsed together, in a second condition only the experimenter rehearsed, in the third the subject rehearsed alone, and a control group received no assistance in addition to labels. Serial recall was facilitated only when the experimenter rehearsed and the child remained silent. In addition, rehearsal by the subject tended to interfere with recall. It was suggested that requiring young children to overtly produce the labels of pictures may cause an interference in memory for order.

Reese (1963) reported that a stage of cognitive development exists in which young children are mediational deficient and that behavior is not regulated by available verbal processes. Flavell (1970) proposed the production deficiency hypothesis as a partial explanation for the apparent unmediated behavior of young children. Production deficiencies exist when the potential mediators are not generated and therefore can not mediate memory. A mediational deficiency occurs when the mediators are produced but result in no control over memory.

A number of studies have used serial recall tasks to investigate the production deficiency hypothesis. Flavell, Beach, and Chinsky (1966) found that kindergarten children were more apt to be production deficient than older children. When given a familiar subset of pictures to recall in a designated order, young children rarely engaged in spontaneous verbal rehearsal, whereas, fifth graders rehearsed frequently. Keeney, Cannizzo, and Flavell (1967) have shown that recall for production deficient first graders was lower than nondeficient first graders. Following a brief training session in verbal rehearsal, these differences were eliminated. The authors concluded that the initial differences were due to a production deficiency and that, following training, rehearsal served as an effective mediator. Although these results have been cited

frequently as evidence for the facilitative effect of rehearsal, the conclusions must be considered tentative. Because of certain weaknesses in the design, alternative explanations could be offered to explain the findings. For example, the changes in recall could have been due to simple labeling or an increase in attentiveness as a result of rehearsing.

Another series of studies have used a probed serial recall task to identify the role of rehearsal in young children. Kingsley and Hagen (1969) reported that induced (and prompted) rehearsal facilitated recall more than labeling for nursery school children. However a later study (Hagen, Hargrave, and Ross, 1973) found that the increase was due to the experimenter helping the subjects rehearse (prompting) and not from the subjects rehearsing. Also when the younger children (mean age 5.7) were required to rehearse alone, there was evidence that the rehearsal impeded recall. Thus, further research is necessary because it is still not clear whether verbal rehearsal by young children facilitates memory for serial learning tasks.

Flavell (1970) has noted that verbal rehearsal is not an all or nothing phenomena and that a whole range of possibilities exists between no rehearsal and perfect rehearsal. Corsini, Pick, and Flavell (1968) used the term production inefficiency to describe the situation in

which production occurred but was only partially correct. Kingsley and Hagen (1969) reported that nursery school children could not rehearse accurately more than two or three words. In experiments where the subject is required to rehearse on a serial recall task, efficient rehearsal depends upon both the ability to produce the proper stimulus labels and to remember the order of items. For children who do not rehearse spontaneously and are generally not accustomed to rehearsing, this could be a difficult and complex task.

The present study was designed to determine the effects of various levels of rehearsal quality on serial recall when labeling is controlled. Since kindergartners do not spontaneously engage in verbal symbolic coding when presented a visual task, it was assumed that beginning attempts to rehearse would result in production inefficiencies. Experimental conditions manipulated the quality of rehearsal from none to perfect by using combinations of the experimenter and child rehearsing. The child was provided perfect rehearsal when the experimenter rehearsed three sequences of the stimuli to be recalled. Inefficient rehearsal was assumed to occur when the child was required to rehearse alone. A control group was given neither assistance nor instructions to rehearse. A fourth treatment involved both the experimenter and subject rehearsing together. Ferguson and Bray (1976)

reported that retrieval practice is important in serial learning and consequently, it was hypothesized that the latter condition would result in the highest recall. Labeling was controlled for all experimental groups in that the stimuli to be recall were labeled by the experimenter.

Method

Subjects

A sample of kindergartners, 52 males and 52 females, were selected from a middle class school and randomly assigned by sex to four treatment conditions. The mean age was 6.2 years.

Materials and Task

Two sets of stimulus cards were prepared for a serial recall task. Each set contained nine pairs of cards with seven familiar objects (e.g., boat, cat, and comb) mounted on each card. A single trial involved a presentation and recall card in which the pictures were identical but the arrangement order was fixed randomly. Pictures were not repeated on any trial. One set of stimulus cards was used in baseline and training while the other set was used in generalization.

On each trial the experimenter pointed to and named a subset of the seven pictures. The number of pictures

in the subset varied in that trials 1, 2, and 3 contained three pictures, trials 4, 5, and 6 contained four pictures, and trials 7, 8, and 9 contained five pictures. After a 15 second retention interval, the subject was presented a new ordering of the same pictures and required to point to the pictures in the same order as designated by the experimenter.

Procedure

The study was conducted in two sessions and contained three phases. Subjects were tested individually with baseline and training phases occurring in the first session and the generalization phase taking place on the next school day. All subjects received the same baseline and generalization instructions to remember the pictures in the correct order. During training children were administered one of four experimental treatments which were designed to manipulate rehearsal quality during the retention interval. In the first condition the experimenter and subject overtly rehearsed together (E and S rehearse) three sequences of the pictures to be recalled. In treatment two, the child was given instructions to rehearse and rehearsed alone (S - only rehearse). In condition three, the experimenter rehearsed (E - only rehearse) for the subject. In the fourth condition (control), subjects received no assistance and were given baseline directions. Prior to each experimental condition, subjects

were given a practice trial followed by nine experimental trials. Also, the pictures to be recalled were labeled on all trials for all subjects.

Serial recall and rehearsal quality were recorded for each trial. Recall was scored as correct when the total sequence was remembered and incorrect if one or more pictures were out of sequence. During the retention interval the subjects eyes were closed and the experimenter scored rehearsal according to the following categories: 3 perfect sequences, one or two perfect sequences, an incorrect sequence, one or two words, none.

The design of the experiment involved a 2(experimenter rehearse) X 2 (subject rehearse) X 2 (sex) with three experimental phases. Multivariate analysis of variance was computed for recall and rehearsal using baseline, training and generalization scores as dependent variables.

Results and Discussion

Recall

The multivariate analysis of variance (MANOVA) was not significant for sex and did not reveal differences on baseline or generalization for any groups. A main effect ($F(3,94) = 4.29, < .01$) for experimenter-rehearse indicated that, in training, recall was higher when the

experimenter rehearsed for the subjects than when the experimenter did not rehearse. Since no interactions were significant, a MANOVA was computed using the four treatment groups as levels of the same independent variable. In figure 1, the means of the groups are presented for each phase.

Insert Figure 1 About Here

A significant difference ($F(3,94) = 5.05$, $p < .01$) was found between the control group and the condition in which only the experimenter rehearsed. None of the other treatment groups differed from the control subjects.

Rehearsal

In figure 2, rehearsal mean scores of each group are presented for each phase.

Insert Figure 2 About Here

The only differences in rehearsal scores occurred in the training phase. Significant main effects for experimenter-rehearse and subject-rehearse ($F(3,94) = 7.46$, $p < .01$, $F(3,94) = 320.74$, $p < .01$) indicated that both treatments were effective in increasing the quality of rehearsal by the subject. However, the interaction ($F(3,94) = 3.62$, $p < .01$) between experimenter-rehearse and subject-rehearse presents a clearer

interpretation of the treatmental effects. As expected, subjects rehearsed most when instructed to rehearse with the experimenter. When the subjects were instructed to rehearse and given no assistance, the quality of rehearsal was much better than the control but not as good as when the experimenter rehearsed with the subject.

These results provide partial support for the initial hypothesis that serial recall is a function of the quality of rehearsal for kindergartners. That is, rehearsal was facilitative, over and above simple labeling, only when the experimenter rehearsed for the subject. It was predicted that recall would be highest when the experimenter and subject rehearsed together. This condition should have provided accurate labeling of the pictures in the correct order in which they were to be recalled. The results indicate that of the four treatment groups only the group in which the experimenter rehearsed for the child performed better than the control subjects. Thus the evidence demonstrates that rehearsal can mediate serial recall when it is done for the child. It also must be concluded that rehearsal by the subject, in addition to labeling, did not facilitate recall.

The lack of significant effects when the subject rehearsed can not be attributed to an absence of rehearsal by the subject. In the E and S rehearse condition, subjects rehearsed perfectly on 93 percent of the

trials; 54 percent for the S-only group; 10 percent for the E-only group and less than 5 percent for the control group. This evidence shows that the treatments were effective for manipulating the quality of rehearsal but corresponding increases in recall were not observed.

In addition to the findings that subject-rehearsal did not improve recall, the data suggest that requiring the young child to rehearse created interference. At present an adequate explanation can not be made for why the E and S rehearse group did not differ from the control group while the E-only subjects recalled significantly more than the control. Figure 1 provides more support for the interference effect by examining the means for experimental groups during training, E-only (7.0), S and E(6.3), control (5.8), and S-only (5.4). Although these means are not all significantly different from each other, the trend suggests that performance was worse when the subject rehearsed. A tentative explanation is that the process of requiring young children to retrieve and produce the labels for the stimuli interfered with their memory for order. An examination of the data revealed that most of the subjects were capable of identifying the correct pictures but that the difficult portion of the task concerned recall of the proper order. Brown (1975) suggested that when order information is not part of meaningful material, it is stored in episodic memory

and is rapidly lost from memory. If young children are inefficient in retrieving and producing labels, order information may be lost from short term memory while their attention is focused on label production.

In an effort to gain a better understanding of the possible reasons for an interference effect, correlational evidence was obtained from the group in which the subjects rehearsed alone. A correlation of .86 between the number of perfect rehearsals and recall during training indicated that good rehearsal led to high recall. Before the subjects could engage in successful rehearsal, they had to remember the subset designated for recall, therefore it is possible that good memory facilitated rehearsal and not the converse. Obviously, children can not rehearse a sequence which they have forgotten. A correlation of .55 between baseline recall and the number of perfect rehearsals in training indicates that children with the best memories rehearsed the best. Although these interpretations must be tentative, the interference effect may be quite task specific in that the requirement to overtly produce the picture labels may cause interference for subjects who have only a weak memory trace for the order of stimuli. More research is necessary to identify the conditions under which rehearsal interferes with recall.

Two main conclusions seem to be warranted from the results of this study. Contrary to many studies with adults and children, verbal rehearsal by the subject did not facilitate serial recall. However, when the rehearsal was done by the experimenter and the child listened, recall improved. The second conclusion concerns the interference effect of overt rehearsal by the subject. It was suggested that the nature of the task involved simultaneous memory processes which may have caused the memory interference.

Figure 1

Mean recall scores for each experimental group in baseline, training and generalization.

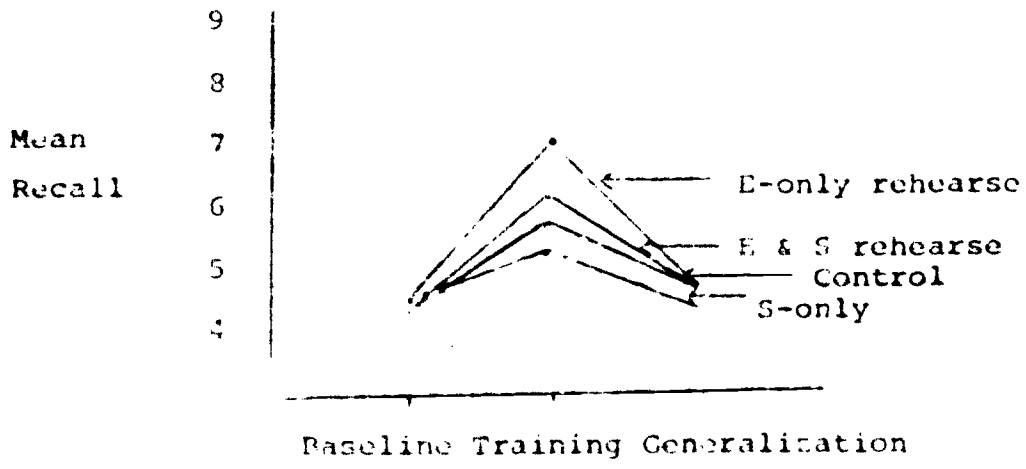
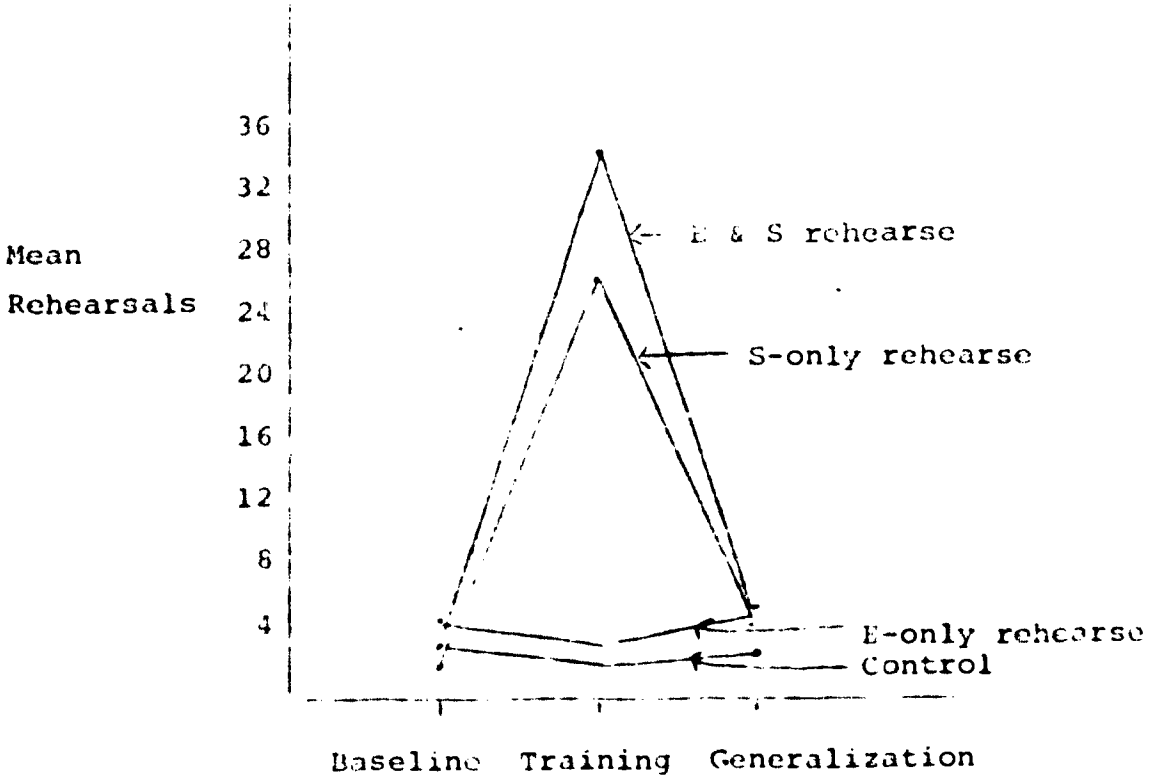


Figure 2

Mean rehearsal scores for each experimental group in baseline, training and generalization



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