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ABSTRACT

Kindergarten and first grade children were given a paired-associate learning task following one of five types of strategy-training procedures. In the motor training conditions, subjects generated interactions involving pairs of toys by playing with them or by drawing pictures of them. It was found that relative to simple imagery practice, motor training facilitated the performance of kindergarteners, with no differences among four motor training variations. For the first graders, imagery practice by itself was as effective as each of the motor-training procedures. The results are discussed in terms of Piaget's theory of cognitive development and contrasted with previously unsuccessful attempts to induce self-generated elaboration strategies in young children. (Author/DP)

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RESEARCH
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Technical Report No. 252

TRAINING IMAGERY PRODUCTION IN YOUNG CHILDREN THROUGH MOTOR INVOLVEMENT

by

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Report from the Research Component
Children's Learning and Development

Wisconsin Research and Development
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Statement of Focus

Individually Guided Education (IGE) is a new comprehensive system of elementary education. The following components of the IGE system are in varying stages of development and implementation: a new organization for instruction and related administrative arrangements; a model of instructional programing for the individual student; and curriculum components in prereading, reading, mathematics, motivation, and environmental education. The development of other curriculum components, of a system for managing instruction by computer, and of instructional strategies is needed to complete the system. Continuing programmatic research is required to provide a sound knowledge base for the components under development and for improved second generation components. Finally, systematic implementation is essential so that the products will function properly in the IGE schools.

The Center plans and carries out the research, development, and implementation components of its IGE program in this sequence: (1) identify the needs and delimit the component problem area; (2) assess the possible constraints—financial resources and availability of staff; (3) formulate general plans and specific procedures for solving the problems; (4) secure and allocate human and material resources to carry out the plans; (5) provide for effective communication among personnel and efficient management of activities and resources; and (6) evaluate the effectiveness of each activity and its contribution to the total program and correct any difficulties through feedback mechanisms and appropriate management techniques.

A self-renewing system of elementary education is projected in each participating elementary school, i.e., one which is less dependent on external sources for direction and is more responsive to the needs of the children attending each particular school. In the IGE schools, Center-developed and other curriculum products compatible with the Center's instructional programing model will lead to higher student achievement and self-direction in learning and in conduct and also to higher morale and job satisfaction among educational personnel. Each developmental product makes its unique contribution to IGE as it is implemented in the schools. The various research components add to the knowledge of Center practitioners, developers, and theorists.

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Abstract

Kindergarten and first-grade children were given a paired-associate learning task following one of five types of strategy-training procedures. In the motor-training conditions Ss generated interactions involving pairs of toys by playing with them or by drawing pictures of them. It was found that relative to simple imagery practice, motor training facilitated the performance of kindergartners, with no differences among four motor-training variations. In the first grade imagery practice by itself was as effective as each of the motor-training procedures. The results are discussed in terms of Piaget's theory of cognitive development and contrasted with previously unsuccessful attempts to induce self-generated elaboration strategies in young children.

I
Introduction

It is well established that paired-associate learning is facilitated by the addition of experimenter-provided elaborations (Rohwer, 1967). However, this is not always true when young children (typically below eight years of age) are asked to generate such elaborations themselves (Levin, 1972; Rohwer, 1972). Given that young children are unsuccessful at generating sentence and imagery elaboration strategies on request, the possibility exists that with systematic instruction or training they may be taught to do so. However, initial efforts to train mnemonic elaboration in young children have been disappointing (Rohwer & Ammon, 1971; Rohwer, Ammon, & Levin, 1971), leading Rohwer (1972) to conclude that children must attain a certain age or maturational level before they can be taught to use elaboration strategies effectively.

Considering the above failures, such a conclusion is tempting. On the other hand, it has recently been demonstrated that supposedly "pre-imagery" children can be induced to generate facilitative imagery elaborations through concurrent motor involvement (Wolff & Levin, 1972). In that experiment it was found that while six- and seven-year-old children did not benefit from instructions to imagine an interaction between pairs of toys, when they were permitted to play with toys concurrently their performance improved dramatically (even though they were not allowed to see the manipulations they generated). This result was interpreted as being consistent with Piaget's theory of cognitive development, in which it is assumed that the preoperational child cannot produce dynamic visual representations (internally) without motor activity involving the events to be represented (Piaget, 1962).

Danner and Taylor (in press) were also able to induce imagery in first graders by giving them pretraining in drawing pictures of separate objects interacting. Although these investigators did not interpret their findings in terms of motor involvement, Piaget and Inhelder (1971) would view playing and drawing activities similarly, with each resulting in internalized imitation (visual imagery). Thus, the important distinction between the Danner-Taylor and Wolff-Levin experiments is that in the former the motor activity (i.e., the pretraining) was temporally removed from the criterion performance (and involved different items), whereas in the latter the motor activity and criterion performance were concurrent.

The purpose of the present study was twofold: (a) to investigate differences in performance of "younger" and "older" children within the imagery-transition stage and (b) to extend the motor/imagery separation results to other types of training procedures.

II
Method

Subjects

Eighty kindergarten and 80 first-grade pupils from a small middle-class community in southern Wisconsin served as Ss. All testing was done during the spring of 1972. At that time the median age of the kindergartners was 6 years, 1 month, and that of the first graders was 7 years, 1 month. The Ss were taken in turn from their classrooms and randomly assigned (in equal numbers) to one of five treatment conditions at the time they entered the experimental room.

Design and Materials

Following Wolff and Levin (1972), a paired-associate task was constructed with children's small toys comprising the stimulus materials. Fifteen pairs were created for the learning task, with an additional eight pairs used for practice and examples during training. All pairs could be easily labeled by kindergarten and first-grade children, as determined from an earlier pilot study. Each pair (e.g., toy cowboy, car) was randomly formed subject to the constraint that a plausible interaction existed for the two paired toys.

Prior to the learning task, Ss were given one of five types of strategy training. In the imagery control condition E demonstrated a predetermined interaction for each of the first four training pairs, after which S was given instructions to imagine an interaction for each of the four remaining pairs. This nonmotor-imagery condition was incorporated as a baseline for evaluating the effects of four motor-imagery training procedures in each grade as follows: In two conditions Ss were instructed to generate interactions for each of the eight training pairs either by playing with the toys (repeated play) or by drawing a picture of them in interaction (repeated draw). These conditions approximated those used by Wolff and Levin (1972) and Danner and Taylor (in press), respectively. In the other two conditions Ss were given playing (or drawing) practice on the first four training pairs, followed by a delayed play (or draw) instruction for the remaining four pairs in which Ss were required to indicate that they had generated an imaginal interaction before they were permitted to execute it through playing with (or drawing) the toys. It was assumed that these latter two conditions, faded play and faded draw, would produce better subsequent performance than their repeated counterparts (especially for kindergartners), since Ss would be receiving practice in generating imagery apart from motor activity.

Procedure

In order to monitor the elaboration of Ss during training, interactions created by S or E were briefly described by E without labeling the toys (e.g., "Look. It's chasing that"). The S's verbalizations regarding his interactions were suppressed by E during training so that facilitative effects of S-generated verbalization would not cloud an imagery interpretation of the training effects. It was difficult to equate the amount of time across training conditions. Altogether, S spent about 25 minutes with E in the imagery control, repeated play, and faded play conditions, and about 35 minutes in the repeated draw and faded draw conditions.

The learning task itself was presented by way of an incidental-learning format because it was thought to be less reactive in this kind of training experiment and because no differences in performing the task as a function of intention to learn were found in an earlier unpublished study with Ss of this age. The S's introduction to the learning task was the same across all conditions, but the "set" given to each S was based on the training he had received.[1]

All Ss were tested individually. Following the eight training items, the 15 learning-task pairs were presented one at a time at a 10-second rate (timed by E). After the last pair was presented, the 15 response toys were displayed, and for each stimulus toy (presented in a different random order than study items) S was required to pick up the response toy with which it was initially paired. The Ss were given 7 seconds to respond to each stimulus toy. Each of S's selections was replaced in the array before the next stimulus toy was presented.

[1]The instructions given to the children within the various conditions and a list of the stimulus materials employed are available from the second author on request to the Wisconsin Research and Development Center.

III
Results

Learning was defined as the total number of correct responses (out of 15) during the recognition test. The mean number of correct responses, by condition and grade, is presented in Figure 1. In the analysis of variance comparisons were nested within grades so that statements about the effectiveness of the different conditions could be made separately for each grade. To do this, each motor-training condition was compared with the imagery control condition via Dunnett's test (one-tailed, $\alpha = .05$). In addition, the factorial combination of the nature (play or draw) and extent (repeated or faded) of motor involvement yielded three orthogonal comparisons among training procedures within each grade.

Within the kindergarten sample Dunnett comparisons revealed that each motor-training condition produced significantly better learning than did the imagery control condition. However, within the first-grade sample mean performance in the imagery control condition was as good as in each of the motor-training conditions. No significant differences among the four motor-training conditions were detected in either grade (all p's $> .05$).

A post hoc breakdown of these effects yielded further interesting information. When the data were analyzed separately for boys and girls it was found that the comparability of the imagery control and motor-training conditions in the first grade was true only for girls ($t < 1$); for boys, however, significant differences in favor of motor training still existed ($t = 1.86$, $df = 29$, $p < .05$, one-tailed), as they had for both sexes in the kindergarten sample (girls: $t = 2.96$, $df = 32$, $p < .01$; boys: $t = 2.57$, $df = 38$, $p < .025$). Despite these different effects for boys and girls, the previous finding of no significant differences among the four motor-training conditions did not change when investigated for each sex group separately.

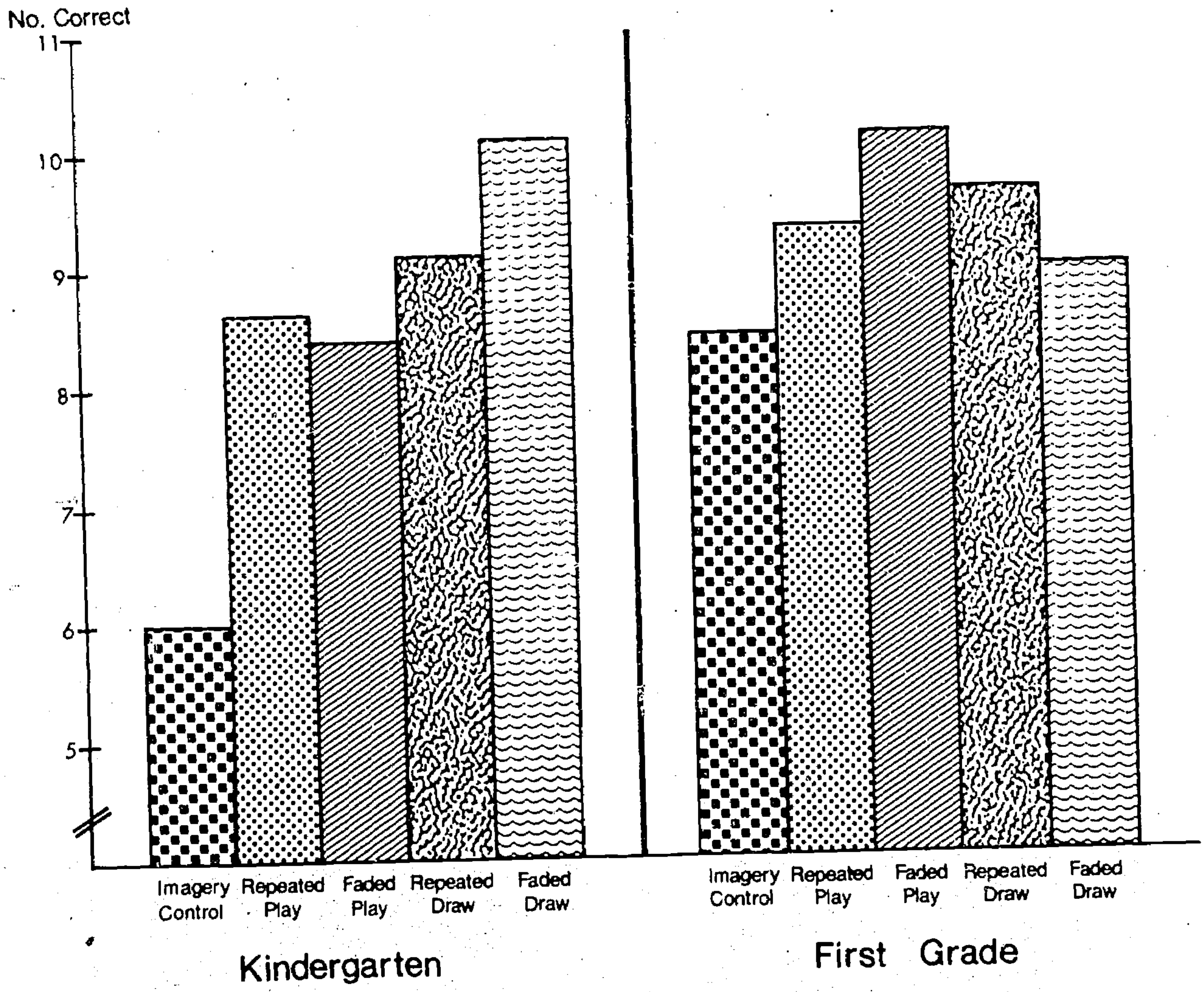

Fig. 1. Mean number of correct responses by grade and experimental condition.

IV
Discussion

The results of the present study indicated that for kindergarten children each motor-training condition resulted in significantly better learning than the nonmotor, imagery control condition. However, this effect due to motor training was not observed in the first-grade sample where motor and nonmotor training resulted in nonsignificant learning differences. It might therefore be inferred that between the ages of six and seven years the young child becomes increasingly adept at generating dynamic representations in the absence of concurrent motor involvement or without immediately prior training. This age range may well be adjusted depending on the sex of the child (with the present data suggesting that the ability develops earlier in girls than in boys), as well as on the particular sociocultural characteristics of the population being considered.

The fact that playing and drawing training did not differ statistically is consistent with Piaget and Inhelder's (1971) view that both playing and drawing represent vehicles for visually internalizing external stimuli. The failure of the faded draw and play training conditions to produce learning superior to the repeated draw and play conditions was unexpected. However, it was noted by E that Ss in the repeated conditions typically hesitated before either playing with or drawing the toys for each training pair. This observation suggests that Ss in these conditions were thinking up (imagining?) interactions before they executed the motor activity, even though they were not explicitly instructed to do so as they were in faded conditions. Such an observation, of course, also suggests additional research (utilizing response latencies, delayed visual feedback, motor blockage, and other variables) to specify more precisely the temporal antecedents of imagery production in young children.

The results of this study have implications for future efforts to train imagery elaboration in children of this age. They strongly support the assumption that procedures designed to train cognitive skills must take into account the information-processing skills of the young child as postulated by developmental learning theories. The present training procedures, based on Piaget's theory of cognitive development, indicate that motor involvement should be a dominant feature of imagery training in young children, an approach not fully exploited in previously unsuccessful training studies (Rohwer & Ammon, 1971; Rohwer, Ammon, & Levin, 1971).

It should be noted that the learning materials of the present study consisted of toys, which may be regarded as being more concrete than the pictures and aurally presented words of Rohwer's earlier work, and which may be assumed to evoke dynamic images more readily (Levin, 1972). However, perhaps one of the most exciting results here was the marked facilitative effects of the drawing-training conditions, substantiating those of Danner and Taylor (in press). A worthwhile direction for future training studies with young children would be to apply drawing training to the learning of less concrete materials. In this way children could be taught to elaborate pictorial or aural learning materials while honoring the need for motor involvement in the training process. The fact that the playing and drawing conditions resulted in equal degrees of facilitation here strengthens this conclusion.

References

Danner, F. W., & Taylor, A. M. Integrated pictures and relational imagery training in children's learning. Journal of Experimental Child Psychology, in press.

Levin, J. R. When is a picture worth a thousand words? In Issues in imagery and learning: Four papers. Wisconsin Research and Development Center for Cognitive Learning, Theoretical Paper No. 36, 1972.

Piaget, J. Play, dreams, and imitation in childhood. New York: Norton, 1962.

Piaget, J., & Inhelder, B. Mental imagery in the child. New York: Basic Books, 1971.

Rohwer, W. D., Jr. Social class differences in the role of linguistic structures in paired-associate learning: Elaboration and learning proficiency. Final Report on Basic Research Project No. 5-0605, U.S. Office of Education, 1967.

Rohwer, W. D., Jr. Decisive research: A means for answering fundamental questions about instruction. Educational Researcher, 1972, 1(7), 5-11.

Rohwer, W. D., Jr., & Ammon, M. S. Elaboration training and paired-associate learning efficiency in children. Journal of Educational Psychology, 1971, 62, 376-383.

Rohwer, W. D., Jr., Ammon, M. S., & Levin, J. R. Learning efficiency and elaboration training among four- and five-year-old children. In W. D. Rohwer, Jr. & P. R. Ammon, The assessment and improvement of learning and language skills in four- and five-year-old culturally disadvantaged children. Office of Economic Opportunity, Final Report, Contract No. B99-4776, June 1971.

Wolff, P., & Levin, J. R. The role of overt activity in children's imagery production. Child Development, 1972, 43, 537-547.

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