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ABSTRACT

Research generally indicated that imagery facilitates children's learning on basic memory tasks, such as paired-associate learning. The role of imagery in prose recall is less well defined, however. The purpose of this study was to determine the effect of the construction of mental images on eight year old's ability to recall progressively lengthening prose passages. Eighty-six third graders enrolled in suburban Minneapolis schools were divided into experimental and control groups. Experimental subjects were given practice constructing mental images and were shown examples of useful images. Controls were exposed to the prose materials, but did not practice constructing mental images. Both groups read seventeen segments of a short story; children in the experimental group were directed to construct an image for each segment, while control subjects were instructed to "do whatever you can or have to" in order to remember the story. Results indicate that experimental subjects were able to answer significantly more short answer questions about the story than were control subjects. (Author/KS)

Mental Imagery Helps Eight-Year-Olds Remember What They Read[1]

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Footnotes

[1]I am grateful to the children, administrators, and teachers of the Richfield Public Schools, Richfield, Minnesota, for their assistance in the conduct of this study and to Joel R. Levin for a careful reading of an earlier version of this manuscript.

[2]This study was conducted while the author was a Trainee of the National Institute of Mental Health, Grant No. 5T01 MH06668.

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Abstract

In order to determine if eight-year-olds could use mental imagery to improve their memory of prose they read, Experimental subjects were given practice constructing mental images of progressively longer prose passages (sentences, paragraphs, and a short story) and were shown examples of good images. Controls were exposed to the prose materials, but did not practice constructing mental images. Experimental subjects read 17 segments of a short story and constructed a mental image for each segment after reading the segment. Control subjects read the same story segments, and were instructed to "do whatever you can or have to" in order to remember the story. Experimental subjects answered significantly more short answer questions about the story than Controls did.

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Mental Imagery Helps Eight-Year-Olds Remember What They Read

Since ancient Greece, visual imagery has been recognized as a powerful aid to memory (Yates, 1966). Moreover, despite behaviorist attacks on the construct of mental imagery, researchers throughout this century found that performance on a variety of memory tasks was improved when subjects generated imaginal representations of the to-be-remembered materials (Paivio, 1971). It is only recently, however, that researchers have explored the effect of instructions to form mental images on children's memory performance.

In general, imagery facilitates children's learning on basic memory tasks (Levin, Note 1), such as paired-associate learning. Children as young as seven-years-old benefit from an instruction to construct a mental image of simple verbal items (Levin, Davidson, Wolff, & Citron, 1973). Very recently, researchers in children's learning have begun examining the effect of imagery on memory for prose.

Several studies revealed that adults who used imagery remembered more of the content of a prose passage than subjects who did not (Anderson & Hidde, 1971; Anderson & Kulhavy, 1972). Similarly, it seems that under some conditions, some types of children show improved memory of connected discourse when instructed to construct internal imaginal representations of prose they read. For instance, Levin (1973) showed that fourth-grade children, who possess adequate decoding skills and vocabulary, but, nevertheless, often perform poorly on reading tasks because they fail to "integrate" text, benefit from an instruction to

construct mental images corresponding to test segments which they read. Moreover, children who benefit from pictorial presentations of stimulus items in simple learning tasks, also benefit from an instruction to construct mental images of sentences they read (Levin, Divine-Hawkins, Kerst, & Guttmann, 1974). However, imagery is often ineffective when children read stories (Levin & Divine-Hawkins, 1974). Levin and Divine-Hawkins (1974) noted that children may try to read and image at the same time and, consistent with Brooks (1967), argued that children may not be able simultaneously to read verbal messages and image the spatial relationships described by those passages. Thus, in order to assess in the study reported here whether young children can improve their memory for prose they read by constructing mental images, eight-year-olds were taught a strategy which produced successive (in contrast to simultaneous) reading and imaging.

The study reported here differs from other work in several respects. Lesgold et al. (in press) reported that third- and fourth-grade children recalled more of a story they read if given an imagery strategy. However, the effect was obtained only after a four-week training period. Lesgold et al.'s four-week training was largely an attempt to improve the quality of internal imaginal mediation by providing subjects with extensive practice in drawing cartoons illustrating prose passages. However, the development of children's ability to draw cartoons seems largely irrelevant to the construction of internal mediators. Thus, much of Lesgold et al.'s training may have been unnecessary. In the experiment reported here, children were given only several minutes of training (in contrast to four weeks in Lesgold et al., in press), but the training was directly relevant to the task, i.e., children practiced making up internal images.

The children practiced making up images of successively longer prose messages, were shown examples of good images, and were instructed to use a strategy which guaranteed successive reading and imaging. The test task was reading and learning the content of a 950-word story. This passage was far longer and more complex than prose materials used in other studies with children in the primary grades, but not unlike the passages children often read in school. Thus, this study tried to demonstrate that eight-year-old children can be taught a mental imagery strategy which facilitates their memory of the type of prose material third graders often encounter in everyday schoolwork.

Method

Subjects

Eighty-six third-grade children enrolled in suburban Minneapolis public schools served as subjects in this experiment, with 43 children assigned to the Experimental condition and 43 to the Control condition. Each child was regularly enrolled in one of three reading groups. One group was reading slightly above grade level, one at grade level, and the third group was a half grade level below third-grade reading achievement. The assignment to Experimental and Control groups was done randomly, except that an equal number of children from each of the reading groups was assigned to the Experimental and Control conditions.

Materials

The training materials included (1) two sentences which contained two major elements (e.g., The children rode the whale.), (2) four sentences which contained three major elements (e.g., The man sat in his chair and smoked his pipe.), two short paragraphs, and part of a short story. All of the training items referred to very concrete items and events. The

portion of the short story used during training was 200 words long. The story was printed in capital letters on five pages and bound into a booklet. Each printed page of the booklet was followed by a blank page.

The objects and activities referred to in each training sentence, paragraph, and page of the story, were illustrated by color drawings. These drawings were shown to the subjects in the Experimental condition by means of a slide projector. The test story was a 950-word story about a border guard. Extensive pilot testing indicated that almost all third-grade children could easily read the story. The story was composed of a series of concrete events. For instance, a rat skipping rope approached the gate with a black ticket. The border guard explained that only those with red tickets could pass through the gate. However, the guard allowed the rat to pass through because the rat claimed that a cow was chasing him. Then a cow came along bouncing a basketball. He told the guard that he was a member of a basketball team and needed to go through the gate so that he would not be late for the big game, etc.

The story was divided into 17 sections, and each section was typed in capital letters and printed on a separate page. The pages were bound into a booklet, and, as in the practice story, each printed page was followed by a blank page.

The 24 test questions were short-answer questions about events in the story. For example, the questions on the portion of the story previously discussed were: When the border guard first saw the rat at the gate, what was the rat doing? What color was the rat's ticket? What did the rat think was chasing him? When the border guard first saw the cow at the gate, what was the cow holding? Why did the cow have to go through the gate? Almost all of the questions referred to concrete materials and events mentioned in the story.

Procedure

Children participated in groups of four to six. The experiment was conducted in a classroom of the school the children attended. When the children arrived in the experimental room, they were seated in school desks, and told that during the hour, they would be read some stories.

Experimental group. Subjects in the experimental condition were told that a good way to remember things was to make up pictures in their heads. The subjects were orally presented a training sentence and instructed "to make up a picture in your head of the sentence." The experimenter, using a slide projector, showed them a picture depicting the meaning of the sentence, and told subjects that this picture was what their mental image might look like, and asked the subjects as a group if their pictures were the same as the ones on the screen. Subjects were told that their picture did not have to be exactly like the picture on the screen, just so long as it contained all the same elements. The procedure was repeated with each of the six training sentences and two paragraphs. Then the experimenter gave each child the training story booklet and pointed out that the book was composed of alternating printed and blank pages. The children were instructed to read the first page, turn to the subsequent blank page, and "make up a picture in your head of what you just read." Then, the experimenter showed the children a slide depicting the content of the first page. The procedure was repeated for all five pages of the story.

Control group. Children in the control condition were presented the same materials as Experimental subjects. The experimenter told the Control subjects to "do whatever you can or have to in order to remember" the practice sentences and paragraphs "for later." Control subjects did not

see the pictures accompanying the verbal materials. Instead, for each item, one child was instructed to recall the item, and the other children were to indicate whether the recall was accurate. This procedure resulted in about the same amount and kind of subject-subject and experimenter-subject interaction as children in the Experimental condition experienced. When the Control subjects read the training story, the experimenter told the children to read a page, and then, turn to the blank page, and do "whatever you can or have to in order to remember the story."

After reading the five segments of the short story, subjects in both conditions were asked five short-answer questions about the story. Training took about 20 minutes for both groups.

After training, the children were given the test story booklet. Both Experimental and Control subjects were instructed that the test story booklet was composed of alternating printed and blank pages and that after (and only after) reading each page, the child was to turn to the blank page. Experimental subjects were instructed to construct mental pictures while looking at the blank page, and Control subjects were again told to do whatever possible in order to remember for later, except that Control subjects were not permitted to write or draw on the page. The experimenter explained that each child would have to print out the answers to some questions about the story, questions very similar to the ones accompanying the practice story.

After the children began reading, the experimenter repeated a short instruction every 1-1/2 minutes. The Experimental instruction was, "Remember to turn to the blank page after you read a page and make up a picture in your head to help you remember." The Control subjects were told to, "Remember to turn to the blank page after you read a page and do whatever you can or have to in order to remember."

The experimenter recorded the amount of time required by each subject to read the story. The question booklet was given to the subject upon completion of the story.

Results

Mean number of correct answers and mean reading times for each treatment level and ability level are recorded in Table 1. The mean number of correct answers was based on 30 correct answers for 24 questions. (Some questions had more than one correct answer.)

An internal consistency estimate of reliability was calculated on the short-answer test performance of both the Experimental and Control group. The Hoyt reliability (Winer, 1971) for the Control group was .82 and for the Experimental group was .77.

A 2 X 2 (Experimental versus Control and Good Readers versus Average and Poor Readers combined) analysis of variance on the reading test scores was conducted. Average and Poor Readers were combined into one group because there were very few Poor Readers. The effect due to experimental condition was significant in this analysis, $F(1,82)=4.86$, $p< .05$. Because of the unidirectional nature of the expectation that Good Readers would correctly answer more questions than Average and Poor Readers, the F statistic was coverted to a t statistic and a one-tailed test was conducted. As expected, Good Readers correctly answered more questions than Average and Poor Readers, $t(82)=1.88$, $p< .05$, one-tailed test. There was no interaction between reading ability and treatment conditions ($F<1.00$).

An analogous analysis of variance was conducted on the reading times. There were no significant effects in the analysis.

Discussion

Since there were so many ways in which this study differed from experiments previously reported, it is impossible to be certain of the cause of the significant effect favoring imagery in this study. Perhaps the most accurate, least speculative summary of the results of the study reported here is that when groups of eight-year-old children are told to use mental imagery to facilitate their memory of prose, and when they are given practice at forming mental images, and when it is guaranteed that the subjects do not attempt to read and image at the same time, then eight-year-olds' memory of a very concrete, easily imageable story can be improved by using mental imagery.

There are many questions left to answer, but this study does suggest that mental imagery training may be easily taught in the classroom and improve children's memory of passages they read. The experimental result reported here is notable because the experimental situation largely approximated a typical school setting. The Experimental and Control treatments were administered to groups of children reading a story very similar to stories found in children's readers, and the task situation was very much like a third-grade reading group.

Another reason the result reported here is notable is that in Lesgold et al. (in press) imagery subjects spent more time on the task than control subjects, and, it may have been, as Lesgold et al. (in press) suggested that imagery subjects did nothing more than read more slowly and carefully than control subjects. In the study reported here, extensive pilot testing of the Experimental and Control procedures indicated that the two procedures resulted in equal time on the task by the two groups, and in the actual experiment there was no confounding of experimental

condition and time on task, i.e., Control and Experimental subjects spent the same amount of time reading the passage. Thus, it is more certain than in Lesgold et al. (in press) that the performance increment observed in the Experimental condition is due to imagery and not time.

Finally why was the difference between Experimental and Control conditions relatively small? At best, the discussion on this point must be speculative. However, it is important to emphasize that the Control subjects were instructed to do whatever necessary in order to remember the passage and, thus, it could be argued that many Control subjects were imaging anyway. Levin and Divine-Hawkins (1974) noted that many children spontaneously used mental imagery when presented concrete prose passages. This difference between Experimental and Control subjects may be small because the Control group was imaging spontaneously.

However, there is another possibility. Although it is well documented that imagery is a potent strategy in basic associative tasks, such as paired-associate learning, it may not be as facilitative of prose learning. It could well be that skilled readers, even young ones, process prose so well spontaneously that the provision of an imagery strategy may not greatly improve their information processing. (Levin and Divine-Hawkins, 1974, make a similar point in their introduction.) However, children from populations with reading/learning difficulties, seem to benefit from imagery instructions (Levin, 1973; Levin et al., 1974; Paris, Mahoney, & Buckhalt, 1974). Thus, there seem to be several next steps. One is to discover if giving good readers an imagery strategy alters their processing of prose materials. It may be that the imagery strategy alters the content of memory more than the quantity of memory. Another next step is to see if the procedure outlined here will aid

deficit populations. The authors cited above have indicated that imagery strategies do aid subjects from poor-learning populations. Moreover, a nonsignificant trend toward a Reader Ability X Strategy interaction in this study suggested that poor readers may be aided comparatively more by the procedure outlined here. Clearly, more research is needed to determine if imagery may be a strategy which can help those who need it most.

Reference Note

1. Levin, J. R. What have we learned about maximizing what children learn? In J. R. Levin & V. L. Allen (eds.) Cognitive learning in children: Theories and strategies. New York: Academic Press, 1976.

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Footnotes

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Table 1

Means and Standard Deviations of Number of Correct Answers and Reading Times for Experimental and Control Conditions

	Experimental			Control		
Variable	Good Readers (n=27)	Average and Poor Readers (n=16)	Across Reading Ability (n=43)	Good Readers (n=27)	Average and Poor Readers (n=16)	Across Reading Ability (n=43)
Correct Answers						
Mean	18.72	17.44	18.55	16.94	13.96	15.83
S. D.	4.58	4.35	4.50	5.25	5.97	5.65
Reading Time (Secs.)						
Mean	652	716	676	660	692	674
S. D.	149	187	165	193	148	179