DOCUMENT RESUME

ED 059 027 RE 003 998

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TITLE A Developmental Study of Imagery Instructions in Noun-Pair Learning.
PUB DATE Apr 72
NOTE 12p.; Paper presented at the meeting of the American Educational Research Association, Chicago, Ill., Apr. 1972

EDRS PRICE MF-$0.65 HC-$3.29
DESCRIPTORS Associative Learning; Behavioral Science Research; Grade 1; Grade 3; Grade 6; Grade 11; *Imagery; Learning Processes; Nominals; *Paired Associate Learning; *Verbal Learning; Word Recognition

ABSTRACT

A three-way design was used to assess the effect of imagery instructions in noun-pair learning. The three principal factors were instructions (imagery versus rehearsal versus control), presentation mode (words versus pictures), and grade (1, 3, 6, and 11). Sixty subjects were drawn from each grade and randomly assigned to the six conditions. Analysis revealed significant main effects for grades and presentation mode. Older subject learned significantly better than younger, and picture presentation resulted in significantly better results than word presentation. No interaction between grade and mode was noted. In the word mode, imagery instructions were effective only in the sixth- and eleventh-grade samples, whereas in the picture mode they facilitated performance in the third-grade samples as well. Tables and references are included. (Author/MS)

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A three-way design was used to assess the effect of imagery instructions in noun-pair learning. The three principal factors were: Instructions (imagery vs. rehearsal vs. control); Presentation Mode (words vs. pictures); and Grade (1, 3, 6 and 11). Sixty subjects were drawn from each grade and randomly assigned to the six conditions. Analysis revealed significant main effects for Grades (favoring older subjects) and Mode (favoring pictures) but no interaction. In the word mode, imagery instructions were effective only in the sixth- and eleventh-grade samples whereas in the picture mode they facilitated performance in the third-grade samples as well.

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Several adult and children's studies have compared the effects of presenting paired-associate (P-A) items as words or pictures. In Experiment VI, Epstein, Rock, Zuckerman (1960) found that college Ss learned concrete noun-pairs significantly better when items were presented as line drawings rather than printed words. Paivio and Yarmey (1966) similarly found that college Ss associated colored drawings more efficiently than their noun referents. Dilley and Paivio (1968) showed that the P-A learning of nursery, kindergarten, and first-graders was significantly enhanced when line drawings were used as stimulus although not when used as response terms. Rohwer, Lynch, Levin, and Suzuki (1967) found that the noun-pair learning of both third- and sixth-graders was similarly enhanced when items were presented as a black and white motion picture of still objects rather than printed words.

A few adult P-A studies and fewer children's studies have been concerned with the effect of associating paired items via induced or instructed imagery. Yuille and Paivio (1967) compared the time in which adult Ss acknowledged self-generated nonverbal images or verbal

mediators linking noun-pairs. Group latencies did not differ when nouns were concrete. With abstract items, however, verbally set Ss acknowledged mediating links significantly faster than imagery instructed Ss. Paivio and Yuille (1967) found no significant differences in the noun-pair learning of adults instructed to form imaginal or verbal links, although both groups were superior to rote repetition Ss. Paivio and Foth (1970), however, found that, when paired nouns were concrete, adults instructed to form images learned better than Ss generating sentences. A reversed sentence superiority occurred when nouns were abstract. Again with adults, Bower and Winzenz (1970) reported significant differences in the concrete noun-pair learning among the following four conditions (in order of descending facilitation): (1) S-generated image, (2) S-generated sentence, (3) E-provided sentence, and (4) rote rehearsal. After reviewing the findings of a few unpublished children's studies involving induced imagery, Levin (1971) proposed a complex three-way interaction involving imagery ability, age, and mode of presentation; e.g., he found that eight-year-olds benefited more consistently from imagery instructions when P-A items were pictures rather than words. Finally, Guy (1971) reported significantly better noun-pair learning for both sixth- and eleventh-graders when items were line-drawings rather than aurally presented words. In both grades, within the pictorial mode, no significant learning differences occurred between rote rehearsal and control Ss or imagery provided and imagery generated Ss.

As yet, no study has been reported comparing the effects of imagery instruction or the effects of presenting P-A items verbally or pictorially across a wide developmental age span within a relatively homogeneous

population with respect to race and socio-economic status (SES). Consequently, the objectives of this study were to compare the effects of verbal and pictorial presentation on the noun-pair learning of white high-SES first-, third-, sixth-, and eleventh-graders and, within each presentation mode, assess the benefit Ss of all four grades would obtain from imagery instructions compared to a rote rehearsal and traditional control condition.

Method

Subjects. Samples of sixty Ss each were drawn from the first-, third-, sixth-, and eleventh-grade classes of an elementary and senior high school serving the same high SES white community. Within each grade, sub-samples of ten Ss were randomly assigned to the six conditions.

Design. The experimental design included three main factors: (1) conditions, (2) grades, and (3) mode of presentation. The three conditions were: imagery instruction (I), rote rehearsal (R), and a traditional control (C). Conditions were nested within two modes of presentation: words (W) and pictures (P). The six cells created by conditions and modes occurred within four grade levels: 1, 3, 6, and 11.

Materials and Procedure. One-hundred familiar concrete nouns such as ball, feather, ring, and cow were randomly paired, avoiding extraexperimental associations. The resulting fifty noun-pairs were randomly ordered to form the study list, and the first words of each pair were reordered to form the test list. For verbally presented materials, each of the fifty study-pair and test items was typed and photographed on 35 mm slides. For pictorially

presented materials, line drawings of the noun referents were made and similarly converted to slides. Whereas study-test lists within each presentation mode were ordered differently, verbal and pictorial slides were identically ordered. Also, an aural presentation of each study-test item simultaneously accompanied (via tape) both verbal and pictorial slides in an attempt to compensate for differential reading ability across age.

All Ss were tested individually in a quiet windowless room. Items were presented once according to the study-test technique at a 10:5 sec. rate. Subjects were seated approximately six feet in front of a white screen on which slides were automatically projected via a Kodak carousel slide projector synchronized with a Wollensak Slide-Sync cassette recorder.

Before receiving the fifty-item experimental list, all Ss were instructed according to the following three-phase sequence: (1) standard P-A learning instructions, (2) a specific learning strategy, if appropriate, and (3) actually learning a four-pair practice list presented manually at a 10:5 sec. rate via cards to a criterion of one perfect repetition or five trials. Therefore, within each presentation mode, the three experimental conditions were distinguished according to differential strategies administered during the second instructional phase. In the traditional control condition, the second instructional phase was simply omitted. In the rote rehearsal condition, Ss were told to repeat each pair implicitly throughout the study interval. In the imagery instruction condition, Ss were told to imagine the items of each pair joined together or meaningfully interacting. Both rehearsal and imagery Ss were requested to utilize their specific strategies during practice list learning. Rehearsal Ss were asked whether

they did, in fact, implicitly repeat items during practice and were further reminded to rehearse immediately prior to receiving the actual experimental list. Imagery Ss were asked to describe their idiosyncratic interactions generated for practice items.

Results

The dependent variable was the number of correct responses given by Ss on the one test trial. Means for the three conditions in two presentations modes within four grade levels were presented in Table 1.

Insert Table 1 about here

The data was analyzed according to twenty-three planned comparisons testing hypotheses (at $\alpha = .05$) in four major areas: (1) age effects, (2) mode effects, (3) age x mode interaction, and (4) condition effects.

A predicted age effect was verified by the following three grade contrasts, each of which showed older Ss learning significantly better than younger: 1 vs 3, $F(1,216) = 5.20$, $p<.02$; 6 vs 11, $F(1,216) = 50.50$, $p<.0001$; and 1&3 vs 6&11, $F(1,216) = 171.67$, $p<.0001$. A significant picture over word mode of presentation was also found across grades and conditions, $F(1,216) = 9.76$, $p<.002$; however no grade x mode interaction occurred: 1 vs 3 x modes, $F(1,216) = .25$, $p>.50$; 6 vs 11 x modes, $F(1,216) = .41$, $p>.50$; and 1&3 vs 6&11, $F(1,216) = .28$, $p>.50$. These comparisons concerning the first three aspects of the analysis are summarized in Table 2.

Insert Table 2 about here

Analysis of condition effects was initiated by pairwise comparisons of the rehearsal and control groups within modes of each grade. Since none of

these contrasts were significant at any grade level, the effect of imagery instruction was compared with the average of the rehearsal and control conditions combined. The results of these eight comparisons are presented in Table 3.

Insert Table 3 about here

Both comparisons within the first-grade were not significant. Within the third-grade, the imagery condition was significantly superior to rehearsal and control within the picture but not the word mode of presentation. Both comparisons were significant within the sixth- and eleventh-grades.

Discussion

The expected finding that older Ss learned better than younger concurs with previous studies of this kind which have included the age variable (Bean and Rohwer, 1970, 1971; Levin, 1971; Guy, 1971). The finding that pictorially presented items were associated more efficiently than those presented verbally also agrees with the previous results of Paivio and Yarmey, 1966; Dilley and Paivio, 1968; Rohwer, Lynch, Levin, and Suzuki, 1967; Levin, 1971; and Guy, 1971. The insignificant interaction between grades and modes indicated that, across the conditions of this study, the pictorial mode facilitated learning similarly in Grades 1, 3, 6, and 11. In effect, the lack of a significant grades x mode interaction found by Rohwer, et. al. (1967) with third- and sixth-graders was extended to include first- and eleventh-graders. The lack of significant differences between rehearsal and control conditions within modes of all grade levels also extended the similar findings of Guy (1971) with sixth- and eleventh-graders. Results of the remaining comparisons between the imagery vs.

rehearsal and control conditions indicated that only sixth- and eleventh-graders benefited from induced imagery when items were presented verbally. Apparently, when the task was made easier via pictorial presentation, third-graders were also able to benefit from the imagery instructions. Consequently, these findings indicated that the facilitation of presenting P-A items pictorially compared to verbally similarly holds across a wide developmental age span, and the benefit that Ss derive from an induced imagery elaboration strategy is jointly dependent upon their age as well as the difficulty of the learning task.

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Table 1

Mean Number of Correct Responses

as a Function of Grades, Conditions, and Modes

	Grades							
	1		3		6		11	
Conditions	W	P	W	P	W	P	W	P
Imagery	5.90	10.50	9.40	16.10	21.50	23.50	30.90	30.30
Rehearsal	2.50	4.80	4.50	4.70	6.50	10.00	18.20	18.40
Control	.40	5.60	5.80	7.10	8.90	13.10	18.20	23.30
All Conditions	2.93	6.97	6.57	9.30	12.30	15.53	22.43	24.00

Table 2

F-Ratios for Grades, Modes, and

Grades X Modes Contrasts

Contrast	df	F
1 vs 3	1,216	5.20*
6 vs 11	1,216	50.50*
1&3 vs 6&11	1,216	171.67*
W vs P	1,216	9.76*
1 vs 3 and W vs P	1,216	.25
6 vs 11 and W vs P	1,216	.41
1&3 vs 6&11 and W vs P	1,216	.28

*$p < .05$

Table 3

F-Ratios for Contrasts

of Imagery vs. Rehearsal and Control Conditions

Grade	Mode	df	F
1	W	1,216	2.57
1	P	1,216	3.64
3	W	1,216	2.34
3	P	1,216	13.50*
6	W	1,216	24.71*
6	P	1,216	18.53*
11	W	1,216	20.93*
11	P	1,216	11.59*

*$p < .05$