

The Effect of Instruction with Relational and Item-Specific Elaborative Strategies on Young Children's Organization and Free Recall

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One hundred and sixty second-grade children were assigned on the basis of a free recall pretest to four instruction conditions and were given a series of lists of pictures for free recall. For three groups, the instructions were directed at encoding either (a) list organizational information, (b) item-specific semantic information, or (c) organizational and individual item information, while the fourth group constituted a "No-training" control with standard free recall instructions. The subjects received either related or unrelated lists during the training phase and related or unrelated lists during two post-tests, immediately following and 1 week after training. For both types of lists, instructions emphasizing list organization were more effective than those emphasizing item-specific elaboration. Subjects given individual item elaborative instructions showed levels of recall which were comparable to those of the control subjects. While the combined effect of organizational and individual item processing did not exceed the performance produced by organizational instructions alone, the degree of generalization was greater for subjects processing both kinds of information, especially when subjects received related lists during training.

Studies in the area of memory development consistently find large age-related differences in recall. In recent years, both the levels of processing model of memory (Craik & Lockhart, 1972) and organizational theory (Mandler, 1980; Tulving & Donaldson, 1972) have been increasingly utilized as frameworks for understanding memory development. According to the organizational position, to achieve optimal memory performance the individual must encode during input the relational information shared between a number of individual items or events. Only by interrelating

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in item with other items on the basis of some common or shared feature will the individual produce a memory trace which is highly integrated and hence easily retrievable. Age differences in recall are attributed to the fact that children younger than age 8 typically do not spontaneously employ organizational strategies, while between age 8 and adulthood, there is a clear developmental increase in the use of such processes (Neimark, Soltnick, & Ulrich, 1971) with a corresponding increase in recall (Moely & Jeffrey, 1974). The alternate position, which has derived from the levels of processing framework, emphasizes that optimal memory performance results from encoding highly specific semantic information about each individual item or event. Although the concept of "depth of processing" has recently been supplemented with the idea of spread of encoding or "elaboration" at a given depth (Craik & Tulving, 1975), the levels of processing position emphasizes the encoding of within-item, highly specific semantic information as the key to improving memory performance. Age differences in retention are attributed to age-related differences in the depth (Murphy & Brown, 1975) or elaborateness (Geis & Hall, 1978; Ghatala, Carbonari, & Bobele, 1980) to which material is processed. Given these two perspectives on memory development, older children's superior retention may reflect their tendency to encode more semantic/elaborative information from each individual item and more between-item relational information than do younger children.

The present experiment examines the differential effects that instructions to encode these two types of information will have on recall and organizational performance in young children. Of interest is the ability of young children to not only effectively process each type of information, but also, their ability to maintain and generalize each information processing strategy. Although the evidence concerning the maintenance and generalization of elaborative sorts of strategies by young children is not clear, the results from a number of studies concerning transfer of organizational strategies has been disappointing. The positive consequences of training young children to use organizational strategies rarely seem to be maintained over time (Scribner & Cole, 1972), nor do they often transfer to new materials (Bjorklund, Ornstein, & Haig, 1977; Scribner & Cole, 1972). However, the observed lack of maintenance and generalization may be due to deficiencies in the training methods employed rather than to deficiencies in the young child's information processing system. When meaningful stimuli, explicit instructions, and extended training are employed, evidence for maintenance and generalization of organizational strategies has been obtained in both young children (Black & Rollins, 1982; Hall & Madsen, 1978) and in mildly mentally retarded individuals (Engle & Nagle, 1979; Engle, Nagle, & Dick, 1980; Hamre-Nietupski, Nietupski, Vincent, & Wambold, 1982).

The present authors (Engle & Nagle, 1979; Engle et al., 1980) used

an instructional package in a free recall task in which mildly mentally retarded children were instructed to think of each object within a list according to any functions that the object might have, any personal experiences he or she might have had with the object, and any other objects in the list that were related or similar in any way. Using lists of unblocked categorizable items, Engle and Nagle (1979) found that the semantic instructions improved recall and categorical clustering, on both training lists and post-test lists 1 week later. In a follow-up study (Engle et al., 1980), half of the mildly retarded children were trained in the use of the semantic strategy and half constituted a "no-training" control group that received standard free recall instructions prior to all training and post-test lists. Subjects in both groups received lists containing either categorically related items or unrelated items during the training phase and related or unrelated lists during two post-tests, immediately following, and 1 week after training. Subjects given semantic instructions recalled significantly more words and exhibited greater levels of organization at recall, both during the training and post-test phases, than did the No-training controls. Moreover, and possibly more important, the degree of strategy generalization to help deal with new stimuli, both like that used in training and different from that used in training, was impressive for those subjects receiving semantic strategy instructions.

Essentially, the instructional package employed in both of the previous studies from our laboratory involved active participation on the part of the subject with a multifaceted semantic acquisition and retrieval strategy. This strategy was designed to focus the subject's attention on two different types of information present in each list. More specifically, the strategy induced the encoding of semantic/elaborative information highly characteristic of each individual item, as well as relational/organizational information shared between items in each list. To use terminology derived from Ritchey (1980; Ritchey & Beal, 1980), the semantic strategy induced subjects to process both the "within-item elaborative" information and the "between-item relational" information present in each free recall list.

Although the effectiveness of the instructional package as a whole has been demonstrated, the contribution made by each of its components on the enhanced recall and organizational performance found with children taught this semantic strategy is not known. It would be desirable, especially for those interested in the development of strategy training programs for use in educational settings, to know if only one component of the instructional package is responsible for the improvements in performance, or if all the components are needed to achieve the desired benefits. In this regard, the present research will attempt to answer a number of questions. First, we are interested in determining whether or not a mnemonic strategy designed to focus a child's attention on relational information shared between a number of items in a list would produce higher recall

than would a strategy designed to focus attention on semantic features of individual items. Although it is possible that both within-item elaborative information and between-item relational information are equally important in the young child's representational system, there is some evidence (e.g., Bellezza, Cheesman, & Reddy, 1977; Ghatala & Levin, 1982) that one type of information may be preeminent over the other. Secondly, can either of these two types of information processing be reduced to the other; that is, can between-item relational processing be considered a form of within-item elaborative processing, or vice versa? It would appear that relational strategies which direct the subject to group together similar items from the same conceptual category must also involve semantic level processing of the items in order to access the item's category membership from semantic memory. There is evidence, however, from recent incidental learning studies with adults that argue against such an interpretation (Einstein & Hunt, 1980; Hunt & Einstein, 1981). These authors have shown that an orienting task which combines between-item relational processing and within-item elaborative processing leads to higher levels of recall than does performing either type of processing alone. In young children, would instructions designed to induce the encoding of both types of information in a list also produce higher levels of recall than would instructions to process only one type of information? Thirdly, the present research investigated the effect that changes in the type of to-be-learned material would have on the two different types of information processing. In adults, recall from a list of highly related items is facilitated by encoding highly specific information about each item, while recall from a list of essentially unrelated items is facilitated by encoding between-item relational information (Einstein & Hunt, 1980). The question we address is whether these same effects on recall that were obtained by manipulating the type of processing engaged in, and the type of materials presented, would occur with children, or is one type of processing more beneficial for recall regardless of the nature of the to-be-remembered materials? The notion that one type of information processing is preeminent over the other regardless of the nature of the list materials was tested by varying the type of list used in the training and post-test phases. Finally, generalization of the different information processing strategies from one type of material to another was tested for by switching the type of list between the training and post-test phases. That is, half of the children in each instruction condition received lists of categorizable or related items during the training trials and half received lists of non-categorizable or unrelated items. Each of these groups were subdivided with half of the children receiving related post-test lists and half getting unrelated post-test lists. Comparisons between the different mnemonic strategies used in the present experiment as to their ability to generalize or transfer to new materials will help in determining which strategies are

the most promising ones for generating effective training programs. The prospect of having to train a new mnemonic strategy every time the task changes does not seem as productive as training a more versatile strategy which is appropriate for handling a number of different tasks.

METHOD

Subjects

One hundred and sixty children were chosen from three suburban public schools serving predominantly middle- and lower-middle-class communities. Subject selection criteria were as follows: (1) all children were to be enrolled in regular second-grade classes and have normal intelligence; (2) children who were known to be emotionally disturbed, neurologically impaired, or learning/reading disabled were excluded from the study; and (3) that parental permission be obtained. During the course of the experiment, 12 children failed to complete all the experimental sessions and were replaced. The children who were replaced did not fall in any one group but were distributed evenly throughout the four instructional conditions.

Materials

Stimuli used in the pretest, training, and post-test lists were black and white line drawings of common objects selected from 27 different conceptual categories. Since subjects could receive training lists composed of categorically related (R) items or unrelated (U) items, and post-test lists of related or unrelated items, a total of four different sets of materials (i.e., RR, EU, UR, and UU) were generated with each set containing 100 cards. To determine the differential effects of the different instructions on recall and organization, equal familiarity among the items in the four sets was necessary. To construct these equal sets, the six most common exemplars of each category were taken from the Posnansky (1974) norms. The items were rated for familiarity to second-graders and were distributed equally among the four sets of materials.

Two types of 20-item lists were composed: (1) Related lists consisting of 4 words from each of five different categories, and (2) Unrelated lists containing 1 item from 20 different categories. In the related lists, items were arranged randomly with the constraint that no two items belonging to the same category occur consecutively. For subjects receiving all Related lists in both training and post-test phases, a given category was presented only once over the five lists. For subjects receiving all Unrelated lists, categories were obviously repeated across lists but different exemplars were always used. For subjects shifting from Related lists to Unrelated lists (or vice versa), categories were also repeated, but a category represented in one related list was never represented in another related list.

For each of the items selected, drawings of relatively uniform size were made and pasted onto 8 × 11-in. white cardboard sheets.

Conditions

Subjects were assigned to 1 of 16 conditions derived by manipulating three factors in a completely balanced design. These factors were (1) the type of instructions given to the child—Semantic, Relational, Elaborative, or standard free recall instructions (i.e., “No-training”); (2) Related or Unrelated lists during the training phase; and (3) Related or Unrelated lists in the post-tests.

Forty of the children received instruction in the use of either the Semantic, Relational, or Elaborative strategy, while the remaining forty children received only standard free recall instructions. For each of the four instruction conditions, half of the children learned their assigned strategy with training lists of Related items and half learned using lists of Unrelated items. Each of these groups was further subdivided, with half of the subjects receiving two post-tests on Related lists and half on Unrelated lists.

Pretest

Each child was seen individually and administered a pretest before their assignment to conditions. The pretest consisted of two free recall trials on a list of 20 unrelated items. On each of the two trials, a different random ordering of the items was used. Items were presented at a 10 sec per item presentation rate with the experimenter presenting the picture of the item and saying the name aloud. Prior to presenting the pretest list, each subject was instructed to recall aloud as many of the items from the list as possible in any order. The mean number of words recalled on the pretest, as well as the chronological age of the child, were used to assign each subject to 1 of the 16 groups. The mean pretest scores for the 16 different groups ranged from 8.0 to 8.4 words (mean = 8.2) and did not statistically differ ($F < 1.0$).

Training Procedures

Approximately 4–6 weeks after the pretest the experimenter returned to the school and administered to each child individually the two training lists of Session 1. This first training period lasted approximately 50 min but varied somewhat depending on which instructions were given. Children were assigned to one of the following four instruction conditions:

1. *Semantic strategy.* For children assigned to the Semantic strategy training conditions, the three training lists were preceded by instructions on a semantic mnemonic strategy with practice on two types of examples. The first set involved Related items, while the second set involved essentially Unrelated items. None of the items which were used as examples

to practice the strategy on were used in the subsequent training or post-test lists. All subjects were told that the best way to remember a list was to think about each of its items in the following terms: (1) its function, (2) personal experiences with the item, and (3) other items from the list that are related to it. To encourage the child to process each item along these three dimensions, the experimenter continually stressed the importance of the child's active participation in asking him or herself appropriate questions about each of the items. For example, "What does this object do?" or "What can we do with it?" are questions which address the function or purpose of the item. Questions such as "Have you ever used it before?" were used to orient the child toward any personal experiences he or she may have had with the item. Finally, questions such as "What other pictures have we seen that are like it?" were employed to help the child access relational information in each list. Correct answers were provided if the child failed to provide them.

2. *Relational strategy.* Children assigned to the Relational strategy training conditions were told that the best way to remember a list of items was to think about how the items are similar to, or related to, each other. The important encoding process underlying this strategy was the abstraction of relational information shared by the items present at input. Children practiced the Relational strategy on the same examples used by the Semantic strategy groups. As was also the case with the Semantic strategy condition, the experimenter encouraged the child to ask him or herself questions about the relational information among a group of items.

3. *Elaborative strategy.* Children assigned to the Elaborative strategy condition were told that the best way to remember a list was to think about each item in terms of (1) its function or purpose and (2) any personal experiences he or she may have had with the item in the past. These instructions served to direct the child's attention toward the specific items themselves and not toward an organizational strategy as did the Relational strategy. The experimenter asked questions about, and directed the child's attention toward highly specific features unique to each individual item. Practice of this Elaborative strategy was done with the same examples used by the Semantic and Relational strategy conditions.

4. *No-training control.* The control group was included to assess the effect of a training period without any specific mnemonic strategy instruction. Children assigned to the No-training control condition received standard free recall instructions prior to all training and post-test lists.

It is important to note that the Semantic, Relational, and Elaborative strategies all employed self-interrogation as an integral part of the rehearsal process. For each of the three strategy instruction conditions, the experimenter said at the beginning of the session that he was going to show the student a way to better remember long lists of items. Furthermore,

throughout the training session the usefulness of each strategy to "help you learn" was stressed verbally to each child in an effort to increase his or her awareness of the benefits possible from using the strategy that they were assigned.

Following the instruction phase, the first of two 20-item training lists was presented at a 15 sec per item presentation rate. As each picture was presented, the experimenter prompted strategy usage in those children assigned to either the Semantic, Relational, or Elaborative conditions by asking questions about each item relevant to their instructional condition. Following presentation of the list, an unpaced oral free recall test was performed without any prompts or retrieval cues being supplied by the experimenter. Immediately after recall was complete, a second trial was performed on the same list but with the items in a different random order and at a 10 sec per item presentation rate. During this second trial, the experimenter again prompted the child to utilize the criteria of their assigned strategy and corrected any inappropriate responding. Following the second trial, an oral free recall test was again performed without any cues or prompts from the experimenter. All other lists for training and post-test phases employed this same procedure of two different randomized presentations of a given word list at 10 sec per item presentation rate. Following each recall test, the experimenter praised the student regardless of performance.

The 2nd day of training occurred within 1-3 days after the first session. For children assigned to either the Semantic, Relational, or Elaborative strategy conditions, the experimenter reiterated the strategy. The active role of the experimenter was gradually faded out over the three training lists so that by the last trial of the third training list, all children were to be using their assigned strategy with little or no guidance from the experimenter.

Post-tests

Immediately after the completion of both trials of training list 3, all subjects received the first post-test. The second post-test occurred 7 days later. The two post-tests consisted of two trials on two new lists of words with the second trial being a different random ordering of the words. The purpose of the post-tests was to determine whether or not children trained in the use of a given mnemonic strategy would continue to utilize this newly acquired skill in the absence of any assistance or guidance from the experimenter. Therefore, prior to and during both post-tests, no reference or prompts were made by the experimenter to use any type of mnemonic strategy.

RESULTS

The dependent variables of primary interest were (1) the number of words correctly recalled from each list, (2) the measure of category

clustering exhibited in recall of Related lists, and (3) the measure of subjective organization exhibited in the recall from both Related and Unrelated lists. The recall and organizational data were first analyzed for possible effects of school, but as no significant effects were found, this variable was disregarded in all subsequent analyses.

Training List Data

Recall. The mean number of words correctly recalled for the three training lists averaged over the two trials for each list are shown in Table 1 for each instruction condition.

The recall scores from the training lists were analyzed by an analysis of variance with instruction condition (Semantic, Relational, Elaborative, and No-training), type of training list (Related or Unrelated), lists (3), and trials (2) as factors. Intrusion responses and repeated responses were not included in calculating the recall data. Instruction condition exerted a significant effect on the number of correctly recalled words ($F(3, 152) = 33.5, p < .001$). Planned comparisons (all effects reported as reliable reflect Tukey HSD tests at the .05 level) revealed that while subjects given Semantic (mean = 13.6) and Relational (mean = 14.4) instructions did not differ reliably from each other, both groups recalled significantly more words than did the No-training controls (mean = 9.7). Surprisingly, children given instructions to engage in elaborative processing of individual items did not recall significantly more words (mean = 10.5) than did the No-training controls. The recall of children given Elaborative strategy training was significantly less than that found for children given Relational strategy training.

The significant main effect for type of training list ($F(1, 152) = 24.7, p < .001$) combined with the absence of an Instruction \times List type

TABLE 1
MEAN NUMBER OF WORDS RECALLED ACCORDING TO TYPE OF TRAINING LIST
AND STRATEGY CONDITION

Strategy	Training lists			\bar{X}
	1	2	3	
Related lists				
Semantic	15.4	14.0	15.4	14.9
Relational	15.4	14.0	15.9	15.5
Elaborative	10.6	11.0	11.8	11.1
No-strategy	11.4	9.7	10.8	10.6
Unrelated lists				
Semantic	13.2	11.3	12.3	12.3
Relational	13.9	12.8	13.2	13.3
Elaborative	10.7	9.1	9.8	9.9
No-strategy	9.3	7.9	9.3	8.9

interaction ($F < 1.0$) reflects the superior recall of all instruction conditions for lists composed of Related rather than Unrelated words. It is evident that Relational strategy training was more beneficial for recall when training lists were composed of related items than when they were composed of essentially unrelated ones. Moreover, children instructed in the Relational strategy showed higher levels of recall with Unrelated lists than did children given Elaborative strategy training.

There were also reliable effects found for lists ($F(2, 304) = 22.3, p < .001$) and trials ($F(1, 152) = 234.7, p < .001$), but both of these variables failed to interact significantly with type of instructions. The lack of an Instruction \times List interaction ($F = 1.0$) simply reflects the general decline in recall performance for all instruction conditions on the second training list of the 1st day of training. One possible explanation for this decline in performance on the second training list is subject fatigue. The absent Instruction \times Trials interaction ($F = 1.3$) means that children given training in the Semantic, Relational, and Elaborative strategies showed no greater improvement in their recall across trials 1 and 2 than did children given standard free recall instructions prior to each training list.

Category clustering. The clustering data exhibited by those groups given Related training lists are presented in Table 2. The clustering measure used in this analysis was the Z score discussed by Frankel and Cole (1971). A positive Z score indicates that the items from a given category cluster together on the recall list more frequently than might be expected by chance alone. The Z score measure has some advantages over other category clustering measures in that it has a relatively straightforward interpretation (i.e., above chance clustering occurs when $Z > 1.64$) and it also normalizes scores to adjust for any differences in the total number of words recalled.

The degree of clustering exhibited in the recall from Related training lists was examined by a 4 (Instruction condition) \times 3 (Lists) \times 2 (Trials) analysis of variance. This analysis yielded significant effects for Instruction condition ($F(3, 76) = 43.7, p < .001$), Lists ($F(2, 76) = 4.06, p < .05$), and Trials ($F(2, 152) = 3.25, p < .05$). As can be seen in Table 2, the significant effect of Instruction condition is due to the fact that children taught the Semantic and Relational strategies organized their recall better than did children given the Elaborative strategy or no specific strategy at all. However, it should be pointed out that the degree of category clustering found for both the Elaborative and No-training control conditions were above that expected by chance.

Subjective organization. In addition to analyzing the Related lists for category clustering, an analysis was performed on the output of both Related and Unrelated lists for subjective organization (SO). Subjective organization is assumed to reflect the extent to which a subject uses

TABLE 2
MEAN Z SCORES ON RELATED TRAINING LISTS ACCORDING TO STRATEGY CONDITION

Strategy	Training lists			\bar{X}
	1	2	3	
Semantic	4.42	3.63	4.40	4.15
Relational	4.01	4.21	4.42	4.22
Elaborative	2.18	2.40	2.63	2.41
No-strategy	2.27	1.67	2.00	1.98

idiosyncratic associations to organize the encoding and/or retrieval of memory items and is measured by the degree to which the subject recalls items adjacently across consecutive trials. Although several SO measures have been reported in the literature, we chose to use the intertrial repetition (ITR) score proposed by Bousfield and Bousfield (1966). The ITR measure has been shown to be highly correlated with several other SO measures and under certain circumstances is more useful than these other measures (Woods, 1972). The mean ITR scores on the training lists for the four instruction conditions are shown in Table 3.

The ITR scores for each subject on the three training lists were analyzed by an analysis of variance with Instruction condition, Type of Training List, and Lists as independent variables. Since the Semantic and Relational strategies produced greater recall and category clustering performance than did either the Elaborative strategy or having no specific strategy instructions at all, then one might anticipate a similar pattern of SO performance in these same conditions. The finding of a significant difference in SO across the instruction conditions was not unexpected ($F(3, 152)$

TABLE 3
MEAN ITR SCORES ACCORDING TO TYPE OF TRAINING LIST AND STRATEGY CONDITION

	Training lists			
Strategy	1	2	3	\bar{X}
Related lists				
Semantic	.63	.56	.62	.60
Relational	.61	.58	.62	.60
Elaborative	.44	.42	.47	.45
No-strategy	.37	.28	.40	.35
Unrelated lists				
Semantic	.53	.37	.49	.46
Relational	.59	.53	.51	.55
Elaborative	.41	.42	.43	.42
No-strategy	.29	.25	.33	.29

= 24.0, $p < .001$). Significantly greater levels of SO were found in the recall of children given Semantic (mean = .53) and Relational (mean = .57) strategy instructions when comparisons are made to the No-training controls (mean = .32). Children given Elaborative strategy instructions showed less SO in recall (mean = .43) than did either of the other two strategy training conditions and were not reliably higher than that of the No-training controls.

As was the case with the recall data, the effect of Type of Training List ($F(1, 152) = 9.92, p < .01$) and Lists ($F(2, 304) = 8.09, p < .01$) proved significant. Children in all four instruction conditions showed higher levels of SO on Related lists than on Unrelated word lists. Furthermore, in all four instruction conditions, the addition of a second training list on the 1st day of training led to decreased SO levels as well as decreased recall.

Post-test Data

The purpose of the post-test phase was twofold. First, the post-tests would allow us to address the question of strategy "maintenance." Strategy maintenance refers to the retention or durability of a taught strategy following a reasonable period of time after the completion of the training period. It is possible, for example, that after a 7-day period and in the absence of any prompting from the experimenter, that the children in the Semantic and Relational strategy groups will no longer continue to perform at a higher level than their corresponding Elaborative strategy and No-training control groups. Second, the post-test results will allow us to examine whether or not the different mnemonic strategies transfer equally well to new sets of materials which are unlike those experienced during training.

Recall. The mean number of words recalled on both the immediate and delayed post-tests are shown in Table 4 for each of the four instruction conditions according to type of training and post-test list. An analysis of variance with instruction condition, type of training list, type of post-test list, post-test lists (i.e., PT1 and PT2), and trials as factors indicated a highly significant effect for instruction condition ($F(3, 144) = 19.4, p < .001$). Recall following Semantic strategy (mean = 11.4) and Relational strategy (mean = 11.6) instructions was significantly higher than that found with standard free recall instructions (mean = 8.2). The recall of children given Elaborative strategy instructions was lower (mean = 10.0) but not reliably different from that found in children given either the Semantic or Relational strategy instructions. This finding was surprising since children given the Elaborative strategy instructions produced levels of recall on the training lists which were considerably lower than those found following either Semantic or Relational strategy instructions. This effect appears to be due to a decline in performance from the levels

TABLE 4
MEAN NUMBER OF WORDS RECALLED ACCORDING TO EXPERIMENTAL GROUP,
STRATEGY CONDITION, AND POST-TEST

Strategy	Post-test		\bar{X}
	1	2	
Related-Related Condition			
Semantic	12.8	12.6	12.7
Relational	13.3	12.3	12.8
Elaborative	9.8	10.9	10.4
No-strategy	8.2	8.4	8.3
Unrelated-Related Condition			
Semantic	12.8	12.6	12.7
Relational	11.0	12.4	11.7
Elaborative	9.4	11.0	10.3
No-strategy	7.7	10.0	8.9
Related-Unrelated Condition			
Semantic	8.6	12.3	10.4
Relational	11.3	10.8	11.0
Elaborative	7.9	10.5	9.2
No-strategy	7.9	8.6	8.2
Unrelated-Unrelated Condition			
Semantic	9.3	11.0	10.1
Relational	9.9	12.0	10.9
Elaborative	9.6	11.0	10.3
No-strategy	7.3	7.9	7.6

achieved in training for all conditions except the Elaborative strategy group.

The effects of Type of Post-test proved reliable ($F(1, 144) = 11.8$, $p < .01$) along with that of Post-test lists ($F(1, 144) = 27.7$, $p < .001$) and the interaction of these two variables ($F(1, 144) = 4.73$, $p < .05$). The more interesting finding, however, was the fact that type of post-test interacted with both post-test lists and instruction condition ($F(3, 144) = 3.16$, $p < .05$). Evidently for most children, recall from Related lists was superior to that found with Unrelated lists especially on the first post-test; however, by the second post-test, this difference in the amount recalled from Related and Unrelated lists was considerably reduced. This finding was particularly true for children given Semantic strategy training. Children from the Semantic strategy conditions recalled more words from Related lists (mean = 12.8) than from Unrelated lists (mean = 8.9) on the first post-test, but by the second post-test, this difference had all but disappeared with an average of 12.5 words being recalled from Related lists and 11.6 words from Unrelated lists.

The main effect for Trials proved significant ($F(1, 144) = 243.5$, $p <$

.001) along with the interaction of Instruction condition \times Trials ($F(3, 144) = 3.75, p < .05$). This interaction was not expected as it had failed to occur during the training phase. Evidently, while all groups tended to recall more words on the second trial with both post-tests, the actual amount of this increase was not consistent across the different instruction conditions. Subsequent Tukey HSD tests indicated that children taught the Semantic strategy showed a greater increase in the number of words recalled on the second trial with each post-test (mean increase = 3.6) than did those given instructions with the Relational strategy (mean increase = 2.9), Elaborative strategy (mean increase = 2.6), or standard free recall instructions (mean increase = 1.9).

The question of strategy maintenance is answered by comparing groups that received the same type of list during the training and post-test phases. Inspection of Table 4 shows that the recall performance of subjects in the Semantic, Relational, and Elaboration strategy conditions who were given Related lists in both the training and post-test phases was higher than that shown by the corresponding control group on both post-tests. Moreover, on both post-tests, subjects in all three strategy training conditions who received Unrelated word lists during both training and post-test phases recalled more words than did the corresponding control group. Additional evidence for strategy maintenance was the nonsignificant Instruction \times Post-test list interaction ($F = 1.3$) indicating that the beneficial effect of instructions with the Semantic, Relational, and Elaborative strategies did not diminish over the 1-week delay.

Evidence for generalization of the different mnemonic strategies to new materials can be observed by examining the performance of subjects given post-test lists which are different from those experienced during training. However, the data from the first post-test are probably not the best index for evaluating the amount of generalization of each mnemonic strategy from one type of material to another. Since the first post-test occurred immediately after the last training trial of the second session, this post-test is subject to the same factors responsible for the decline in recall and organization observed in all groups on the second training list during the 1st day of training. As was the case with the second training list, performance on post-test 1 was probably affected in a negative direction by factors such as subject fatigue and reduced motivation. These same factors would not be operating 1 week later and therefore, the data from the second post-test is probably more valuable when making inferences about strategy transfer or generalization.

To determine the amount of generalization for any given mnemonic strategy, we compare recall in the shift groups (i.e., groups trained on one type of list during training and tested on a different type of list during post-test) using a particular strategy to the corresponding control groups. For example, when the two Semantic shift groups are compared with

the two corresponding control groups, we can observe the amount of generalization shown by the Semantic strategy. While the group given Semantic strategy training on Unrelated lists and tested on Related lists showed approximately 26% positive transfer on the delayed post-test, the Semantic strategy group trained on Related lists and tested on Unrelated lists showed about 43% transfer. This seems to be evidence that the Semantic strategy does, indeed, generalize to novel stimuli. However, this generalization does not appear to be symmetrical since the group trained on Related lists showed greater generalization than did the group trained on Unrelated lists. A similar asymmetry in generalization occurs with children instructed in the Elaborative strategy but is absent in those taught the Relational strategy. That is, the Elaborative strategy group trained on Unrelated lists and tested on Related lists showed about 10% transfer, while the Elaborative group given Related training lists and Unrelated post-tests showed about 23% positive transfer. In contrast, both shift groups in the Relational strategy condition showed similar levels of positive transfer regardless of the type of training list they had experienced earlier. The Relational strategy group trained on Unrelated lists and tested on Related lists showed 24% transfer, and those trained on Related lists and tested on Unrelated lists showed 25% transfer.

Category clustering. The clustering scores for those groups given Related post-tests were submitted to an analysis of variance with instruction condition, type of training list, type of post-test list, post-test lists, and trials as factors. The outcome of this analysis revealed significant effects for Instruction condition ($F(3, 72) = 9.9, p < .01$), Post-test lists ($F(1, 72) = 5.18, p < .05$), Trials ($F(1, 72) = 9.6, p < .01$), as well as the interaction of Instruction condition \times Post-test lists ($F(3, 72) = 3.15, p < .05$). The clustering data exhibited by those groups given Related post-test lists are shown in Table 5 according to instruction condition and type of training list they received.

Overall, children trained with the Relational strategy showed the highest levels of clustering during recall (mean $Z = 2.37$), followed by children receiving Semantic strategy instructions (mean $Z = 2.26$), Elaborative strategy instruction (mean $Z = 1.91$), and No-training (mean $Z = 1.13$), in that order. As can be seen by inspecting Table 5, there was a tendency for clustering to be greater on the first post-test than the second one; however, this reduction in category clustering across post-tests was not consistent for all instruction conditions. Except for children receiving the Relational strategy instructions, there was a general reduction in organization across the two post-tests. It should be noted that the levels of clustering for all three mnemonic strategy training conditions are significantly above chance on both post-tests. This is in contrast to that found with the No-training control group which showed levels of clustering on both post-tests at chance level.

TABLE 5
MEAN Z SCORES ON RELATED POST-TEST LISTS ACCORDING TO TYPE OF TRAINING LIST AND STRATEGY CONDITION

Training condition/strategy	Post-test		\bar{X}
	1	2	
Related lists			
Semantic	2.96	2.29	2.63
Relational	2.85	2.34	2.59
Elaborative	1.95	1.86	1.90
No-strategy	1.19	0.96	1.08
Unrelated lists			
Semantic	2.51	1.30	1.91
Relational	1.75	2.56	2.15
Elaborative	1.93	1.89	1.92
No-strategy	1.42	0.95	1.19

Subjective organization. Subjective organization scores for each instruction condition are summarized in Table 6 according to type of training and post-test list. An analysis of variance was computed on the ITR scores from the post-test data. In general, the results from this analysis were consistent with those previously found with the recall and clustering analyses. As can be seen in Table 6, the significant effect for instruction condition ($F(3, 144) = 19.2, p < .001$) reflects the superior levels of SO shown by the Semantic (mean = .41), Relational (mean = .40), and Elaborative (mean = .40) strategy conditions over that of the No-training controls (mean = .22) on both post-tests. Subsequent planned comparisons indicated that all three strategy instruction conditions produced significantly higher levels of SO at recall than did the control condition. This advantage was maintained across both post-tests as shown in the nonsignificant Instruction condition \times Post-test list interaction.

DISCUSSION

In general, the pattern of results from the present experiment both replicates and extends the findings of our previous studies. First, it is clear from the training and post-test data that children instructed in the use of the Semantic strategy showed significantly greater recall and organization at recall than did children given standard free recall instructions prior to each list. The Semantic strategy groups showed enhanced performance on all dependent measures from the very first trial on the initial training list through to the conclusion of all of the training trials. Furthermore, the superior performance of the Semantic strategy groups was relatively stable over time in that even after a 1-week interval following the training period, all of the Semantic groups were performing higher on all dependent measures than the No-training controls.

TABLE 6
MEAN ITR SCORES ACCORDING TO EXPERIMENTAL GROUP, STRATEGY CONDITION,
AND POST-TEST

Strategy	Post-test		\bar{X}
	1	2	
Related-Related Condition			
Semantic	.45	.43	.44
Relational	.51	.45	.48
Elaborative	.41	.45	.43
No-strategy	.26	.27	.27
Unrelated-Related Condition			
Semantic	.52	.40	.46
Relational	.40	.43	.42
Elaborative	.45	.44	.45
No-strategy	.20	.22	.21
Related-Unrelated Condition			
Semantic	.29	.42	.36
Relational	.35	.37	.36
Elaborative	.28	.45	.37
No-strategy	.23	.22	.22
Unrelated-Unrelated Condition			
Semantic	.43	.37	.40
Relational	.44	.54	.49
Elaborative	.31	.40	.36
No-strategy	.16	.20	.18

The primary purpose of the present study was to isolate the elements of the multifaceted Semantic strategy and determine if only certain individual elements were responsible for the enhanced recall an organizational performance shown by children instructed with this mediational strategy. It is clear from the training list data that young children given instructions which directed their attention toward the relational information in each list recalled at virtually the same level as did children given the complete Semantic strategy training package. In contrast, Elaborative strategy instructions which served to direct the subject's attention to the semantic features of individual items led to levels of recall and organization that were no better than those found following standard free recall instructions. Taken together, these findings appear to indicate that instructions to engage in "semantic" types of mnemonic strategies will be beneficial in improving recall in children of this age to the degree that they capitalize on the processing of relational or organizational information. Furthermore, the beneficial effects of instructions to process relational information occurred regardless of whether or not the to-be-remembered lists possessed a clearly defined categorical structure. Subjects attending to the between-

item relational information in lists of essentially unrelated items recalled more words than did subjects attending to the semantic features of items from conceptually related lists. It would appear that organization is a more effective mnemonic activity for improving recall in young children than is engaging in additional semantic elaboration of individual list items.

The overall pattern of results from the present experiment is consistent with the findings of several recent studies. Using elementary school children, Ghatala and Levin (1982) examined the effect of two types of semantic orienting instructions in improving recall in an incidental learning task. With lists of conceptually related pictures or words, they found that recall following instructions which directed the child's attention to list organizational properties was higher than following instructions which directed attention to the semantic characteristics of individual list items. Furthermore, recall following instructions to attend to item-specific information was no better than following intentional learning instructions. The findings from the present experiment indicating (1) that Elaborative strategy instructions are less effective than Relational strategy instructions at improving recall, and (2) that Elaborative strategy instructions led to levels of recall which are comparable to that found following standard free recall instructions, are consistent with Ghatala and Levin's results. Using adults in tasks involving intentional learning processes, Bellezza, Cheesman, and Reddy (1977) have clearly demonstrated that while both individual item and relational information are important in determining free recall performance, instructions to organize produce higher recall than do instructions to process the semantic features of individual items. The present finding that instructions to process both within-item and between-item information in a list (i.e., Semantic strategy) led to levels of recall which are virtually the same as found following Relational instructions is consistent with Bellezza et al.'s view that organization is the preeminent process. In regards to this last point, Ritchey (1980) has suggested that when sufficiently powerful between-item activations are induced, they may effectively mask or overwhelm differences in within-item elaborations.

Given the pattern of results from the present experiment, it would appear that mental representations produced by encoding relational information shared between a number of list items are more beneficial for recall than are those produced by encoding information highly characteristic to each item in the list. One possible explanation is that limitations in the young child's semantic knowledge store may prevent elaborative processing instructions from achieving their maximum benefits. The effect of a restricted knowledge base on semantic processing has recently been shown by Ghatala et al., (1980) and Lindberg (1980) using the incidental learning paradigm. In general, the results of these studies using both young and older children show large developmental increments in recall

following semantic orienting tasks but little or no developmental differences in recall following nonsemantic types of orienting tasks. Furthermore, the choice of pictures as stimulus materials may have limited the beneficial effects of instruction with the Elaborative strategy. Ghatala and Levin (1981) have shown that item-specific semantic processing instructions are more beneficial in improving young children's recall if words, rather than pictures, are used as stimulus items.

Evidence of maintenance and generalization of a mnemonic strategy are two important evaluative criteria for judging the success of any strategy training program. The findings of the present experiment indicate that children as young as 7 years of age can be taught to use organizational strategies to improve recall and that they will retain these mediational strategies over time and will generalize their use to novel situations. The amount of positive transfer of the Semantic and Relational strategies varied and was influenced by the type of list used in training. That is, the amount of transfer was greatest for the Semantic strategy groups, particularly when training involved the use of Related lists. Therefore, when presented with an unfamiliar post-test situation, children taught to process both the relational information and item-specific elaborative information in a list are more likely to transfer these skills than are children taught to process only the between-item relational list information. In this manner, strategies which direct attention to within-item elaborative information are not necessarily ineffective ones for improving recall.

It should be stressed that the performance on the post-tests of both the Semantic and Relational strategy subjects was considerably better than that which would have been predicted from much of the existing literature dealing with the generalization of organizational strategies (Bjorklund et al., 1977; Scribner & Cole, 1972). While Black and Rollins (1982) and Hall and Madsen (1978) were successful in training an organizational strategy to young children (first- and third-graders, respectively), which was transferred to new categorical material, it is important to note that the material used in the training and transfer phases of both studies involved categorizable word lists. In the present study, children given training in organizational strategies (i.e., Semantic and Relational conditions) with training on Related lists showed positive transfer to post-test lists composed of new categorizable items, as well as to lists composed of uncategorizable or unrelated items. Therefore, our findings indicate that young children can transfer organizational strategies to new materials which are both moderately different from those experienced in training, as well as materials which are considerably different from those used in training.

Another point of comparison with existing literature concerns the necessity for suggesting to the child at the time of training that the strategy can and should be used for other tasks. Brown, Campione, and Barclay

(1979) suggest that for generalization to occur, it is necessary that "it be made clear to the trainee that generalization is one hoped-for result." The present procedure did not indicate to the subject during training that generalization was expected or would even be tested, yet generalization did occur. However, our procedure, like those of the two other successful transfer studies (Black & Rollins, 1982; Hall & Madsen, 1978), did include an explanation of the value of employing the strategy as a means of improving retention. Flavell and Wellman (1977) argue that strategy maintenance and generalization occur once the child understands the value of the strategy for recall.

In summary, the data presented here indicated that the improvements in recall and organizational performance found in both young nonretarded children and mildly retarded children (Engle & Nagle, 1979; Engle et al., 1980) taught the Semantic strategy are due primarily to the organizational component of this multifaceted strategy. Strategies which direct attention to a list's relational information tend to produce higher recall and organizational performance than do strategies which emphasize the processing of within-item, elaborative sorts of information. Nevertheless, the combination of these two types of information processing strategies in a single instructional package produces a more generalizable, hence versatile, training program than would a program which emphasizes only the processing of organizational information.

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