Memory and the syntagmatic-paradigmatic shift: A developmental study of priming effects

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The relationship of the syntagmatic-paradigmatic shift to recall was examined in college-aged adults and young children. Forced experience (priming) with taxonomic or functional modes of categorization produced modest effects on children's recall and powerful effects on their style of recall, as measured by taxonomic and functional intrusions. No comparable effects were observed with adults, demonstrating a developmental inequivalency based on experience with different conceptual modes. Phenomena associated with the syntagmatic-paradigmatic shift are thus shown to result from differences of experience between age groups, rather than from endogenous developmental differences.

Preschool children tend to classify things in terms of their functional relations to each other. Older children and adults tend to classify things by taxonomic relations. The shift from one preferential mode of categorization to the other is called the syntagmatic-paradigmatic shift (e.g., Nelson, 1977; Smiley & Brown, 1979). If this shift results from experience with the taxonomic mode, as has been indicated by previous work (e.g., Garrison, 1980; Kreye, 1984), it should be possible to influence patterns of conceptual mode usage in reasoning and memory in the young child through the use of techniques that force experience with different modes. We focused the present study on recall, because of Garrison's (1980) finding that young children can be "primed" (trained) to cluster items by taxonomic relationships in free-recall situations, despite their tendency, when unprimed, to cluster almost exclusively by functional relationships. If the syntagmatic-paradigmatic shift results from experience with taxonomic categorization, then priming in such categorization should influence the child to recall taxonomically related items more readily than if unprimed. Moreover, the child's style of recall should be influenced by priming: Intrusions should be predominantly of a type consistent with the mode of organization that is primed. Adults, however, should be so experienced with both types of cognitive organization that experimental priming should have little or no effect on their recall performance.

EXPERIMENT 1

Method

Subjects

Sixty children attending preschools and day-care centers in the Boul-

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Procedure

Three priming conditions—control, taxonomic, and functional—were employed, with 20 subjects in each. There were three consecutive phases to the experiment: the priming task, the study task, and the recall task.

Priming. In the priming task, the subjects in the functional and taxonomic priming conditions were given 14 picture-pairing trials. In each, three line drawings of objects familiar to children 4 to 6 years of age, mounted in a line on a 41.5 × 14 cm poster board, were shown to the subjects, who were asked to name each picture. If, as infrequently happened, the subjects could not or would not name a picture, the experimenter named it for them. The subjects were then asked which two pictures were alike, or went together.

In the taxonomic priming condition, each set of pictures depicted two objects that belonged to the same taxonomic category (e.g., food, clothing, animals) and one that was not related to either of the other two (example of a three-item set: penguin, panther, crayon). The subjects were given verbal confirmation for pairing the two items from the same taxonomic class. The confirmation was in an expanded form calculated to enhance priming of the taxonomic mode and included a statement of the taxonomic relationship between the two items (e.g., "that's right, because the penguin and the panther are both animals"). If the subjects responded incorrectly, correction was given in similar expanded form ("no, the panther and the penguin go together because they are both animals").

The functional priming condition was analogous to the taxonomic priming condition. Two of the pictures in each array were related by function, and one was unrelated to either (example of a set: wristwatch, arm, sled). Verbal confirmation or disconfirmation of the subjects' choices was the same as in the taxonomic priming condition, but in the functional priming condition, it was a functional relationship that was emphasized for the subject (e.g., "that's right, because the wristwatch and the arm go together; you put the wristwatch on the arm"). For both taxonomic and functional priming, placement of the unrelated items occurred equally often in each position.

In the control condition, the subjects were presented with a connect-the-dots puzzle, which they completed with the help of the experimenter. This procedure took 10 min to complete, approximately the same amount of time that the priming procedures required.

Study. In the study task, in which the materials to be remembered were studied, 14 sets of pictures were employed. These sets had been determined in a pilot test, conducted with 20 preschoolers, to be equiva-

lently salient and familiar across conditions. Redundant confirmation of equivalent salience and memorability was provided through the use of the norms of Thorndike and Lorge (1972) and, where applicable, the norms of Paivio, Yuille, and Madigan (1968).

These sets of pictures were identical to those used in the priming task, except that the center picture, the "index," bore a taxonomic relationship to one of the others (the "taxonomic associate") and a functional relationship to the other (the "functional associate"). Examples are: foot/hand/mittens; baby/crib/bed. The positions of the associates of each category type were alternated across trials according to a selected Gellermann order (Moody & Gollin, 1972). The study task followed directly after completion of the priming task. The children were told that the experimenter had more pictures to show them and that they were to look at the pictures carefully because later the experimenter would ask the child what the pictures were. The arrays were then displayed in front of the children, one array at a time. The experimenter pointed to the index picture of each array and asked the children to name it, and then pointed to the associates, one at a time, requesting the children to name these also. If the children could not or would not name a picture, the experimenter did so. Finally, the children were told to look again at each picture while the experimenter pointed to it, in the same order. This procedure was followed for each of the 14 arrays. The index picture was pointed out first on each trial, and the left-right positions of the associates were counterbalanced with regard to category type, as was the order of pointing to them.

Recall. In the recall task, the children were tested for cued recall of the associates. Each recall trial (there were 14 of them, corresponding to the trials of the study task) consisted of the presentation, one at a time, of the appropriate index picture from the study task. The children were asked what pictures went with the picture. After the children had given an initial response, they were asked what else had gone with it. The index pictures in this task were presented in an order different from that used in the study task.

Results

The total numbers of functional and taxonomic associates recalled were significantly affected by priming [$F(2,54) = 6.16$, $p < .01$, and $F(2,54) = 6.74$, $p < .01$, respectively]. The subjects in the functional priming condition recalled more functional associates than did the subjects in the taxonomic priming condition (Student-Newman-Keuls $q = 2.85$, $p < .05$) or in the control condition (Student-Newman-Keuls $q = 1.7$, $p < .05$). The subjects in the taxonomic priming condition recalled more taxonomic associates than did the subjects in the functional priming condition (Student-Newman-Keuls $q = 1.45$, $p < .05$), although taxonomic priming was not found to be superior to control priming in this regard. Functional priming was associated with a drop in taxonomic responses below the level found under control conditions (Student-Newman-Keuls $q = .95$, $p < .05$).

Even when the children recalled one of the two possible associates, they very seldom recalled the second one. In only 15% of the trials were both associates recalled. The effect of priming on frequency and type of intrusions was significant [$F(2,54) = 5.937$, $p < .001$]. Since the pattern of intrusions was specifically predicted, the least-significant-difference test was employed. All significant differences that resulted from this test were significant at $p < .05$ or less. The number of taxonomic intrusions was significantly greater within taxonomic priming than within functional priming or control conditions, which were statistically indistinguishable. The number of func-

tional intrusions was significantly greater within functional priming than within taxonomic priming or control conditions, which were statistically indistinguishable. No significant effects of priming on the numbers of unclassified intrusions were observed. Within the functional priming condition, there were significantly more functional intrusions than taxonomic or unclassifiable ones. The difference in frequency of these last two types of intrusions was not significant. Within the taxonomic priming condition, there were significantly more taxonomic intrusions than functional ones, but the number of taxonomic intrusions was not significantly different from the number of unclassifiable ones. No significant differences were observed within the control priming condition. The difference between the number of functional intrusions within the functional priming condition and the number of taxonomic intrusions within the taxonomic priming condition was not significant. The pattern of results is displayed in Figure 1.

Discussion

It could be argued that the "recall" data discussed above were the result solely of functional priming, which could have been responsible both for elevated recall of functionally related items and for a suppression of recall of taxonomically related items. The data on intrusions, however, clearly demonstrate the effects of priming. Taxonomic priming is associated with an increase in the frequency of taxonomic intrusions to the same extent that functional priming is associated with an increase in the frequency of functional intrusions. This shows that preschool children are capable of obtaining a powerful mental set toward either taxonomic or functional categorization.

EXPERIMENT 2

To test the hypothesis that adults should be relatively immune to the effects of priming, the following experiment was performed.

Figure 1. Percentages of different types of intrusions within priming conditions.

Method

Subjects

Thirty adults were recruited through introductory psychology classes at the University of Colorado at Boulder. The mean age was 233.6 months, with a standard deviation of 9.8 months.

Procedure

The procedure was the same as that employed for Experiment 1, except that 70 sets of pictures were used in the study task and the connect-the-dots task was more complex.

Results

No significant effects of priming on recall or frequency and type of intrusions were observed. Adults recalled one associate correctly in 60% of the trials and both associates correctly in 40% of the trials.

Discussion

As anticipated, adult recall and style of recall were unaffected by priming. This demonstrates a developmental inequivalency between the effects of priming on the recall performances of young children and adults. Adult experience with both taxonomic and functional modes of organization appears to render them immune to the effects of priming, whereas the recall performance of young children, who are less experienced, is markedly influenced by the priming techniques employed.

GENERAL DISCUSSION

The syntagmatic-paradigmatic shift is demonstrated here to reflect young children's lack of experience with the use of taxonomic modes of organization, rather than endogenous developmental change. This is in accord with the results of Denney and Moulton (1976), who regarded the shift as a result of preference, and this preference in turn as a result of the young child's lack of experience with more abstract modes of categorization. It is also in accord with the data of Garrison (1980), who found that young children can be taught to cluster items by taxonomic class in free-recall situations, and with the data of Kreye (1984), who demonstrated effects of social and physical context on organization in recall. The shift is demonstrated to be, at least in large part, a result of experience with different modes of cognitive organization. This undoubtedly accounts for the wide variation (Nelson, 1977) in reported ages of acquisition of abilities to classify things taxonomically.

The effect of priming on style of recall in young children, as measured by the type and frequency of intrusions, is large. The effects on

actual recall are relatively modest. These findings may be interrelated; the intrusions generated as a result of priming may interfere with, rather than cue, the retrieval of the correct associates in young children. The limited number of instances in which both associates in a given set were recalled is probably related to phenomena associated with encoding specificity (e.g., Tulving & Thomson, 1971, 1973): A given associate may be seen by a subject as being in a special contextual relationship with the index picture, and this may interfere with recall of the other associate.

In summary, taxonomic classification of items, a relatively "abstract" mode of cognitive organization, can be made available to young children to the extent that it pervades their style of recall. This strongly suggests that the syntagmatic-paradigmatic shift, and the cognitive phenomena associated with it, results from experience and practice with different modes of organization, rather than from differences reflecting endogenous developmental processes.

REFERENCES

- DENNEY, D. R., & MOULTON, P. A. (1976). Conceptual preferences among preschool children. *Developmental Psychology*, **12**, 509-513.
- GARRISON, A. (1980). Conceptual and spatial models of representation in young children's recall. *Journal of Experimental Child Psychology*, **30**, 383-388.
- KREYE, M. (1984). Conceptual organization in the play of preschool children: Effects of meaning, context and mother-child interaction. In I. Bretherton (Ed.), *Symbolic play: The representation of social understanding*. New York: Academic Press.
- MOODY, M., & GOLLIN, E. S. (1972). Problems of control in simultaneous discrimination. *Developmental Psychology*, **6**, 416-425.
- NELSON, K. (1977). The syntagmatic-paradigmatic shift revisited: A review of research and theory. *Psychological Bulletin*, **84**, 93-116.
- PAIVIO, A., YUILLE, J., & MADIGAN, S. (1968). Concreteness, imagery, and meaningfulness values for 925 nouns. *Journal of Experimental Psychology Monographs*, **76**(1, Pt. 2).
- SMILEY, S., & BROWN, A. (1979). Conceptual preference for thematic or taxonomic relations: A nonmonotonic age trend from preschool to old age. *Journal of Experimental Child Psychology*, **28**, 249-257.
- THORNDIKE, E. L., & LORGE, I. (1972). *The teacher's word book of 30,000 words* (rev. ed). New York: Teachers College Press, Columbia University.
- TULVING, E., & THOMSON, D. (1971). Retrieval processes in recognition memory: Effect of associative context. *Journal of Experimental Psychology*, **87**, 116-124.
- TULVING, E., & THOMSON, D. (1973). Encoding specificity and retrieval processes in episodic memory. *Psychological Review*, **80**, 352-373.

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