

Children's Understanding of Cognitive Cuing: How to Manipulate Cues to Fool a Competitor

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SODIAN, BEATE, and SCHNEIDER, WOLFGANG. *Children's Understanding of Cognitive Cuing: How to Manipulate Cues to Fool a Competitor*. CHILD DEVELOPMENT, 1990, 61, 697-704. 4-6-year-old children's understanding of cognitive cuing was studied in 2 experiments using a strategic interaction paradigm. Children could fool a competitor by hiding targets in locations that were labeled with semantically weakly associated cues and help a cooperative partner by hiding them in semantically highly associated locations. Very few 4-year-olds, half the 5-year-olds, and almost all 6-year-olds appropriately chose semantically highly vs. weakly associated hiding places to make the targets easy vs. difficult to find. The second experiment showed that 4-year-olds did not strategically *manipulate* cues as sources of information, although they themselves proficiently *used* them as such in a search task. These findings are discussed with regard to research on children's developing understanding of origins of knowledge and belief and with regard to recent claims that young preschoolers possess a metacognitive understanding of cognitive cuing.

Children's developing understanding of cognitive cuing has been studied as an important aspect of metacognitive development since the 1970s (e.g., Ackerman, 1982; Beal, 1985; Fabricius & Wellman, 1983; Gordon & Flavell, 1977; Ritter, 1978; Whittaker, 1986). This study addresses the question whether preschool children understand that a cue that is related to a target object (by semantic association) can function as a source of knowledge about this target object in the absence of other (e.g., direct perceptual) evidence.

Research by DeLoache (1986) shows that in simple tests even 2-year-olds can exploit cues as sources of knowledge about the location of a hidden object. Similarly, Gordon and Flavell (1977) found that 3-year-olds had no difficulty finding targets (e.g., pictures of a doctor or a fireman) via their associates (e.g., pictures of a thermometer or a fireman's hat). However, Gordon and Flavell's (1977) study indicates that although semantically associated cues function as a source of knowledge

even in young preschoolers, they may not be understood as such: for instance, young preschoolers (3½-year-olds) did not attempt to fool a competitor by misplacing cues even if this strategy was suggested to them, and they predicted that the competitor would look for the target where they knew it was rather than next to its associate. Gordon and Flavell (1977) concluded from young children's difficulty with a series of tasks probing their understanding of cognitive cuing that 3½-year-olds possessed no understanding of how semantically associated cues help a seeker find targets, and that even 5-year-olds conceived of cuing in a behavioral manner, understanding that a target's associate will cause the seeker to search for the target at that location without understanding the effect a cue has on the seeker's belief about the target's location.

This account of the development of children's understanding of cognitive cuing has recently been challenged by Whittaker (1986)

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and Whittaker, McShane, and Dunn (1985). They found that a substantial proportion of 3-year-olds predicted that placing a high-associate cue at an inappropriate location would not help recall, and that children of this age could systematically use indirect cues to eliminate alternatives when searching for hidden objects. While the latter finding is compatible with the view that young children may be proficiently using indirect sources of information without possessing a metacognitive understanding of this process, the former finding seems to indicate some metacognitive awareness about the function of cues, even in 3-year-olds. For example, 4- and 5-year-old children know that it will be easier to relocate hidden items if they are hidden with semantically related rather than unrelated cues (Beal, 1985; Schneider & Sodian, 1988). Schneider and Sodian (1988) found that about 50% of the 4-year-olds not only judged semantically related cues to be more effective than unrelated cues but also justified this opinion by referring to the semantic relation between cue and target. Moreover, this study indicates that this knowledge is not merely a by-product of an experience with a specific memory task, and that metacognitive knowledge about the use of retrieval cues is functionally related to the strategic use of cues in preparation for future retrieval, even in 4-year-olds.

Young preschoolers' understanding of cognitive cuing may thus have been underestimated in earlier studies (e.g., Gordon & Flavell, 1977). However, the finding that 4-year-olds judge a cue that is semantically associated with the target to be more useful than one that is not does not lead to the conclusion that these children understand how cuing works. They may judge correctly on the basis of a conviction that "things that go together should be placed together" without a very clear or precise idea about why this should help remembering. That is, they may know that cues should be semantically associated with targets, and this knowledge may guide their behavior in memory tasks, but they may not understand the function of cues as origins of a person's belief about the probable location of a target.

Such an assumption about 4-year-olds' limited understanding of cognitive cuing is supported by research on children's developing understanding of the conditions that lead to knowledge in a human mind (see Wimmer, Hogrefe, & Sodian, 1988, for a review). Four-year-olds have been shown to understand that perception and verbal communication function as sources of knowledge, but they do not seem to understand that

knowledge can be acquired inferentially in the absence of direct evidence. Although young preschoolers proficiently use simple inference as a means of knowledge acquisition, children below the age of about 6 years do not seem to conceptualize inference as source of knowledge. Young preschoolers attribute ignorance to other persons who are shown to be aware of premise information from which a certain conclusion follows by simple inference (Sodian & Wimmer, 1987). If 4-year-olds do not conceptualize indirect (inferential) sources of knowledge, they may not understand the epistemic effects of cognitive cuing.

Young children's understanding of cognitive processes is hard to explore with interview techniques. A deceptive hiding task such as the one used by Gordon and Flavell (1977) seems to be better suited to study metacognitive understanding in young children. To be able to deliberately manipulate other persons' knowledge or beliefs, children have to be aware of the origins of this knowledge or beliefs. In fact, 4-year-olds, but not young 3-year-olds, are able to lead a competitor to a false belief in very simple tasks (LaFreniere, 1988; Sodian, in press). This is consistent with findings indicating that around the age of 4 years children become able to attribute false beliefs to other persons (Perner, Leekam, & Wimmer, 1987; Wimmer & Perner, 1983). Gordon and Flavell's (1977) finding that most 3½-year-olds did not lead a competitor into a false belief by misplacing cues thus does not seem surprising from the point of view of more recent research on false belief representation. It is unclear, however, whether 4-year-olds, who are able to lead others into false beliefs by very simple manipulations, would also be able to manipulate others' beliefs by operating on the semantic association between cues and targets. To do so, they should be able to understand that in the absence of other relevant information, a person's belief about a critical fact (e.g., the location of a hidden item) will be based on information that is indirectly associated with the critical fact.

The present study was designed to explore the development of this understanding in 4-6-year-old children. Children were given a task in which they could mislead a competitor by placing a target item not in the vicinity of a cue that was semantically strongly associated with it but in the vicinity of another, weakly associated, cue. To interpret the neglect of semantically associated cues as evidence for a deliberate manipulation of another person's knowledge, it has to

be ruled out, of course, that a child generally neglects the semantic relation between a cue and a target, regardless of his or her communicative intentions. This can be done by introducing a condition in which the child is instructed to help a cooperative partner find a target as easily as possible. A child who understands that in the absence of direct perceptual evidence indirect hints or cues may guide a person's search for an object should consistently choose highly associated hiding places under cooperative instructions and weakly associated ones under competitive instructions.

Experiment 1

The aim of Experiment 1 was to determine the age at which children start to deliberately manipulate the semantic relation between a cue and a target in order to supply or withhold information from another person. A hiding task was constructed in which targets could be hidden in locations that were strongly or weakly semantically associated with them (e.g., target: policeman; highly associated hiding place: house labeled with a police car; weakly associated hiding places: houses with other labels, e.g., a football). The materials for this task were taken from Schneider and Sodian (1988). To be granted with an understanding of the function of cues, children had to hide the targets in the semantically strongly associated hiding places in a cooperative interaction condition, and hide them in places that were not semantically associated with the targets in a competitive interaction condition. As one might argue that children might perform well on this task by just reacting "automatically" to the semantic association between cues and targets under cooperative instructions, and by doing "something else" under competitive instructions without an understanding of the function of cues, children were questioned after the hiding task where they thought the other person would look for the targets. If children who avoided the semantically associated places under competitive instructions understood that the competitor would mistakenly believe that the target was hidden in the highly associated location, they should be able to indicate that the competitor will not search for the target where it is in fact hidden but in the house marked by the semantically related cue.

Method

Subjects.—Forty-eight children, 26 boys and 22 girls, participated in the experiment. They were equally divided into three age groups. The 4-year-olds ranged from 47 to 57

months, with a mean age of 53 months; in the 5-year-old group the range was 60 to 71 months (mean age 66 months); and in the 6-year-old group, 72 to 79 months (mean age 75 months). All children attended kindergartens in Munich.

Materials.—Ten small wooden houses (14.0 cm long, 9.2 cm wide, and 5.0 cm high) were used. The roofs of the houses could be opened and shut like lids of boxes. Each house had a small magnetic sticker on its front side to affix the picture cue. Two identical sets of people pictures (12.0 × 7.4-cm colored drawings) were used, including a doctor, farmer, policeman, soccer player, and sailor. Ten small (4 × 4 cm) colored drawings served as picture cues; five of these were functionally related to the people pictures (syringe, tractor, police car, ball, and ship), while the other five were not directly related to the people pictures (comb, letter, key, flower, and lamp). Two hand puppets, a king and a burglar, served as partners in interaction.

Design and procedure.—Children were tested individually in a quiet room in their kindergarten. Each child received an introductory task, followed by the two true experimental tasks. Half the children in each age group received the cooperative experimental task first, while the other half started with the competitive task.

In the introductory phase, the houses did not bear the picture cues. The 10 houses were placed in front of the child in a semicircle. The five people pictures were arranged in front of the child in random order. First the child was asked to name each of the persons. Then the experimenter introduced the two hand puppets, saying that the king was a nice guy who always helped children, while the burglar was a nasty guy who teased children. The puppets were shown the people pictures, and said that they wanted to play a hiding game with the child. Then the puppets had to "go home" (they disappeared under the table). It was emphasized that they could not see what the child was doing now. The child was then told to hide each person in a house. When the child had finished, the puppets reappeared and the experimenter produced the duplicate set of people pictures in front of the puppets, saying that it was now the puppets' task to lead each person to the house where his twin brother (the term "twin" was explained if necessary) was hidden. The puppets exclaimed that this was very difficult, that they did not know where to look for the twins, and that they had to guess. Each puppet then tried to find several twins but was shown to be wrong on each occasion.

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After this introduction, the experimenter told the child that he or she was to play the game again twice, once with the king, and once with the burglar, and that this time he or she could make it very easy for the king to find the people, and very difficult for the burglar to find them. The experimenter said that for this purpose she would now put door labels onto the houses and labeled the houses with the picture cues in a predetermined random order. The child was then asked to name the objects depicted on the cues. It was pointed out that the puppets had also seen the door labels.

In the competitive condition, the experimenter then said that the child was now to play the hiding game with the burglar. The burglar went off stage, and it was emphasized that he could not see what the child was doing. The experimenter then gave the following instructions: "As the burglar is a nasty guy who teases the children, you should try to tease him, too. Do you want to tease him?" After the child had answered affirmatively, the experimenter proceeded, "You are now going to hide each person in one of the houses. Hide them so that it will be very difficult for the burglar to find them afterwards. Try to hide them so that he will not be able to find them. Now look at the houses and try to think how you can make it difficult for the burglar." Any spontaneous comments by the child were recorded, and the hiding places the child chose were noted.

After the child had hidden all the pictures, the experimenter asked the child where he or she thought the burglar would look for each of the persons. She proceeded in a predetermined order, starting with the policeman. The child was asked whether he or she still knew where she had hidden the policeman. When the child indicated a location, the experimenter looked into the house. When the child was right, she proceeded with the question where the burglar would look for the policeman. When the child was wrong, she said: "No here's not the policeman, let's look whether he is in this house," opened the house where the policeman was, and pointed it out to the child. She then asked the child, "When the burglar comes back, where will he look for the policeman? What do you think?" This procedure was repeated for each of the five people pictures.

When the competitive condition was administered last, the burglar reappeared after the questioning procedure and was allowed to search for the pictures, showing joy at

finding and disappointment at not finding the targets. When the competitive condition was first, this was not done, to avoid feedback to the child. Instead, the child was told that the burglar was busy roaming in the forest and that he therefore could not look for the people right away but that the experimenter had taken notes where the pictures were and that the burglar could therefore take his turn later. A similar excuse was made for the king when the cooperative condition came first.

In the cooperative condition, the procedure was the same as in the competitive condition, except that the child was instructed as follows: "As the king is a nice guy who helps the children, you should try to help him, too. Do you want to help him?" After the child had answered affirmatively, the experimenter proceeded, "You are now going to hide each person in one of the houses. Hide them so that it will be very easy for the king to find them afterwards. Try to hide them so that he will find them all right away. Now look at the houses and try to think how you can help the king." After the child had hidden the pictures, the experimenter questioned her about where she thought the king would look for each of the persons, in the same way as in the competitive condition.

Results and Discussion

Preliminary analyses showed neither effects of sex nor of order of presentation of the cooperative and competitive conditions on any of the dependent variables. Thus, these variables were not considered further.

Table 1 (top row) shows the number of children of each age group who, in the cooperative condition, hid at least four out of five people pictures in the location marked with the semantically related cue and, in the competitive condition, hid not more than one of the targets with a related cue. While only three out of 16 4-year-olds showed this hiding pattern, 15 out of 16 6-year-olds did so. The number of children who showed this response pattern (compared to all other children) increased significantly with age, $\chi^2(2, N = 48) = 18.29, p < .001$. Three 4-year-olds, seven 5-year-olds, and 12 6-year-olds showed perfect performance, that is, hid all five pictures with their related cues in the cooperative condition, and none in the competitive condition. Of those children who showed the correct hiding pattern, that is, who appropriately distinguished between cooperative and competitive conditions, one 4-year-old, five 5-year-olds, and 11 6-year-olds indicated the house with the related cue in response to at least four out of five of the questions where

TABLE 1
 FREQUENCY OF HIDING PATTERNS IN EXPERIMENT 1

HIDING PATTERN	AGE		
	4	5	6
Cue use in cooperative condition only ($\geq 4, \leq 1$).....	3	8	15
Cue use in neither condition ($\leq 1, \leq 1$)	7	7	0
Cue use in both conditions ($\geq 4, \geq 2$)	4	0	1
More cues used in competitive than in cooperative condition ($\leq 1, \geq 2$).....	2	1	0

Note.—The numbers in parentheses refer to the number of targets hidden in locations marked by semantically related cues (max = 5) in the cooperative and the competitive condition (e.g., $\geq 4, \leq 1$ means that 4 or 5 targets were hidden with related cues in the cooperative condition and 0 or 1 in the competitive condition).

the burglar would look for the target, that is, they correctly represented the burglar's false belief about the location of the targets. In contrast, only two of the 17 children who hid not more than one people picture with its related cue in the cooperative condition answered at least four of the questions where the king would look for the target correctly, that is, understood that the king held a false belief about the location of the targets.

Table 1 also shows the hiding patterns displayed by the remaining subjects. The majority of the 4- and 5-year-olds neglected the semantic relation between cue and target in both conditions, that is, they used not more than one semantically associated hiding place in either condition. Twenty-five percent of the 4-year-olds showed the opposite pattern, that is, they hid the targets with their related cues under both cooperative and competitive instructions. Only three 4-year-olds and three 5-year-olds chose identical hiding places in both conditions, indicating that they may not have attended to the instructions.

Children's spontaneous comments and observations by the experimenter indicated that many of those children who did not vary the hiding places along the dimension of semantic relatedness between cue and target chose some other "strategy" to make it "hard" for the competitor. Some 4- and 5-year-olds seemed to think that the targets would be harder to find if they were placed in the houses that were spatially most distant from their own standpoint. Five 4-year-olds and three 5-year-olds put the pictures face down into the houses in the competitive condition, sometimes explicitly saying that this would prevent the burglar from seeing the person when he opened the lid.

Experiment 1 showed a clear developmental trend between the ages of 4 and 6 years in the use of cues to deliberately manip-

ulate another person's belief about the location of a hidden item. Almost all 6-year-olds, but very few 4-year-olds, used the semantic relation between cues and targets to supply information to a cooperative partner and to withhold it from a competitor. In the 6-year-old group, the majority of the children clearly indicated that they understood that the competitor would use the cues as a source of information on the location of the target and would thus search in the wrong locations. These results are consistent with earlier findings indicating that around the age of 6 years children begin to understand that in the absence of direct perceptual or communicative evidence indirect hints or cues may function as sources of information.

Most 4-year-olds and about half of the 5-year-olds did not seem to realize that the partner's chance to find the targets in the absence of any direct perceptual or communicative evidence depended on the placement of the targets relative to the picture cues, although the majority tried to respond to the instructions mostly by making it physically or perceptually "harder" for the competitor than for the cooperator to find the targets. Five-year-olds' performance on the present task was worse than the results reported by Gordon and Flavell (1977) would lead one to expect. However, in Gordon and Flavell's task, children were asked to fool the other person only after the experimenter had demonstrated the misplacement of cues and its effects. This may have helped some 5-year-olds who may not have spontaneously come up with a misplacement strategy. The present findings suggest that, as indicated by studies on children's understanding of sources of information, young preschoolers understand direct perceptual evidence as a source of knowledge but do not understand that knowledge can be acquired through indirect (inferential) sources as well.

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However, most of the 4- and 5-year-old children who did not manipulate the hiding places along the dimension of semantic relatedness between cue and target neglected this relationship in both conditions. That is, they did *not* use the cues to lead the cooperative partner to the location where the target was hidden. Although the instructions were designed to focus children's attention on the cues, it cannot be ruled out that these children simply did not attend to the cues at all or that they failed to associate the cues with the semantically related targets. Thus, the particular cues used in this experiment may not have functioned as sources of information in some of the younger children. Whether or not cues function as sources of information on the location of a hidden item in a subject can easily be tested in a task where the subject herself has to search for the targets in the absence of other evidence on their location. If it can be shown that young children use cues when searching for the targets themselves but neglect them when hiding the targets strategically, it can be concluded that cues function as a source of knowledge in young children but are not understood as such. For this purpose, Experiment 2 was conducted.

Experiment 2

Experiment 2 was designed to replicate the results obtained in Experiment 1 for young preschoolers under conditions controlling for children's ability to use cues as sources of information when searching for hidden objects. The same hiding task was employed as in Experiment 1. In addition, children were given a search task, employing the same materials as in the hiding task to test their ability to exploit the cues to find hidden targets. The search task was always presented first to ensure that a neglect of cues in the hiding task could not be attributed to the fact that the cues had at first escaped children's attention.

Method

Subjects—Twenty-four children, 10 boys and 14 girls aged 4-0 to 5-0 (mean age 4-6), participated in Experiment 2. None of these children had participated in Experiment 1. The same materials were used as in Experiment 1.

Procedure—Children were first introduced to the people pictures in the same way as in Experiment 1. Then the door labels which were fixed to the houses were pointed out to the child and he or she was asked to name each of the objects depicted on the

labels. The experimenter did not draw the child's attention to the relation between cues and targets. After this introduction, the experimenter handed the child the pictures of the "twins" and said that she now wanted to see how good the child was at finding the people when they were hidden in the houses. She said that she would "bring each person home" while the child was waiting outside with the twins. She then sent the child outside and hid each person in the appropriate house. Then the child was called back and told to lead each of his or her persons to the house in which their twin was hidden. After the search task was completed, the puppets were introduced and the hiding task was administered in the same way as in Experiment 1, except that the hiding procedure was not followed by the belief-questioning procedure. Half the children received the cooperative condition first, and the other half started with the competitive condition.

Results and Discussion

Nineteen out of 24 children correctly searched for at least four out of five targets in the houses marked with the semantically related cues. Only five of these children performed correctly on the hiding task, where correct performance was defined as at least four pictures hidden with their related cue in the cooperative, and not more than one picture hidden with its related cue in the competitive condition. Four of the five children who failed the search task failed the hiding task as well. Thus, five children performed correctly on both search and hiding, four failed both tasks, one child failed search and was correct on hiding, while 14 showed the reverse pattern. Hiding was significantly more difficult than search, McNemar's test, $\chi^2(1, N = 24) = 9.6, p < .01$.

The children who failed the hiding task were equally distributed between two hiding patterns: six children used at least four semantically associated hiding places in both conditions, and six children used none or one of these locations in both conditions. The remaining two children used three related cues in the cooperative, and two or one, in the competitive condition. Only four of those children who did not show the correct hiding pattern used exactly the same hiding places in both conditions. Several children tried to solve the task by using perception-bound strategies: seven children suggested leaving the lids open for the cooperative partner; when the experimenter said that this was not possible, four children insisted on leaving those lids open where the targets were not

hidden and shutting *all* houses for the competitive partner. Four children put the pictures face down into the houses in the competitive condition, and three children clearly used "spatial" strategies (hiding the pictures "far away").

As in Experiment 1, the majority of the 4-year-olds neglected the semantic relation between cues and targets in the hiding task in Experiment 2. They did so although they proficiently exploited the cues as a source of information when they themselves had to search for the targets. Thus, young children's failure to manipulate cues as a source of information in strategic interaction was not due to an inability to exploit them as a source of information. It is also unlikely that children's attention was not sufficiently focused on the cues in the hiding task in Experiment 2, as they attended to the cues in the preceding search task. The results of Experiment 2 therefore support the assumption that young preschoolers lack a metacognitive understanding of the function of cues in the acquisition and retrieval of knowledge.

General Discussion

The present study investigated 4–6-year-old children's use of cues to deliberately supply or withhold information from a partner in strategic interaction as an indicator of their developing understanding of cognitive cuing. The results showed a clear developmental progression over the age range under study. Few 4-year-olds but almost all 6-year-olds appropriately chose semantically highly versus weakly associated hiding places to make targets easy versus difficult to find for a cooperative versus competitive partner. Additional evidence indicated that the majority of those children who appropriately manipulated the hiding places were aware of the effects of their hiding behavior on their competitor's beliefs. The majority of the 4-year-olds failed to manipulate cues as sources of information in strategic interaction even when the hiding task immediately followed a search task in which they themselves proficiently used cues to gain information on the location of hidden targets.

These results suggest that young preschoolers lack a metacognitive awareness of cognitive cuing, in the sense that they do not understand how knowledge can be acquired or retrieved in a human mind through the activation of semantically related information. This seems to contradict recent findings that even young preschoolers understand some

basic facts about cognitive cuing and that this metacognitive understanding is related to their actual use of cuing strategies (Beal, 1985; Schneider & Sodian, 1988; Whittaker et al., 1985). While these findings imply that young preschoolers do not merely conceive of cues in a behavioral manner, as assumed by Gordon and Flavell (1977), but that they possess some knowledge of the positive effects of associated cues on cognitive performance, they are compatible with the view that these children may lack an understanding of the causal mechanisms that make cues effective. Four-year-olds may well believe that targets should be placed with associated rather than nonassociated cues, and may act according to this conviction in simple memory tasks, such as the one employed by Geis and Lange (1976) and Schneider and Sodian (1988), without an understanding of *how* cuing works.

The early development of children's metamemory concerning cuing strategies may thus proceed in two steps: in a first step, children form some commonsense ideas about cuing, for instance, that the presence of cues may be helpful in remembering, and that cues that are somehow related to a target may be more helpful than cues that are not. These ideas may be based on everyday experiences, such as the observation that making a location distinctive in a set of identical locations helps you find objects, and that putting things where they "belong" is generally better than putting them in arbitrary places. Children at this level of understanding may well be aware of positive effects (e.g., on the retrieval of lost objects) associated with cuing without understanding the mechanism that produces these effects. Only in a second step, around the age of 6 years, do children begin to understand the causal relation between the presence of a cue and the acquisition or retrieval of a certain piece of information.

From this account of metamnemonic development, one would predict that although young preschoolers may occasionally employ cuing strategies to help themselves remember, older children (i.e., young elementary school children) will on the basis of their understanding of the function of cues as sources of information employ these strategies more frequently and productively. In fact, research on the development of the strategic use of cues to aid prospective retrieval indicates that the use of cues in young preschoolers is highly dependent on situational characteristics, such as the exact placement of the cues and the strength of the semantic as-

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sociation between cue and target (Ritter, 1978; Ritter, Kaprove, Fitch, & Flavell, 1973), whereas 6-year-olds productively generate relations between targets and weakly associated cues (Schneider & Sodian, 1988).

The results of this study were predicted from research on developmental changes in children's intuitive epistemological theory between the ages of 4 and about 7 years (Wimmer et al., 1988). At the age of about 4 years, children seem to form a first "empiricist" theory of knowledge based on the fundamental insight that basic informational conditions like perception and communication function as origins of knowledge and belief. Around the age of 6 years, this theory is replaced by a more differentiated one, based on an understanding of constructive processes in knowledge acquisition. This "theory change" may be the conceptual basis for a number of changes that have been observed in children's strategic behaviors between the preschool and the elementary school years: while young children have been shown to rely primarily on perception-bound strategies like close visual inspection and specific attention to the materials to be remembered (Baker-Ward, Ornstein, & Holden, 1984), older children employ more sophisticated strategies like semantic organization that require an understanding that encoding of inferred information (e.g., of information about the relations between the items to be remembered) will facilitate a memory task. A similar interpretation has been proposed recently by Fabricius and Cavalier (1989), who studied children's explanations of strategy choice as a core aspect of their theories of memory. In our view, future research on early memory development will gain from accounting more precisely for the *conceptual* changes underlying the changes in children's memory behaviors.

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