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Very Young Children's Memory for the Location of Objects in a Large-Scale Environment

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Great progress has been made in recent years in the study of early cognitive development. This advance has come about in large part because a great deal of care and ingenuity have been invested in developing research tasks that address the competence rather than the ineptitude of young children. We are increasingly aware that two tasks that are structurally similar may give very different estimates of the developmental levels of the children observed, depending on a variety of superficial features. Stripping away nonessential features of a task, situating the task in a familiar setting, and making the task content familiar and meaningful are some of the steps that can transform a difficult task in which young children fail into an opportunity for them to display their fledgling competence. The objective of such careful task engineering is not simply to demonstrate that some ability is present earlier than has previously been shown, but to examine the precursors and rudimentary forms of the ability and the conditions of its emergence.

This paper reports research on very young children's memory for the location of hidden objects. Remembering the temporary location of objects is an important, naturally emerging ability that develops over a considerable age range (Brown & DeLoache, 1978) and is thus worthy of study in its own right. Recent naturalistic and diary studies have testified to the prominence of location in the spontaneous mnemonic activities of very young children (Ashmead & Perlmutter, 1980; Nelson & Ross, 1980), as well as in the memory demands placed upon them by their parents (Ratner, 1980).

Another motivation for studying object retrieval was to have a means of examining early signs of mnemonic regulation. Very young children are cooperative and compe-

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tent in such situations earlier than in memory tasks requiring verbal recall (Perlmutter & Myers, 1979); children who are unable or unwilling to retrieve verbal information from memory will readily retrieve objects from the environment (Brown & DeLoache, 1978; Wellman & Somerville, 1980). Since regulatory skills are more likely to be used in planning and executing tasks that subjects can comprehend and are motivated to perform (DeLoache, 1980; Shatz, 1978), such skills should be exercised relatively early in object-retrieval tasks.

We have previously reported research using a memory-for-location task that was specifically designed to tap the strength of young children’s natural memory (DeLoache & Brown, 1979). A controlled task was embedded in the familiar, natural environment from which diary accounts of impressive early memory feats have originated (e.g., Nelson & Ross, 1980). The task was a highly motivating game of hide-and-seek that the child played with a small stuffed animal. The child was told that Big Bird was going to hide and that she should remember where Big Bird was hiding in order to find him later. She then watched while the toy was concealed in some natural location in her own home (under a couch cushion, behind a door, inside a cabinet). After a prescribed delay interval, the child was allowed to retrieve her toy.

The 18- and 30-month old subjects demonstrated robust memory for the location of the hidden toy. Errorless retrievals averaged 72%, and performance was minimally affected by delay intervals ranging from 3 to 60 min. In fact, the rate of errorless retrievals was similarly high—77%—when the toy was hidden overnight. Generally high performance, ranging from 75% to 96% errorless retrievals, has been observed in several other studies using the hide-and-seek task with very young children (DeLoache & Brown, in press, Note 1). This research has thus provided a demonstration under controlled conditions of memory performance by very young children that approaches the impressive accounts of natural memory observed less formally (Nelson & Ross, 1980).

These data also suggest considerably better performance in the hide-and-seek task than that reported in previous research on young children’s memory for the location of hidden objects, most of which has used the standard delayed-response task introduced by Hunter (1913, 1917). In that basic task, an object is concealed in one of a set of containers, and after a delay interval (usually 25 sec), the subject attempts to retrieve the object. When no special cues are explicitly provided (i.e., when the relative spatial positions of a set of identical containers constitute the only cues to the location of a hidden object), the performance of 2-year-olds has generally been around 50% or lower (Blair, Perlmutter, & Myers, 1978; Daehler, Bukatto, Benson, & Myers, 1976; Horn & Myers, 1978; Perlmutter, Hazen, Mitchell, Grady, Cavanaugh, & Flook, 1981). This is in contrast to the rates of 72%-96% errorless retrievals observed in the hide-and-seek studies (DeLoache & Brown, 1979, in press, Note 1).

It is possible to elevate performance in the delayed-response task by providing additional cues to the correct location, although the younger the subject, the less likely they are to capitalize on available information. For example, pictures of familiar objects placed on top of the containers facilitate retrieval efforts of 3-year-old children, but the results for younger children are mixed, with some negative (Horn & Myers, 1978; Loughlin & Daehler, 1973) and some positive findings (Blair et al., 1978; Perlmutter et al., 1981).

Most of our previous information about very young children’s ability to retrieve hidden objects comes from these and other delayed-response studies where the object is hidden in one of a set of small containers, with or without distinctive visual cues such as pictures. The data from the hide-and-seek studies suggest that performance is better when young children are required to remember the location of an object hidden in a large-scale environment. Since comparison across studies is always dubious, it seemed worthwhile to compare directly the hide-and-seek and standard delayed-response tasks. Accordingly, in Experiment 1 a within-subjects design was used to compare performance in the two tasks. Each task was carried out following standard procedures previously reported for that task (with respect to number of trials given, types of objects hidden, etc.), with the exceptions that the long delay intervals used in the hide-and-seek task were used for both tasks and both tasks were conducted in the subjects’ homes. Although the delayed-response studies have typically been confined to the laboratory, one would expect that the home setting would, if anything, increase performance in the delayed-response condition (Acredolo, 1979). To make a conservative comparison, the delayed-response task in-
volved picture cues added to the spatial information available in the fixed relative positions of the boxes.

**Experiment 1**

**Method**

**Subjects.**—The within-subjects comparison of the hide-and-seek and delayed-response tasks was carried out with 16 children between 22 and 29 months of age ($\bar{x} = 26$ months), nine boys and seven girls. Half of the subjects were randomly assigned to receive one task first and half the other. An additional group of eight children ($\bar{x} = 26$ months) received pretraining with the delayed-response task, and they were tested on only that task.

**Materials.**—A stuffed animal approximately 22.5 cm high (Big Bird, Mickey Mouse) was used as the hidden object in the hide-and-seek task. Four plain metal boxes (11.5 cm $\times$ 16.5 cm $\times$ 10 cm) with color photographs mounted on their lids served as hiding locations in the delayed-response task. Two different sets of photographs familiar to young children were used: (1) car, banana, teddy bear, and couch; (2) truck, apple, toy dog, and chair. One of the following eight unrelated small toys was hidden on each trial: keys, box of crayons, toy watch, cup, toy phone, sunglasses, doll, scissors.

**Procedure.**—As in the previous hide-and-seek research (DeLoache & Brown, 1979), the stuffed toy and a set of instructions were delivered to the subjects’ parents, who were asked to introduce the hide-and-seek game to their own children before our observations were made. This was done to ensure that all children fully understood the task before being tested, since a common problem in interpreting data from such young subjects is uncertainty as to whether they understood what they were meant to do or, if they did understand, whether they were motivated to do it (Gelman, 1978). The mean extent of such pre-exposure across studies was 9.9 trials over 3.8 days. (This pre-exposure has proved not to be necessary; the performance of subjects in subsequent studies [DeLoache & Brown, Note 1] with no pre-exposure was the same as that of children who were familiarized with the task.)

On each trial of the hide-and-seek task, the experimenter, accompanied by the child, hid the toy in a natural location in a single room of the child’s home. The set of potential hiding locations depended on the particular house, but included all places that could afford complete concealment of the toy, such as under couch or chair cushions, under pillows, behind doors or pieces of furniture, and so forth. The pre-exposure had introduced the subjects to a variety of such hiding places. One practice trial was followed by four scored trials.

For the delayed-response task, one set of four boxes with picture cues was arranged in a semicircle approximately 25 cm apart on the floor in the child’s home. The experimenter and the child sat in front of the array, and the experimenter asked the child to name the pictures. Any labels that the child failed to produce correctly were supplied. Following a practice trial, eight trials were given (four trials on each of two consecutive days).1 On each trial, a different small toy was hidden in one of the four boxes. The toy was hidden with each picture once, and each spatial position was used twice (once in each block of four trials). Subjects were randomly assigned to one of two orders of hiding locations.

In both tasks, the experimenter always called the child’s attention to the act of hiding (“Look, he’s hiding here”), but the hiding places and picture cues were never named. After the toy was hidden, a timer was set for a specified interval; the child was told that when the bell rang, she could get the toy. During the delay interval, the subject and experimenter played together. In the hide-and-seek game, they played in a different part of the room; in the delayed-response task, the child was oriented away from the boxes. When the timer signaled the end of the delay interval, the child was encouraged to get the toy. If she made an error, she was permitted to search other locations.

Since previous research had found no effect of delay interval on performance in the hide-and-seek task, 5-min intervals were used for all those trials. However, since the effect of longer delays was not known for the standard delayed-response task, both 3- and 5-min intervals were used for it. Any bias of

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1 Although only four trials were given in the hide-and-seek task, each subject experienced eight trials of the delayed-response task. This was done to make the tasks comparable to the existing studies in the literature. Performance in the delayed-response task increased slightly, but not significantly, over trials. Thus, the only bias of the differing number of trials was some attenuation of the task difference in favor of the delayed-response task.
the different trial lengths could only operate in favor of the delayed-response task. Practice trials had 1-min delays.

Delayed response—pretraining.—The pre-exposure that had been incorporated into the hide-and-seek game might contribute to the apparent superiority of that task. To ensure that any task difference observed was not simply due to this factor, a control group of eight children was given pretraining in the delayed-response task to see if their performance would be better than that of subjects with no pre-exposure. Each child was given eight practice trials by her mother (following our instructions) before being tested.

Results and Discussion

The general level of performance in the hide-and-seek task was 89%, very close to the figure of 81% errorless retrievals reported by DeLoache and Brown (1979) for subjects of the same age (26 months). The level of errorless retrievals in the delayed-response task was 68%, significantly above chance and remarkably close to the figures of 66% and 62% reported for a similar picture-cue task by Blair et al. (1978) and Perlmutter et al. (1981). The task difference was significant, \(F(1,14) = 9.51, p < .01\), according to a 2 (task: hide-and-seeking, delayed response) \(\times\) 2 (order of tasks) within-subjects analysis of variance performed on the arcsine transformed proportions of errorless retrievals. No other effects in that analysis were significant. Individual response patterns conformed to the mean task difference: of the 13 subjects who had any difference in performance in the two tasks, 11 did better in the hide-and-seek than in the delayed-response task, \(p < .01\) (Wilcoxon signed-ranks test).

The young children in this study clearly performed better in the hide-and-seek than in the delayed-response task. While the difference between them was highly significant, it was probably an underestimation due to a ceiling effect: 10 of the 16 subjects had 100% errorless retrievals in the hide-and-seek part, while only two perfect scores were achieved in the delayed-response task. Thus, Experiment 1 confirmed that very young children show better memory for the location of objects concealed within the natural, large-scale environment than in small containers with arbitrary picture cues.

A 4 (trial blocks) \(\times\) 2 (delay interval: 3 or 5 min) within-subjects analysis of only the delayed-response data produced no significant effects. The mean number of errorless retrievals at the 3- and 5-min intervals were 2.8 and 2.5, respectively. Thus, performance in the delayed-response task is quite constant across intervals, ranging from the 25-sec intervals employed in other studies to the 3- and 5-min intervals used here.

The final analysis evaluated the effect of pretraining in the delayed-response task. Test performance was compared for the eight subjects who were pretrained and the eight subjects from the task-comparison group who had received the delayed-response task first. Thus, the two groups had identical experience with the delayed-response task except for whether or not they had been pretrained on it. The difference between the groups was small and not significant, with 58% for the pretrained and 63% for the nontrained subjects. As mentioned earlier, we have found this same insensitivity to extra experience for the hide-and-seek game: performance is the same regardless of whether the parents introduce the game ahead of time or not.

The general picture that emerges of very young children’s memory for the location of a hidden object is that it is quite robust. Performance is especially good when the memory task is embedded in the natural environment. Indeed, a sizable proportion of the subjects achieve perfect scores, a rare phenomenon for any type of research with 2-year-old and younger children. Memory is fairly resistant to decay over time, with little or no decline in performance in the delayed-response task with intervals from 25 sec to 5 min, and similarly persistent in the hide-and-seek task with intervals up to several hours long. In both tasks, memory performance is apparently unaffected by the degree of experience the subject has with

\*\*The level of errorless retrievals reported in Experiment 1 for the delayed-response task, which was conducted in the subjects’ homes, is extremely close to the levels reported by Blair et al. (1978) and Perlmutter et al. (1981), who observed their subjects in the laboratory. This correspondence in results attests to the stability of performance in the delayed-response task and suggests that the setting or environment in which the task is conducted has minimal effect on performance.
the task. Given that this type of memory task is well within the general competence of very young children and is comprehensible and motivating to them, it would seem to be an excellent domain in which to look for evidence of very early forms of mnemonic regulation. Experiment 2 does so.

Experiment 2

We have established that 1½- to 2½-year-old children are highly capable of retrieving an object hidden in the natural environment, but we have not addressed the question of what it is about that situation that might facilitate remembering. Why is it easier to remember that the toy was hidden under the couch than that it was hidden in the box with a picture of a couch on its lid?

A review of the delayed-response literature suggests a possible explanation. A focus of much of that research has been the types of cues young children are capable of or prefer using to remember location, and particular interest has centered on the role of picture cues. Evidence has been adduced for a developmental trend in young children's use of unrelated picture cues, shown especially clearly in an experiment by Horn and Myers (1978). Adding picture cues to spatial position cues (by putting pictures on top of stationary containers used to hide an object) improved the memory performance of 3-year-old, but not 25-month-old, children. When picture and spatial cues were made to conflict with each other (by rearranging the position of the containers), the 2-year-olds searched the previously correct, but now irrelevant, position, ignoring the picture cues, while the 3-year-old subjects used the relevant pictures to locate the hidden object. At what age children begin using unrelated picture cues is not clear, although Perlmutter and her colleagues (Blair et al., 1978; Perlmutter et al., 1981) have found positive evidence with 27-month-old subjects. The increasingly effective use of picture cues between 2 and 3 years of age has generally been interpreted as evidence for a shift from a reliance on location information to a reliance on or preference for pictorial information (Babůška, 1965; Horn & Myers, 1978).

Another interpretation of these data is possible, however, and is suggested by the fact that even children younger than 2 years of age perform extremely well in the hide-and-seek task (DeLoache & Brown, in press, Note 1). When an object is hidden in a natural location, as in the hide-and-seek game, there is distinctive information available that is intrinsic to the hiding place itself. In contrast, when the hiding place is a box with a picture on top of it, there is no inherent or nonarbitrary relation between that particular picture and that particular box. For such a cue to be a useful guide to retrieval, the subject must notice its association with the relevant hiding place.

Two delayed-response studies are directly pertinent to this point. Daehler et al. (1976) found that the performance of 18- and 24-month-old children was significantly improved when the boxes used as hiding locations differed in size, an intrinsic property of the boxes. Note that the available evidence indicates that such young children would not be aided by unrelated picture cues. Ratner and Myers (1980) reported the only study in the delayed-response literature in which children as young as 24 months have profited from picture cues. In this case, the pictures matched the hidden object (e.g., a toy boat was hidden with a picture of a boat). Thus, the association between the picture and object was preexisting and nonarbitrary.

We are thus suggesting that when a visual cue bears some inherent and/or prior relation to the hidden object or to its location, even children of 24 months and younger improve their recall. When a cue is only arbitrarily and temporarily related to the correct location, so that the subject must associate the potential cue with the location it designates, such young children do not profit from it. According to this view, the increasing reliance on picture cues is not due to an increasing preference for pictorial information per se, but rather it reflects a more general development of the ability to integrate unrelated information in the service of memory.

Experiment 2 was designed to explore this hypothesis. If we are correct that the developmental increase in the use of picture cues in delayed-response studies reflects a general increasing ability to exploit available cue information, then the same pattern should hold for other potential cues. Thus, we would predict that very young children's memory for the location of a hidden object will be extremely good when the distinctive cue information is intrinsic to the hiding place (as in the hide-and-seek task); but when the available information is not inherently linked to the relevant location, developmental differences should appear.

Accordingly, in this study we varied the type of cue information that was available.
One condition duplicated the hide-and-seek game from Experiment 1, with the toy hidden in a piece of furniture. A second condition was a standard delayed-response task (as in Experiment 1, but without picture cues): the toy was placed inside one of four small boxes arranged in the center of the room. The third condition was the crucial one: the toy was hidden in one of four small boxes, and each of the boxes was placed on or near a different piece of furniture. Thus, the furniture was a potential cue, a landmark denoting the correct box. However, this cue would be available only to a subject who associated the box with its nearby landmark. Notice that the relevant cue information was the same in both the first and third conditions; what differed was whether the subject merely had to notice the item of furniture itself or had to recognize its relation to the baited box (i.e., notice that the toy was hidden in the armchair vs. that the box in which the toy was hidden was the one on the armchair). We thus expected that the older group of subjects would do significantly better in the landmark condition than the younger ones would.

Method

Subjects.—A new sample of 18 children (8 girls, 10 boys) comprised a younger group of nine children between 18 and 22 months of age ($\bar{X} = 21$ months) and an older group of nine children between 24 and 29 months ($\bar{X} = 26$ months).

Procedure.—Each subject participated in three experimental conditions differing in the nature of the locations used to conceal a small stuffed animal (Big Bird, Mickey Mouse). In the natural condition, the toy was hidden in natural locations in the home, as described for the hide-and-seek task in Experiment 1. In both of the other two conditions, the hiding place was always in one of four plain metal boxes (the same boxes used in Experiment 1, but without the pictures). In the no-landmark condition, the four boxes were arranged in the middle of the room, roughly in a rectangular configuration. The third condition, landmark, was a combination of the other two: the four boxes were placed on or in close proximity to a piece of furniture, such as might be used as a natural hiding location (e.g., a box was set on a couch or beside a chair). Thus, the nearby piece of furniture was a potential landmark associated with each box. In both the landmark and the no-landmark conditions, the four boxes remained in the same locations and were always clearly visible throughout the session. An effort was made to make the distances between the four hiding locations as comparable as possible across conditions, given the limitations of the particular room. The mean distance between hiding locations was 195 cm (range across homes = 130–252.5 cm) for the natural, 182.5 cm (110–202.5 cm) for the landmark, and 147.5 cm (95–227.5 cm) for the no-landmark conditions.

The children received the three conditions on three different, usually consecutive, days. The order of conditions was counterbalanced, so that overall they occurred equally often on each day for the two age groups. Each session began with a practice trial with a 1-min delay interval. For the natural condition practice trial, the toy was hidden in a natural location, as in the hide-and-seek game in Experiment 1, and that location was not used again on any of the four experimental trials. For the practice trial in the landmark and no-landmark conditions, the toy was hidden in a box placed in the center of the room. This was done to avoid giving the child experience with any of the four locations to be used on the experimental trials or confusing the child by moving one of the set of boxes after they had been put in place. Following the practice trial, the child accompanied the experimenter and watched while she positioned the four boxes.

Each subject then received four test trials with 5-min intervals, with each trial consisting of hiding the toy in either a natural location or in one of the boxes. On each trial the child accompanied the experimenter to the hiding location and watched while she hid the toy. The experimenter explicitly called the child's attention to the hiding, saying, "Look, I'm hiding him here," but she never named the hiding places or landmarks. In the landmark and no-landmark conditions, each box served as the hiding place one time. During the delay interval, the subject played with the experimenter and her mother in another part of the room away from the hiding area. The hiding locations were thus potentially within the child's view during the interval. When the bell rang, the child was encouraged to go from the waiting area to find the hidden toy. If the subject searched the wrong location, she was allowed to search other locations for the toy.

Results

Preliminary analyses indicated no effects due to sex of subject, order of conditions, or day of testing. A $2 \times 3$ (con-
dition: natural, landmark, no-landmark) × 2
(trial blocks: trials 1 and 2 vs. 3 and 4) mixed
analysis of variance was performed on the
number of errorless retrievals. Significant
main effects were found for condition,
F(2,32) = 5.47, p < .01, and for trial blocks,
F(1,16) = 6.71, p < .05. Performance gener-
ally declined over trials, from 72% overall in
the first block of two trials to 53% in the sec-
ond. The condition main effect was qualified
by the finding of a significant interaction of
age and condition, F(2,32) = 8.90, p < .001,
shown in Figure 1. One-way analyses of
variance revealed that the main source of the
interaction was the landmark condition. The
mean number of errorless retrievals by the
two age groups did not differ in either the
natural or the no-landmark conditions. How-
ever, in the landmark condition the older
subjects performed significantly better than
the younger ones, F(1,16) = 16.98, p < .001.

The older subjects chose the correct one
of the four boxes significantly above the
chance level of 25% in both landmark (p <
.001) and no-landmark conditions (p < .05).
The younger subjects were above chance
only in the no-landmark (p < .01) condition.
(A chance level of performance cannot be
specified for the natural condition, since
there is no set number of potential hiding
locations.)

Examination of the errors committed
lends some support to the primary analysis.
The majority (78%) of errors in all conditions
involved searching a location that had
served as the hiding place on a previous
trial, especially the immediately preceding
one. Other research has also reported this as
the most frequent category of error in
delayed-response tasks (Daehler et al., 1976;
Horn & Myers, 1978; Loughlin & Daehler,
1973; Perlmutter et al., 1981; Webb, Massar,
& Nadolny, 1972). Errors due to searching a
new location (one that had not previously
served as a hiding place) were relatively in-
frequent, but a suggestive pattern emerged.
Both the old and young subjects rarely
searched a completely new place in the natu-
ral condition, while in the no-landmark
condition approximately a fourth of their er-
rors were responses to a box that had never
been used before. In the landmark condition
the older subjects avoided searching new
locations, but the younger subjects searched
new places almost as often as they had in the
no-landmark condition. The pattern of errors
thus suggests that the older subjects be-
haved similarly in the natural and landmark
conditions, while the younger children's be-
behavior was more similar in the no-landmark
and landmark conditions. It must be stressed
that these data are only suggestive, as they
are based on a fairly small number of errors.
Because several subjects had perfect scores
in one or more conditions, the errors cannot
be statistically compared across conditions.

The error data were also examined to
consider the possibility that the younger
children's low performance in the landmark
condition was due to impulsive search ten-
dencies, such as described by Perlmutter et

![Graph](image-url)

**Fig. 1.—** Percent errorless retrievals as a function of type of hiding location
al. (1981). It is conceivable that they simply searched the first box they encountered in the landmark (and possibly also the no-landmark) conditions. This hypothesis was not supported. Neither age group showed above-chance levels of searching the first box they came to (i.e., the one[s] nearest the delay-interval play area) in either condition.

Discussion

The results of the second experiment replicate those in Experiment 1, showing substantially better retrieval when an object is hidden within the natural environment than when the hiding locations are small containers. The high level of performance in the natural condition, 75% errorless retrievals, is similar to that reported previously for the hide-and-seek task (DeLoache & Brown, 1979, in press, Note 1) and represents remarkably good memory performance by 1½- to 2-year-old children.

The results support the hypothesized age difference in memory for the location of a hidden object as a function of the type of information specifying the hiding location. In the natural condition (the standard hide-and-seek game), the toy was hidden in a natural location so the available cue information was intrinsic to the hiding place, and there were no age differences in errorless retrievals. In the landmark condition, the same visual information was available to specify the location of the object, but it was not intrinsic to the actual hiding place (the box). Here, the older subjects performed as well as they did in the natural condition, but the younger children failed to make effective use of the landmark associated with the relevant box to direct their retrieval. In the no-landmark condition (the standard delayed-response task), no distinctive visual cues were readily available, and both groups were near the 50% level of performance commonly reported for this task (e.g., Blair et al., 1978; Horn & Myers, 1978).

The pattern of results for the three conditions combined thus reveals an absence of developmental differences in remembering the location of a hidden object when (1) no supplementary cues are available or (2) distinctive cues are intrinsically associated with the hiding locations. When potential cues must be integrated with the hiding place, clear developmental differences emerge, with older children capitalizing on their presence and younger children failing to do so.

It would be possible, though by no means uncontroversial, to interpret these data as reflecting an early form of mnemonic regulation. It could be argued that the older subjects did so well in the landmark condition because they actively integrated the landmark cue with the relevant box. That is, at the time of hiding they noticed and encoded the relationship between the baited box and the nearby piece of furniture and then at retrieval used that information to direct their search. The younger subjects may have failed to encode the relationship in the first place, or they may have neglected to draw on that information for retrieval. The present data do not allow us to place the effect in either encoding or retrieval processes.

Inferential interpretations of this nature have been used to support claims of strategic intervention in older children. For example, in a recognition memory task requiring recency judgments, Brown (1975) and Brown, Campione, and Gilliard (1974) found no age differences between second- and fourth-grade subjects when no supplementary cues were available. When contextual, spatial, or color-background cues were provided, the older children outperformed the younger subjects, who failed to take advantage of the additional cues. Training the younger children to use these cues eliminated the developmental differences. This not atypical pattern of results was interpreted in terms of mnemonic strategy development. Older children strategically exploited the available cues to enhance memory, and they did so spontaneously. Younger children needed training to ensure appropriate cue use. While one may be unwilling to credit the 2-year-olds in the present study with behaving strategically, the similarity in the pattern of results found here to those that are commonly reported in the memory literature is suggestive.

One could argue that these data point to an early form of deliberate remembering, and one would expect to find such evidence, if at all, in the context of a familiar task in which the young child is both competent and confident (DeLoache, 1980). Obviously, such an interpretation should not be accepted prematurely. Additional evidence is needed, such as direct observation of deliberate actions undertaken in the service of remembering, however hard that may be to elicit from a 2-year-old. Convergent evidence of this form greatly strengthened the claims that young grade-school children were capable of strategic action, and it is certainly no less needed if one wishes to extend the claim down to much younger
learners. To date the youngest children credited with primitive strategic intervention in memory tasks have been 3-year-olds (Wellman, Ritter, & Flavell, 1975), but it is by no means impossible that still younger children actively prepare for recall under certain circumstances (DeLoache & Brown, Note 1). The exact conditions eliciting such activities deserve careful attention, as does the developmental linkage between early tentative forms of strategic action and later more robust forms (Brown, Bransford, Ferrara, & Campione, in press).

When the results of the present study are combined with the existing delayed-response literature, the following developmental progression is clear in very young children's use of available cues. By 24 months and even before, children are capable of benefiting from perceptual information that is intrinsic to the hiding location itself, such as the distinctive hiding locations used in the hide-and-seek game or differences in the size of the containers (Daehler et al., 1976). Similarly, such young subjects can utilize a matching picture cue, one that bears a preexisting, nonarbitrary relation to the hidden object (Ratner & Myers, 1980). Slightly later, young children are able to use previously unrelated information; for example, they can use a nearby landmark as a cue to the relevant location (as in the present experiment) or associate an unrelated picture with the correct box (Blair et al., 1978; Horn & Myers, 1978; Perlmutter et al., 1981). Even later, preschool children become capable of planning ahead to make sure a cue will be available in the future (Ryan, Hegion, & Flavell, 1970). Thus, the increasing reliance on picture cues in the delayed-response literature probably has more to do with children's developing ability to exploit available information than with a specific sensitivity to or preference for pictorial information.

Reference Note


References


Hunter, W. S. The delayed reaction in animals and children. Behavior Monographs, 1913, 2, 1–86.


