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Differentiating Fact from Fantasy: The Reliability of Children's Memory

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*This paper examines a set of common assumptions about children's memory. Children compared to adults are thought to notice less, omit more, forget faster, be more susceptible to suggestion, and especially to intermingle imagination and perception in remembering. These propositions are interesting from the point of view of theoretical models of memory and memory development. They also have important implications for legal practice. While children's tendency to recall less than adults is well documented, there is surprisingly little evidence for other deficits in children's memory. This paper describes a new line of research, directed at the question of whether children are worse than adults in discriminating real from imagined events in memory (*reality monitoring*). The results suggest that children may have difficulty with some, but not all, reality-monitoring situations.*

The extent to which accurate information is available in the courtroom critically depends on the ability of witnesses to remember what was said or done, and who said or did it. Based on accounts of actual testimony and early experimental studies (largely of adult memory), Munsterberg (1908) and Whipple (1909, 1912, 1913) emphasized that the vast potential for errors in memory has dangerous consequences in courtroom testimony. More recent studies and reviews have generally reflected the same concern (e.g., Buckhout, 1974; Chris-

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tiaansen, Sweeney, & Ochalek, 1983; Clifford & Hollin, 1981; Doob & Kirshenbaum, 1975; Lipton, 1977; Loftus, 1979; Marshall, 1967; Tapp, 1976; Yarmey, 1979).

Compared to adults, children are assumed to notice even less, forget faster, and, especially, to "intermingle imagination with memory" (Lipmann, 1911; Melton, 1981; Rourke, 1957; Stern, 1939; Whipple, 1909; Yarmey, 1979). There is considerable evidence that children typically recall less than adults. This in itself could reduce the value of a child as a witness. However, the extreme wariness about children's testimony reflected in legal literature and practice originates not so much from children's errors of *omission*, but rather from their presumed errors of *commission*. In particular, children are often supposed to have more trouble than adults in distinguishing real from imagined events, and to be especially susceptible to errors produced by uncritical embellishment of memory and to errors produced by suggestion. Surprisingly, there is little experimental evidence to support these assumptions.

This wariness concerning children's memory may be part of a more general attitude toward children. For example, Gelman (1978) suggested that developmental psychologists characterize children as "cognitively inept." Similarly, Skolnick (1975) pointed out that children are viewed as "incompetent humans" by both the law and developmental psychology. Since both disciplines tend to focus on the differences between children and adults, Skolnick suggested that an unfortunate consequence has emerged—we tend to overestimate the foibles of children and to underestimate the foibles of adults. In regard to memory, this would have important implications for the evaluation of children's courtroom testimony.

Do Children Have a General Memory Deficit?

In recent years, a large number of developmental studies of memory have been reported (see Brown, 1979; Brown, Bransford, Ferrara, & Campione, 1983; Chi, 1983; Mandler, 1983; Ornstein, 1978, for useful reviews). From this work it is clear that on memory tasks involving recall, children make more errors of omission than do adults. Much of this literature investigates purposeful remembering; it indicates that younger children do not deal with memory tasks in a strategic fashion (do not rehearse, generate images or other mediators, spontaneously organize, etc.). A great deal of the development of strategic skill occurs between the ages of 5 and 10 years (Brown, 1979). Another factor that affects recall is that children may not have the relevant prior knowledge that would allow them to organize disparate elements into a cohesive whole or to relate one set of events to another. Obviously, the older one is, the more opportunities one has had to acquire such knowledge, and the more opportunities for establishing the cognitive relations on which recall depends.

However, there is little evidence that children's lower recall reflects a defect in the memory system itself. In general, children may be at much less of a disadvantage the more familiar they are with the situation. If the usual knowledge advantage of adults is eliminated, so is their memory advantage over children. For example, Chi (1978) compared adults and 10-year-old children in their ability to recall chess positions. Several chess pieces from the middle of a game were displayed on a board for 10 seconds; the subject then had to set up another board to match the one presented. The children were experienced chess players; the adults were not. In this case, the children recalled more than the adults. Similarly, Lindberg (1980) found that third graders recalled a great deal more than adults when the materials they were shown were selected from the children's everyday experiences (e.g., cartoon characters, teachers, books). To the extent that children are asked to testify about activities with which they are quite familiar, we might expect their memories to be at least as good, and on occasion better, than those of adults.

As these studies indicate, the ability to produce information voluntarily depends critically on the encoding factors that operate when information is initially processed. However, the conditions of retrieval are equally important (Tulving & Thomson, 1973). Even when children and adults are encouraged to encode information in a similar fashion, adults typically recall more. This may be partly because adults are planful and sophisticated about how to go about remembering. For example, they will use their knowledge of the structure of a list to develop an efficient retrieval plan. Children, on their own, seem less able to do this. However, Kobasigawa (1974) found that 6-year-olds remembered as much as 11-year-olds when the experimenter directed the recall process by telling them not only what category the to-be-remembered items belonged to, but how many items per category they should try to recall. Thus developmental differences in recall may be substantially reduced when the remembering occurs in a highly structured situation, which implies that young children may profit especially from directive (but nonsuggestive) questioning. The problem for testimony situations is that we rarely know all the facts at the outset, so it often would not be obvious what specific questions to ask a child. On the other hand, it is important to realize that young children's memories might well be underestimated unless the situation in which the remembering occurs provides the child with external memory cues.

Also assumed in the eyewitness testimony literature is that children notice less than adults. Although developmental studies show a change with age in the salience of dimensions—e.g., for vision, from color to form; and from nonsemantic to semantic categories (Wright & Vliestra, 1975)—it is not clear that children notice less (Morrison, Holmes, & Haith, 1974; Sheingold, 1973). Actually, there is some intriguing evidence that young children sometimes notice potentially interesting things that older children and adults miss. In a study on

selective looking (Neisser, 1979), first graders, fourth graders, and adults were asked to watch a ball game on a TV screen and to press a key whenever a critical event took place. At one point, an irrelevant event occurred; a woman with an umbrella walked across the playing area and was in view for four seconds. When asked later about the woman in the film, adults had no idea that she had even appeared. However, 22% of the fourth graders and 75% of the first graders remembered seeing the woman. These findings are consistent with those showing that, as children get older, they increasingly attend to core details of action sequences portrayed in films, and increasingly ignore nonrelevant information, such as what people wore or incidental pieces of conversation (Collins, Wellman, Keniston, & Westby, 1978). However, Neisser's results also suggest that young children may sometimes be better than adults at reporting events that are irrelevant to some ongoing activity. Such "irrelevant" events, though, potentially *are* relevant in the courtroom.

Another assertion mentioned in the testimony literature is that forgetting occurs more rapidly in younger children. However, the available evidence does not seem to support the assertion. For example, the rate of loss of information in short-term memory tasks is comparable across age levels (Belmont & Butterfield, 1969). The number of studies involving long-term retention intervals is quite small, and there are even fewer developmental studies. From the evidence we do have, age does not appear to influence long-term retention (Bach & Underwood, 1970; Hasher & Thomas, 1973).

Equally striking are findings that children show little memory deficit for frequency of occurrence or temporal order of events (Brown, 1975; Hasher & Zacks, 1979). For example, Stein and Glenn (1979) reported that children as young as 6 years are quite good at remembering the temporal order of events in stories.

In addition, there appear to be few age differences in whatever acquisition and remembering processes are responsible for the recognition of familiar faces (Diamond & Carey, 1977) and simple objects (e.g., Newcombe, Rogoff, & Kagan, 1977; Nelson, 1971). On the other hand, recognition of more complex events, such as unfamiliar, disguised faces (Carey & Diamond, 1977) or complex scenes (e.g., Mandler & Robinson, 1978; Newcombe et al., 1977; Siegler, 1983), evidently requires processes that are more likely to develop with age. These processes may involve the integration of separate elements into an integrated whole and thus be much like the organizational processes necessary for recall. Such organizational activity depends on several things, most importantly a set or plan to view scenes as representative of complex events rather than accidental collections of objects, and the relevant prior knowledge that allows one to comprehend the interrelations within or the meaning of a scene. When children have the relevant prior experience, their recognition should, like their recall (Chi, 1978), surpass that of adults who do not.

Because of their presumed memory deficit (and because of their possibly greater susceptibility to demand characteristics), children are also often assumed to be more influenced by leading questions than are adults. Loftus and her colleagues have shown two important consequences of the wording of questions put to adults (Loftus, 1979). First, the wording of a question affects the answers generated by the question. Secondly, misleading information introduced in earlier questions affects the answers to later questions. Young children are also affected by leading questions (Cohen & Harnick, 1980; Dale, Loftus, & Rathburn, 1978; Loftus & Davies, 1984; Varendonck, translated in Goodman, 1984), but in at least two experiments, 5- and 6-year-olds were no more likely than college students to misremember information that had been introduced via misleading questioning (Duncan, Whitney, & Kunen, 1982; Marin, Holmes, Guth, & Kovac, 1979). At this point, the evidence for children's greater susceptibility to leading questions is not strong. It may be that children are only more susceptible than adults to leading questions about information that they typically are less likely to have available to begin with. Furthermore, insofar as distortions from leading questions reflect social factors (e.g., demand characteristics, source credibility), we need studies that focus on characteristics of questions and questioners least likely to produce compliance (Marshall, Marquis, & Oskamp, 1971; Dodd & Bradshaw, 1980), or least likely to affect children more than adults.

Do Children Have Difficulty Separating Fact From Fantasy?

The expectation that children cannot be counted on to separate fact from fantasy comes from many sources. Most of us have had direct experience of, or have heard anecdotes about, children's confusion between dreams and waking events or their apparent belief in imaginary companions. Added to these informal observations are the more systematic observations, speculations, and theories of developmental psychologists (Flavell, Flavell, & Green, 1983; Morison & Gardner, 1978; Piaget, 1929, 1959; Vygotsky, 1962; Werner, 1948). For example, Piaget (1929) suggested that children have difficulty discriminating between thoughts and the things thought of, and that they do not remember the origins of their knowledge and mistake memories of dreams for memories of waking events. Piaget also concluded that children do not reliably discriminate between "the psychical and internal [as opposed to] the material and external" until about the age of 11 or 12 years.

Werner (1948) proposed that objective reality (based on perceptual experience) and subjective events (e.g., fantasy) are clearly separated in the adult but not in the child. "In the young child . . . there is a relatively close connection between perception and imagery. This is grounded, first of all, on the fact that the real percept possesses a great deal more of the character of an image than is the case with the adult. . . . On the other hand, images are [for the child] much

more perceptual in nature, much more 'eidetic,' than with the normal adult. Because of this, small children may consider an image not as something privy to them alone, but as an objective phenomenon" (pp. 389–390). Werner further suggested that children become conscious of the distinction between reality and fantasy when they are between 6 and 8 years of age (p. 395). More recently, Flavell, Flavell, and Green (1983) speculated that children's tendency to tell "whoppers" may actually be a consequence of their failure to tag in memory the origin of events.

While many examples of children's confusion between fantasy and reality have been described by Piaget and others, there is not much evidence comparing children with adults, and we know that adults too sometimes confuse fact and fantasy (Johnson & Raye, 1981). Do children generally have more difficulty than adults in distinguishing between memories for actually experienced events and the products of their imaginations and thoughts (that is, in *reality monitoring*)? This question has received almost no direct experimental attention. Until quite recently, a comparison of memory for internally generated and externally derived information was not addressed even in the adult memory literature.

The surge of interest in the role of thought processes in memory that characterized work during the 1960s and 1970s initially tended to point out the importance of such internal processes as organization, imagery, interpretation, and comprehension for *accurate* memory of external events (e.g., Bransford & Johnson, 1973; Mandler, 1967; Paivio, 1971; Tulving, 1968). The fact that internal processes might also yield memory *products* was also recognized and investigated, via the study of errors such as intrusions in recall and false recognitions. With prose material, people often falsely recognize (e.g., Johnson, Bransford, & Solomon, 1973; Sulin & Dooling, 1974) or recall (e.g., Brewer, 1977) information that is not necessarily implied by the text. For example, subjects who had heard that "the spy threw the secret document into the fireplace just in time . . ." are likely to say later that they heard that "the spy burned the secret document" (Johnson et al., 1973). These types of studies illustrate that making associations and inferences is a natural part of processing information.

Some studies of inferential processes of children indicate no developmental trends (e.g., Brown, Smiley, Day, Townsend, & Lawton, 1977; Landis, 1982). Others find that with increases in age, there is an *increase* in the likelihood that both logical and pragmatic inferences will be made with picture sequences (Schmidt, Paris, & Stober, 1979), films (Collins et al., 1978), and prose materials (Brown, 1975; Lindauer & Paris, 1976; Paris, 1975; Schmidt & Paris, 1983; Stein, 1979). For example, cues for recall that depend on inferences are less useful with younger children (e.g., *shovel* as a cue for the sentence "The workman dug a hole in the ground."). Like the recall studies mentioned earlier, these results suggest that as they get older, people increasingly draw on relevant

knowledge in comprehending and organizing information. Furthermore, subjects show confusion between their prior knowledge and the target information (Johnson et al., 1973). However, based on available laboratory studies, children do not seem more likely than adults to make such confusions. The importation into memory of erroneous information is usually based on extensive prior knowledge or preconceptions, that children may not possess or may not make use of (Lindauer & Paris, 1976). This sometimes makes them, of course, less successful in the appropriate use of inference, but it also sometimes makes them less subject to distortions in memory introduced by unwarranted inferences or incorrect expectations.

What Do Confusions Between Fact and Fantasy Imply About Memory?

According to some investigators (Bartlett, 1932; Dooling & Christiaansen, 1977; Loftus & Loftus, 1980; Neisser, 1967), memory is extremely malleable. Moreover, some assume that one event can "replace" another in memory, and that thoughts occurring at the time of an external event or even later thoughts about the event alter the memory of the event itself (e.g., Loftus & Loftus, 1980).

In contrast, we think that events may be confused in remembering, but one event does not replace another. The circumstances of remembering greatly affect whether the memory system appears to be accurate or inaccurate (Johnson, 1983). For example, errors of memory from leading questions have been eliminated when people were questioned about the event in sequence (Bekerian & Bowers, 1983). In general, memory is improved when the original physical or cognitive context is reinstated (e.g., Malpass & Devine, 1981; Smith, 1979; Tulving & Thomson, 1973). As noted above, children may especially need such contextual support for remembering.

Developmental Studies of Reality Monitoring

Our own recent work has been guided by the idea that the memory system preserves the origin of memories, and that distortions in remembering may result from failures in decision processes rather than "altered" traces. The term *reality monitoring* refers to the set of processes involved in discriminating the origin of events (Johnson & Raye, 1981). We proposed that as a class, internally generated memories differ from the class of externally derived memories along several specific dimensions. For example, externally derived memories should have more spatial and temporal information, more sensory information, and generally more details. Internally generated memories, in contrast, should be more schematic and have more information about the thought processes (*cognitive opera-*

tions) engaged in to create them. This latter notion is based partly on the assumption that perception is usually more "automatic" than self-initiated generation processes, and on the idea that voluntary control is coded in memory.

These class differences could be used to identify the origin of memories. For example, a memory that has a great deal of sensory detail and very little information about cognitive operations would be judged to have had an external origin. Of course, many memories would not be such clear cases and, when a memory is of uncertain origin based on class characteristics, additional criteria would be required. You might think about the content of the memory in light of your prior knowledge. For example, you might remember an extremely vivid dream about a purple gorilla and reason that it could not have been a real perception because real gorillas are not purple. Thus, errors in reality monitoring potentially come about in several ways: a target memory may not be typical of its class and thus attributed to the wrong source; failures in reasoning processes may be produced by such factors as failure to retrieve additional information, or failure to have the relevant prior knowledge (you may not know that gorillas are not purple).

Several studies of both memories established under controlled laboratory conditions (Johnson, Taylor, & Raye, 1977; Johnson, Raye, Foley, & Foley, 1981; Raye & Johnson, 1980; Raye, Johnson, & Taylor, 1980) and more natural, autobiographical memories (Johnson, Kahan, & Raye, 1984) support this model of reality monitoring. For example, compared to poor imagers, the memories of good imagers for perceived and imagined events should be more similar in amount of sensory information. Consistent with this, good imagers show greater confusion (Johnson, Raye, Wang, & Taylor, 1979).

Within this framework, developmental trends would be easy to account for. They could result from a greater overlap in perception and imagination in younger children (e.g., Werner, 1948). Or they could result from unsophisticated use of available cues by younger children, or from a failure to have relevant prior knowledge that could be used to reason about the probable origin of an event.

Therefore, as reflected in legal practice and as suggested by a number of theorists (e.g., Piaget, 1929; Werner, 1948), we initially assumed that children should be less able to distinguish memories produced by perceptual processes from memories generated by thought or imagination. Thus, reality monitoring should develop as people learn to better use cues associated with externally derived and internally generated information. To be sure, the experimental findings cited above provide little encouragement for this idea. However, for various methodological reasons (Johnson, Raye, Hasher, & Chromiak, 1979), intrusions in recall or false recognition paradigms may not be the optimal tests of this prediction. Thus, we used paradigms that we thought would provide clearer tests of the hypothesis that reality monitoring improves with age. The major results of these studies are described below.

Experiment 1. The first experiment (Johnson et al., 1979) examined the influence of imagination on the judged frequency of events. Subjects were drawn from four age groups: 8-, 10-, and 12-year-olds, and adults. We varied the number of times subjects thought about events. We expected that children would be more likely to confuse their thoughts with external events and, thus, to show more confusion about how often they had seen things.

The study session consisted of two types of events—presentation trials and imagination trials. On presentation trials, subjects were shown slides (pictures of objects from children's books); on imagination trials, they were read the names of some of the pictures and were asked to form an image of the corresponding slide in response to each name. Sets of presentation trials alternated with sets of imagination trials. During the course of the study session, some slides were shown once, some twice, and some three times. Also, subjects imagined some of these slides once, some slides three times (over the course of the entire session), and some not at all.

After the study session, the subjects were asked to judge the frequency with which each of the slides had been *actually presented.* Judgments of subjects of all ages were appropriately affected by presentation frequency. That is, more frequently presented slides were judged as more frequent. Of primary interest, however, was the influence of imagination frequency on judgments of presentation frequency. If imaginations were confused with presentations, subjects should give higher estimates to items that had been imagined more frequently—and it was expected that this confusion would decrease with age. All subjects showed systematic confusion, but confusion for children was no greater than that for adults.

At the time, we were extremely surprised to find that children were *not* more susceptible than adults to confusion in this situation. We have since discovered that this was not an unusual result.

Experiment 2. While the 8-year-olds in Experiment 1 did not show a deficit in reality monitoring, younger children might do so. Therefore, Experiment 2 (Foley, Johnson, & Raye, 1983) compared 6-, 9-, and 17-year-olds. In one condition (Say–Listen), subjects were asked to say some words and to listen while another person said other words (common words selected from children's story books). Then, on a surprise memory test, subjects were asked whether each word was (a) one they had said, (b) one they heard the other person say, or (c) a "new" word (one neither had said). In a second condition (Say–Think) other subjects were asked to say some words and to imagine themselves saying other words. Afterward, on a surprise memory test, they were asked to decide if each test word was a word they had said out loud, a word they had imagined saying, or a new word.

The Johnson–Raye reality-monitoring model (1981) predicts that perform-

ance will be poorer in the Say–Think than in the Say–Listen condition. In the Say–Think condition, the amount of information about cognitive operations should be quite similar for memories of expressed and unexpressed thoughts, making it relatively difficult to distinguish between them. In contrast, there should be a greater difference in the amount of information about cognitive operations in memories for "Say" and "Listen" events, with a large amount of information about cognitive operations signaling an event was self-generated (i.e., said). This prediction was confirmed; performance was generally poorer in the Say–Think than in the Say–Listen condition.

Moreover, the developmental results were very interesting. Six-year-olds performed as well as young adults in remembering whether they had said something or whether the other person had (Say–Listen). This is analogous to the finding from Experiment 1 that children were no more likely than adults to confuse seen with imagined pictures. The striking new finding was that 6-year-olds were at a distinct disadvantage compared with older subjects in the Say–Think condition. It was much more difficult for the 6-year-olds to distinguish what they had said aloud from what they had only imagined themselves saying aloud.

Experiment 3. Experiment 3 (Foley et al., 1983) was conducted with 6- and 9-year-olds to replicate the findings from Experiment 2 and to investigate two new conditions. In one of the new conditions (Listen–Listen), subjects listened to two speakers and later were tested on their ability to remember who said what. Both the Say–Think and Listen–Listen conditions required discrimination between memories from the same class of experience—i.e., internal and external, respectively. If the inferior performance of the 6-year-olds in the Say–Think condition in Experiment 2 was because they have a hard time separating memories that originated from the same class of events, then 6-year-olds should also have difficulty discriminating between memories from two external sources (Listen–Listen).

In the other new condition (Think–Listen), subjects sometimes listened to another person say words and sometimes the subjects imagined themselves saying words. If young children's difficulty in the Say–Think condition reflected a general inability to distinguish thoughts from other events, then the 6-year-olds should have trouble in the Think–Listen conditions as well.

The results from Experiment 2 were replicated in that there was no age difference in the Say–Listen condition, and that 6-year-olds were at a particular disadvantage in the Say–Think condition compared with 9-year-olds. Furthermore, the discrimination performance of the 6- and 9-year-olds was comparable in the Listen–Listen condition. Thus, we now know that young children do not simply have greater difficulty distinguishing between memories originating from the *same class* (internal or external). We also know that young children do not

simply have a general problem in distinguishing memories for their thoughts from *all* other memories. They were at no disadvantage in discriminating memories for their own thoughts (words they imagined saying) from memories for words another person said.

This latter finding is important for several reasons. It shows that the disruption in children's performance in the Say–Think condition is not based on a general deficit in making decisions involving memories for imagined events. It also suggests that young children can understand instructions to identify imagined items. Finally, the results for the Think–Listen condition argue against Piaget's proposition that children have no idea about the origin of their own thoughts (1929, p. 125).

Experiment 4. The 6-year-olds' deficit in Experiments 2 and 3 was specific to distinguishing their own thoughts about an action from their own actual actions—at least in the case of thinking about speaking versus actually speaking. Experiment 4 (Foley & Johnson, in preparation) investigated whether this result would generalize to other sorts of actions.

There were three age groups (6-year-olds, 9-year-olds, and college students) and three conditions in Experiment 4. In the Do–Watch condition, subjects performed some actions and watched while another person performed other actions. In the Watch–Watch condition, subjects observed two people performing actions. Finally, in the Do–Think condition, subjects performed some actions and *imagined* themselves going through the motions of other actions. These three conditions parallel the Say–Listen, Listen–Listen, and Say–Think conditions, respectively, in Experiments 2 and 3.

The actions involved communicative gestures (e.g., shake your head yes), extending a part of the body (e.g., point your fingers out in front of you), touching (e.g., touch your elbow), looking or orienting toward an object in the room (e.g., look at the door behind you), tracing (e.g., trace over the letter *A*), and actions performed from a standing position (e.g., stand up, do a jumping jack, and sit back down). After the activity phase of the experiment, subjects received a surprise memory test. For each test item, the subject had either to indicate it was new or to identify its appropriate condition—i.e., did they do it or watch it (Do–Watch), which of two others did it (Watch–Watch), or did they do it or imagine doing it (Do–Think).

Performance was generally higher in the Do–Watch than in the Watch–Watch condition, and there were no developmental differences in these two conditions. In contrast, discrimination performance varied with age in the Do–Think condition. The performance of the 6- and 9-year-olds was comparable, and both groups of children performed worse than adults. Overall, this pattern of results from actions is very similar to what we obtained in Experiments 2 and 3 with verbal materials. But when actions were studied in Experiment 4, 9-year-

olds as well as 6-year-olds had difficulty distinguishing what they had only thought of doing from what they had actually done.

Summary and Discussion of the Studies

A good deal of developmental theorizing would lead us to expect that children are generally unable to identify the sources of their memories. These studies demonstrate, however, that this is not necessarily the case. How confused young children appear depends on the *nature* of the discrimination called for. Children as young as 6 years were as able as older subjects to separate memories originating from different perceptual sources (Listen–Listen; Watch–Watch). More importantly, children as young as 6 or 8 were at no disadvantage in relation to older subjects in discriminating between memories originating from internal and external classes of experience (e.g., imagined and perceived pictures; imagined and perceived words). These findings indicate that children do not have a general deficit in discriminating the origin of information in memory.

However, it would be a mistake to conclude that children are never more confused than adults about reality and fantasy. When children were asked to distinguish memories for ideas realized in action from memories of ideas only (Say–Think; Do–Think), they were at a marked disadvantage.

According to the Johnson–Raye reality-monitoring model, decisions about the origin of memories are based on characteristics of the memory traces being evaluated. Memories originating from the same source presumably share similar amounts of certain information (e.g., contextual cues or information about cognitive operations). Thus, decisions about memories in situations like our Listen–Listen, Watch–Watch, Say–Think, or Do–Think conditions should typically involve more difficult discriminations than those in the Say–Listen or Do–Watch conditions. In the more difficult cases, successful discrimination depends on a finer analysis of both quantitative and qualitative characteristics along any particular dimension.

The specific age decrement in discrimination in the Do–Think and Say–Think conditions (as opposed to the Watch–Watch or Listen–Listen conditions) suggests the interesting possibility that children may have particular difficulties when comparisons involve certain dimensions—namely cognitive operations and associated motor programs for imagined and executed actions. The idea that children might become sensitive to fine distinctions in characteristics of perceptual events sooner than fine distinctions in characteristics of self-generated events seems plausible. For one thing, perceptual events are publicly available and their attributes (e.g., color, size, location) are frequently the topic of conversation. Also, the more difficult the decision, the more it should profit from consideration of multiple cues. Adults presumably take into account several dimensions of memories at one time, whereas children appear to have trouble using multiple

cues in memory simultaneously (Foley & Johnson, in preparation; Hasher & Clifton, 1974).

In short, children evidently had difficulty separating action plans that had been carried out from those plans that had not. An important question, both for theory and for courtroom testimony, is whether children only have difficulty with memories that involve themselves as agents or whether the same pattern would be found with another agent. Would children have the same difficulty separating what they saw someone else do from what they only imagined that person doing? We are currently investigating this question.

Conclusions

Our review of others' and our own findings suggests that several aspects of children's memory relevant to courtroom testimony need further investigation. It is well documented that younger children typically recall fewer items than do older children. This relationship between age and recall seems to be associated with a developmental trend in the acquisition both of enriched knowledge structures (e.g., an apple is a fruit) and of memory strategies (e.g., organizing or generating images). This suggests that children will typically produce less detailed testimony in the courtroom, although not necessarily for all aspects of an event. For example, it is not clear whether children should be expected to be any worse than adults in recalling spatial arrangements of objects and people, or the temporal order and frequency of events. Our own work suggests that even young children may be able to recognize who did what. On the other hand, recall of complex events that children do not understand (e.g., adult conversations) would show a marked developmental trend. The belief is pervasive that children have more difficulty than adults in discriminating what they perceive from what they imagine, but it has little direct experimental support. Children in our studies did not appear to be more likely to confuse what they had imagined or done with what they had perceived. On the other hand, young children did have particular difficulty discriminating what they had done from what they had only thought of doing. This difficulty, though not part of a generalized confusion in children about fact and fantasy, is nonetheless important.

A considerable amount of work needs to be done that compares adults and children in their recall of specific types of information likely to be relevant to courtroom testimony. Few developmental studies motivated by an interest in children's competence to testify have compared children and adults under equivalent circumstances (but see Marin et al., 1979). Most of what we know about similarities and differences in children's and adults' memories comes from studies of basic memory processes. We need more investigations comparing memory of children (especially very young children) and adults for different aspects of complex and realistic events over longer retention intervals. Crucial is not just

that the events should be more realistic, but also that reasonably complex events provide an opportunity to compare adults' and children's memories for different aspects of these events.

Memory was once considered a general capacity that would reveal itself consistently across many different measures (e.g., recall and recognition were supposed to measure an abstract quality called "trace strength"), but it is now apparent that this belief was too simple. There are many aspects or attributes of memory (see Underwood, 1969), not all of which necessarily mediate performance in all memory situations (Johnson, 1983). Thus the change in memory performance with age may not be the same for all situations (e.g., Brown, 1975; Flavell, 1977; Hasher & Zacks 1979). To date, views on children's testimony have not sufficiently taken into account the idea that memories are multifaceted. Investigators have not systematically explored the possibility that children's testimony is more credible in some instances than in others.

A provocative illustration that the issue of children's testimony is complex was provided by Allport and Postman (1947) in *The Psychology of Rumor.* Adults who viewed a picture of a subway scene often erroneously reported that a black man was holding a razor, and holding it aggressively, when, in fact, a white man held the razor in the scene. Children, if they recalled this detail, never confused who was holding the razor. Freud (1909/1955, p. 103) suggested that the "untrustworthiness of the assertions of children is due to the predominance of their imagination, just as the untrustworthiness of the assertions of grown-up people is due to the predominance of their prejudices." At this time, it remains unclear whether the imagination of children or the prejudice of adults is the more dangerous enemy of justice.

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