

EDITORIAL

Children's Memory for Early Experience

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Who and what do we study when we study the development of memory? Until recently, the answer was clear to most developmental psychologists. We studied what we can now characterize, in retrospect, as the deliberate rememberer: children, usually of school age, who needed to know where they left their glasses, who wanted to remember what to buy at the store, or who (most typically of all) were required to remember certain decontextualized facts in a school context (e.g., the names of the fishes of the Great Lakes). Studies of this kind of memory led to several conclusions about the development of memory: for example, that children initially don't have, but acquire, strategies for dealing with deliberate memory tasks (e.g., rehearsal, chunking, self-testing), and that children's ability to remember things seems to be linked to their knowledge and understanding of what they're trying to remember.

There are other rememberers than the deliberate verbal school-aged child, however. There are younger children, who sometimes amaze their parents by telling stories of events the parents had long forgotten, but who also sometimes amaze their parents by forgetting a former best friend who moved away. There are real-world events, which simply occur rather than being presented as needing to be remembered; memories for events may be asked for later, though, when an adult needs to know what went on, or may be used by a child in thinking about the world and the child's place in it. There is also a real brain doing the remembering, a fact we always knew but are only now beginning to be in a position to study.

In the fall of 1993, the *Journal of Child Psychology* published a call for contributions to a topical issue on early memory. The volume of excellent papers submitted in response turned out to result in enough papers for two issues, of which this issue is the first. There are several distinguishing characteristics of this new wave of research on early memory. Here, we highlight four new trends, which center on the ties between research in memory development and research in related areas.

Closer Relations between the Study of Memory Development and the Study of Cognitive Development

Recent research on memory development is more seamlessly a part of the study of cognitive development than has been true in the past. While memory development has always been regarded as a sub-topic in cognitive development, it has often been treated as an area of inquiry easily separable from other lines of research. Indeed, a quick look at current cognitive development texts shows this organization; memory development typically has its own chapter (Bjorklund, 1989; Rosser, 1994; Siegler, 1991; Small, 1990). This decision reflects pedagogic convenience, in part, but also reflects and reinforces a view of memory in which memory is one component in an information-processing system separable into sequential "boxes," with a strict distinction made between encoded information and mental processes.

Memory is, however, central to most cognitive activity, and segregating it has a disturbing artificiality. Increasingly, investigators are integrating memory research with thinking about other aspects of cognitive development. For instance, Meltzoff (1988) and Mandler (1992) use data on infant memory in arguing that infants form mental representations which are not simply sensorimotor in nature, surely a crucial question for any theory of cognitive development. In this issue, there is another example of integration and intersection between the study of memory and the study of cognitive development: theory of mind research and early memory research have come together in two interesting ways. On the one hand, Perner and Ruffman have used theory of mind research to suggest something about the development of autobiographical memory: that such memory depends on the emergence of a theory of mind and, in particular, on an awareness of the self as an experiencing and remembering agent. On the other hand, Freeman has used memory research to illuminate an issue in the theory of mind: whether or not children truly lack a memory for the old state of affairs when they claim that a naive viewer will know about a new state of affairs produced from the old state in his absence. It seems clear that thinking about memory as integrally related to cognitive tasks will bring fuller understanding all around.

Closer Relations between the Study of Memory Development and the Study of Neurological Development

Recent research in memory development has also increasingly been exploring the relations between memory tasks and neurological development. This relation is a two-way street. Going in one direction, cognitive tasks may be used to index neurological development. For instance, in this issue, Gilmore and Johnson show, using an oculomotor delayed response task, that infants as young as 6 months can maintain spatial information in working memory for 3 to 5 s. From this finding, they draw conclusions about the

maturation of the brain areas known to be associated with successful performance of this task. Going in the other direction, evidence from neuropsychological investigation may be used to help define the nature of cognitive tasks. For instance, Mandler and McDonough use evidence from the study of amnesics to justify their claim that delayed imitation tasks in very young children index more than implicit memory.

New Relations between the Study of Memory Development and the Study of Adult Memory

The study of memory development has always been informed by the study of adult memory, but the study of adult memory has changed remarkably in the past decade. New findings on memory without awareness, in both normal adults and amnesics, have led to very different proposals about the architecture of the memory system than those predominating in the past (see Roediger and McDermott, 1993, for a recent overview). Sharp distinctions are now made between explicit and implicit memory, and among various types of implicit memory, such as conditioning and priming. This change in theory and approach, still the subject of lively debate, has changed the nature of the questions we ask about memory development. Some findings, including data from Drummey and Newcombe and from Russo et al. in this issue, support the idea that implicit memory is much more developmentally robust than explicit memory. On the other hand, explicit memory is not absent, even in the infant, as shown by findings, some reported in this issue, that infants and toddlers, often thought to have only fragile memories, can show strikingly long-term retention, as measured in a variety of ways: deferred imitation of individual actions (Meltzoff), deferred imitation of sequences of actions (Bauer & Wewerka; Mandler & McDonough), conditioned kicking responses (Boller, Grabelle, & Rovee-Collier), looking preferences (Bahrick & Pickens; Diamond), and certain varieties of delayed non-match to sample (Diamond).

Evaluating these findings requires us to characterize the nature of the tasks used: are they nonverbal equivalents of the explicit memory measures used with adults, such as verbal recall, or can they be based on implicit memory? If they are explicit, are they episodic memories of particular events located in time and space and linked to non-central details of the event, or are they part of semantic knowledge?

One reason to believe that at least some of these tasks index explicit memory is that amnesics, who lack the ability to form explicit memories, do not show normal performance on delayed imitation (McDonough, Mandler, McKee, & Squire, 1994) or on preferential looking (McKee & Squire, 1993). These results will need further exploration, given that amnesic effects can result from damage to a variety of brain areas and that groups of amnesic subjects are often diverse. However, what we focus on here is the possibility that the information infants retain, while explicit in the sense of de-

pending on brain systems damaged in amnesia, is semantic rather than episodic. For instance, subjects in a delayed imitation experiment do not have to intentionally search for memories of previous experiences occurring in particular spatio-temporal contexts. They can remember that certain toys can be made to enact certain stories, without necessarily remembering when, where, how, or from whom they acquired that information. This kind of remembering is semantic, similar to knowing a fact, such as that oranges are a citrus fruit. There is no need for an episodic memory for the acquisition of the information. Thus, the memories assessed by tasks such as delayed imitation may be different in important respects from the memories we call autobiographical.

The fact that infants and toddlers can remember a great deal about their early experiences has raised questions about the phenomenon termed "infantile amnesia." On the one hand, Howe and Courage (1993) have claimed that it doesn't exist, at least not after the age of two. On the other hand, there is some evidence that information acquired before the age of 5 is forgotten much more quickly and completely than similar information acquired later in life (Newcombe & Fox, 1994). In this issue, both Bauer and Werwka and Fivush et al. propose that having accessible memory requires learning to represent one's past verbally and in narrative form. Perner and Ruffman argue that we need to understand the idea of knowing something in order to have recollective experience. Drummey and Newcombe suggest accessible memory increases with the advent of strategic linkages between explicit and implicit memory (i.e., the deliberate search for contextual associates of information that elicits a feeling of knowing). Developmental milestones such as acquisition of language, acquisition of narrative form, developing sense of self, and developing understanding of how minds work, as well as the acquisition of mnemonic strategies linking explicit and implicit memory, may work interactively to create coherent autobiographical memory.

New Relations between the Study of Memory Development and Real-World Issues

One characteristic of many of the papers is an interest in applications of research on memory to real-world contexts in which children are asked to give eye-witness testimony. Several papers show situations in which children's memory can be highly suggestible, especially at younger ages. This is, of course, of great concern given its possible implications for cases of child abuse. However, this concern needs to be put in a context in which one acknowledges the fact that adults as well as children do not have perfect memory. Under certain circumstances adults can be just as suggestible as children (Zaragoza & Lane, 1994). Thus, it seems of paramount importance to investigate under what conditions children's reports are most likely to be accurate and reliable.

Several findings relevant to this goal are reported in the topical issue. First, Pezdek and Roe's paper suggests that, if the event reported on is one that was repeated, reports are less open to suggestion. Second, and contrary to popular opinion, the verbal reports of young children may be more accurate than information obtained using toy objects or anatomical dolls to support recall. Both DeLoache and Marzolf and Salmon, Bidrose, and Pipe reach this interesting conclusion, using different memory events and interviewing techniques. (This research is also another example of integration with the study of cognitive development; the counterintuitive hypothesis supported in these papers was originally inspired by DeLoache's work on the development of understanding of models). Third, reinstating emotional and physical contexts may encourage more elaborate recall that maintains accuracy, as shown by Liwag and Stein. Fourth, it is important to interview children as soon as possible after an event, as shown in Parker's paper, and to use nonsuggestive techniques, as shown by Poole and Lindsay. Fifth, mothers may make especially good interviewers; they are, at the least, not particularly bad interviewers, as is sometimes thought (see the paper by Goodman et al.).

Organization of the Topical Issues

The articles in these two issues have many points of cross reference and potential comparison. Because they needed to appear in some order, we grouped them as follows. In the present issue, there are four articles on memory in infants (Bahrck & Pickens; Boller, Grabelle, & Rovee-Collier; Diamond; Gilmore & Johnson), three closely related articles on infants' and toddlers' delayed imitation (Mandler & McDonough; Bauer & Wewerka; Meltzoff), two articles on the development of explicit and implicit memory (Drummey & Newcombe; Russo et al.), and Perner and Ruffman's article on self-awareness and infantile amnesia.

The general theme of the next issue of the journal will be preschoolers' memories for events. Questions investigated include characteristics of children's narratives over time (Fivush, Haden & Adam; Liwag & Stein), the extent to which children's memories are affected by suggestibility (Ackil & Zaragoza; Parker; Freeman), the effect of memory strength on suggestibility (Pezdek & Roe), and what interviewing techniques maximize the accuracy of children's recall (Poole & Lindsay; DeLoache & Marzolf; Salmon, Bidrose, & Pipe; Goodman et al.).

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