Remembering Early Childhood: How Much, How, and Why (or Why Not)

Nora S. Newcombe,[1] Anna Bullock Drummey, Nathan A. Fox, Eunhui Lie, and Wendy Ottinger-Alberts

Department of Psychology, Temple University, Philadelphia, Pennsylvania (N.S.N., A.B.D., W.O.-A.); College of Human Development, University of Maryland, College Park, Maryland (N.A.F.); and Temple University School of Medicine, Philadelphia, Pennsylvania (E.L.)

Abstract

In this article, we consider recent research on three questions about people's memories for their early childhood: whether childhood amnesia is a real phenomenon, whether implicit memories survive when explicit memories do not, and why early episodic memories are sketchy. The research leads us to form three conclusions. First, we argue that childhood amnesia is a real phenomenon, as long as the term is defined clearly. Specifically, people are able to recall parts of their lives from the period between ages 2 and 5 years, but they recall less from that period than from other periods. Second, we conclude that implicit memories from early childhood may be evident even when explicit memories are not, a finding that suggests early experience may affect behavior in ways that people do not consciously recognize. Third, we argue that although young children are well known to be wonderfully efficient learners of semantic information, they have difficulty in either encoding or retrieving the interlinked aspects of events that lend them their autobiographical character. Although more evidence is needed, the relative lack of episodic memories of early childhood may be linked to maturation of prefrontal cortex.

Keywords

memory; development; amnesia; frontal lobes

Do you remember your third birthday party? When your younger brother was born? What happened on your first day at preschool? For most people, the answer to these questions is "no." However, most people *can* remember their high school prom, the birth of their children, or their arrival at college. This intuitive contrast between memory for early childhood and memory for middle childhood and beyond has led to the idea that there is a phenomenon called childhood amnesia, and researchers have searched to understand its dimensions and explain it. In this article, we consider three questions about childhood amnesia. First, is the intuitive phenomenon real? Some investigators have suggested that memory is essentially at adult levels at least by age 2, whereas others have thought that childhood amnesia extends for variable periods, up to age 5 or 6. Second, if there is such a phenomenon, an interesting question is whether, as in "real" amnesia (the kind arising from some kinds of brain damage), early experience might affect behavior in ways that people would not consciously recognize. Third, there is the issue of why memories for early childhood seem to be lacking. Children learn much before the age of 5 years, including most of the language they will ever need to know and a host of facts about the world; why should these voracious learners lack the ability to remember some of the basic elements of their own daily lives during this period?

IS CHILDHOOD AMNESIA A REAL PHENOMENON?

Salient events occurring in children's lives when they are as young as 2 years, such as the birth of a younger sibling, can sometimes be recalled even in adulthood (e.g., Eacott & Crawley, 1998). Furthermore, controlled studies have shown that when children only a year or so old are shown certain actions by an adult, they can remember those actions when they are 2 or so, as indicated by their production of the actions when shown the context again (Bauer & Wewerka, 1995). In the face of data such as these, showing startling evidence of the existence of early memory, some investigators have doubted whether there is a real phenomenon of childhood amnesia at all.

It is important to remember, however, that verbal recall of early events in these studies is usually sketchy. Memories are more likely to occur and are likely to be more detailed as the age when the event occurred increases. This phenomenon does not appear to be explained simply by the fact that older memories necessarily involve longer delays. Our research has shown that not only is verbal recall for childhood events sketchy, but visual memories of familiar faces from childhood are sketchy as well. For example, we showed 10-year-olds pictures of their preschool classmates, mixed with pictures of

other preschool children. The children correctly recognized just over 20% of their preschool classmates, a level of performance that is better than would be expected by chance but unimpressive compared with how well adults recognize photos from their high school yearbooks (Newcombe & Fox, 1994). Even after almost five decades, adults can pick out their high school classmates with better than 70% accuracy (Bahrick, Bahrick, & Wittlinger, 1975). In another relevant study (Lie & Newcombe, 1999), about 3 years after leaving preschool, children were much poorer at recognizing their former classmates than were their preschool teachers.

The phenomenon shown in these studies is not an absolute one. Although virtually nothing can usually be recalled from before the age of 2 years, stimuli children encounter when they are 2, 3, and 4 years old are often remembered with above-chance accuracy. However, the fact that memory at these ages is substantially lower than comparable memories formed by older individuals suggests a phenomenon appropriately called childhood amnesia, even though the amnesia is not profound or absolute. Indeed, the amnesia induced by brain damage is often not absolute either.

DO IMPLICIT MEMORIES SURVIVE IN CHILDHOOD AMNESIA?

One of the most fascinating discoveries in recent research on memory has been the finding that people suffering from brain damage causing amnesia can still show evidence of being affected by prior experience. For instance, they can learn motor skills, exhibit classical conditioning, and show evidence of what is called priming (i.e., increased swiftness and accuracy in processing previously encountered stimuli). Such research gives rise to the question of whether similar phenomena can be seen in childhood amnesia. Do children who show failure to recall or even recognize things from their preschool years show evidence that this information is nevertheless preserved in some fashion?

In one study (Newcombe & Fox, 1994), we used small changes in the skin's electrical conductance as a measure of implicit (i.e., nonconscious) memory for preschool classmates' faces. Even children who had no apparent explicit (i.e., consciously stateable) memory of the faces exhibited skin conductance responses that discriminated between classmates and unknown children. This discrimination was equivalent to that shown by children who did have some ability to recognize their former classmates. In another study (Lie & Newcombe, 1999), we used instead a behavioral test of implicit memory, asking children to judge whether pictures of two faces, taken from different angles, showed the same person or not. The children were better able to make these judgments if the faces were pictures of a former classmate rather than pictures of a stranger. (Explicit memory in this case was not low enough to examine the issue of whether the facilitation existed even when explicit memory was lacking.)

Studies of memory for faces encountered in natural social settings are interesting, but they are difficult to control for various important variables, such as length of exposure to the faces. For this reason, in yet another study of implicit memory (Drummey & Newcombe, 1995), we showed storybook pictures to 3-year-olds, 5-year-olds, and adults. Three months later, they were asked to name the pictures, in a situation in which the pictures were initially out of focus and became progressively sharper. Being able to recognize pictures that are not in good focus is a measure of perceptual priming, a type of implicit memory. After 3 months, 3-year-old children's recognition memory for the pictures was at chance (i.e., the children demonstrated no explicit memory for the pictures), but they still showed perceptual priming for those pictures. Five-year-olds and adults did better on recognition memory than 3-year-olds, but no consistent age differences were seen in perceptual priming.

These data are consistent with the general conclusion, derived from many studies, that implicit memory is formed at an earlier age than explicit memory and shows little developmental improvement. Taken together, the findings suggest that much that people forget about their early childhood influences their responses later in life. In this sense, there may truly be an unconscious—not the kind of unconscious postulated by Freud, in which material is repressed because it is unacceptable, but rather a source of feelings and facilities that the conscious mind does not fully understand.

WHY ARE EARLY MEMORIES SKETCHY?

Observations of the survival of implicit memories of early childhood do not explain (in some sense, they deepen) the mystery of why early explicit memory is lacking. An additional element in the mystery is that young children do form certain kinds of explicit memories easily—the kinds of memories that fall into the category of what is called semantic memory. For instance, they learn large numbers of words. What they seem not to do as well is to encode and retain

what are called episodic memories, that is, memories for particular events, or particular stimuli occurring in particular contexts. An important factor in explaining the dramatic changes in episodic memory occurring during the preschool years can be derived from the source-monitoring framework developed by Johnson, Hashtroudi, and Lindsay (1993). Johnson et al. suggested that the ability to bind together specific combinations of memory characteristics, including perceptual, contextual, and affective information, underlies the ability to show explicit episodic memory. In their view, access to such perceptual, contextual, and affective memory characteristics allows people to determine the source of information, for instance, whether an event was imagined or real (e.g., "Did I really take my pill or just think about doing it?"). A memory for a real event would include more perceptual information (e.g., color), more spatial-temporal information, and more meaningful details than a memory for an imagined event. In addition, knowing that an event is real—and having access to particular information about details, spatial-temporal context, and so on—is critical for having memories that seem to be part of the personal past.

Consider memories for an event, such as a trip to the beach. If one remembers vivid and interlinked details about the trip to the beach, such as the hot weather, wearing a polka-dot bathing suit, and eating a pistachio ice-cream cone under the shade of the palm tree, the event will both be considered real rather than imagined and have an episodic (i.e., autobiographical) quality. A memory for a more isolated aspect of the experience, such as the weather taken alone, may be thought to be merely imagined, or to be simply a semantic memory (i.e., knowledge of the fact that people usually go to the beach when the weather is hot).

Previous work on the development of children's ability to recall the source of facts (source monitoring) suggests that source monitoring is relatively mature by the time children are 6 years old. However, there is evidence of rapid development between the ages of 3 and 5 years. For instance, Gopnik and Graf (1988) found that 3-year-olds performed only slightly better than would be expected by chance when asked how they knew what was in a drawer (i.e., whether they had been shown, had been told, or had been given a clue). More recently, we adapted a source-monitoring paradigm previously used to study elderly people and people with brain damage for use with young children (Drummey & Newcombe, 1999). We taught children of various ages a set of novel facts (e.g., that the Nile is the longest river in the world) and later asked the children questions about these facts. The 4-year-olds later recalled, or at least recognized, more than 70% of these facts, but were strikingly unable to remember where they learned the information, succeeding in only 21% of the cases. Most of the errors involved saying that the information was learned in a situation outside the experiment, for example, from a parent, a teacher, or the media. The 6- and 8-year-olds in this study rarely made such errors.

However, children's failure to remember a source could be due to factors not relevant to their difficulties with episodic recall. For instance, children might perform poorly because of a lack of interest in such information (i.e., young children may not realize how important it is to discriminate real from imagined events). Finding a similar developmental improvement in the preschool years for other kinds of information about simple events, such as perceptual, contextual, and affective information, would bolster the case for a source-monitoring approach toward explaining why early episodic memory is lacking. We found such evidence in a study with children 4, 6, and 8 years old (Ottinger-Alberts & Newcombe, 1999). The children either experienced or imagined scenarios (e.g., planting a flower, unpacking a picnic basket), guided by a taped script. One week later, they were asked whether the events had been experienced or imagined, and answered a number of questions concerning perceptual, spatial-temporal, and semantic aspects of the events. For example, in the case of unpacking a picnic basket, they were asked what color the napkin was, what shape the basket was, and what kind of utensil was in the basket. Recall for aspects of real events increased markedly between the ages of 4 and 6, but relatively little between the ages of 6 and 8, despite the fact that recall levels for older children were quite far from perfect. In addition, 4-year-olds performed quite poorly in distinguishing experienced from imagined events, whereas 6- and 8-year-olds did very well. When 4-year-olds were tested on the same day the events took place, their memories were much better than after a 1-week delay, and they were easily able to make source-monitoring judgments. Thus, the difficulty after the 1-week delay was likely due to the fact that the younger children's memories for the real events, although more vivid than their memories for the imagined events, were still too impoverished to support a judgment that an event had actually taken place.

Development of contextualized memories may be linked to development of function of prefrontal cortex, a process known to be ongoing at this age. Prefrontal cortex is the area of cortex at the front of the brain that has been linked to

working memory, inhibition, decision making, and executive control of behavior. The hypothesis of a linkage to prefrontal development is suggested by several findings. First, people with damage to this area perform poorly on tests of source memory. Second, poor source memory can also be seen in the elderly, and their scores on tests of prefrontal functioning are often correlated with their scores for source memory. Third, in normal adults, neuroimaging studies have shown that the prefrontal cortex is activated during encoding and retrieval of episodic (autobiographical) memories.

The results of two studies we recently conducted are in line with this hypothesis. In one study (Drummey & Newcombe, 1999), source memory was correlated with measures of prefrontal functioning. In the second study (Ottinger-Alberts & Newcombe, 1999), 4-year-olds' recall scores for real events were significantly predicted from another measure of prefrontal functioning. The relations held true even in analyses controlling for age, IQ, and, in the latter study, size of vocabulary.

NEW DIRECTIONS

One reason for the difficulty people have recalling events and stimuli from the preschool period may be that either the encoding or the retrieval, or both, of episodic memory depends on effortful use of the prefrontal lobes to coordinate and interlink the aspects of events that give them their particular and autobiographical quality. These areas of the brain may not yet be mature enough at this age to easily or efficiently support such activity. This hypothesis needs further assessment, however. A promising tactic is to use electrophysiological methods to examine the relation between prefrontal activation at encoding and retrieval in young children and the probability of successful recall or recognition. In addition, we need to understand how social and biological factors interact in memory development. For instance, children's growing appreciation of the importance of memory to other people (e.g., parents want to know what happened at preschool) might depend on brain maturation. Alternatively, social factors leading to such appreciation might recruit and shape prefrontal cortex in the service of this socially valued function.

Recommended Reading

Fivush, R., & Hammond, N.R. (1990). Autobiographical memory across the preschool years: Towards reconceptualizing childhood amnesia. In R. Fivush & L.A. Hudson (Eds.), *Knowing and remembering in young children* (pp. 223–248). New York: Cambridge University Press.

Howe, M.L., & Courage, M.L. (1993). On resolving the enigma of infantile amnesia. *Psychological Bulletin, 113*, 305–326.

Johnson, M.K., Hashtroudi, S., & Lindsay, D.S. (1993). (See References)

Nelson, K. (1992). Emergence of autobiographical memory at age 4. *Human Development, 35*, 172–177.

Perner, J., & Ruffman, T. (1995). Episodic memory and autonoetic consciousness: Developmental evidence and a theory of childhood amnesia. *Journal of Experimental Child Psychology, 59*, 516–548.

Note

1. Address correspondence to Nora S. Newcombe, 565 Weiss Hall, Temple University, 1701 North 13th St., Philadelphia, PA 19122-6085; e-mail: newcombe@astro.temple.edu.

References

Bahrick, H.P., Bahrick, P.O., & Wittlinger, R.P. (1975). Fifty years of memory for names and faces: A cross-sectional approach. *Journal of Experimental Psychology: General, 104*, 54–75.

Bauer, P.J., & Wewerka, S. (1995). One- to two-year olds' recall of events: The more expressed, the more impressed. *Journal of Experimental Child Psychology, 59*, 475–496.

Drummey, A.B., & Newcombe, N. (1995). Remembering versus knowing the past: Children's explicit and implicit memories for pictures. *Journal of Experimental Child Psychology, 59*, 540–565.

Drummey, A.B., & Newcombe, N. (1999). *Prefrontal cortex development and changes in episodic memory*. Manuscript submitted for publication.

Eacott, M.J., & Crawley, R.A. (1998). The offset of childhood amnesia: Memory for events that occurred before age 3. *Journal of Experimental Psychology: General, 127*, 22–33.

Gopnik, A., & Graf, P. (1988). Knowing how you know: Young children's ability to identify and remember the source of their beliefs. *Child Development, 59*, 1366–1371.

Johnson, M.K., Hashtroudi, S., & Lindsay, D.S. (1993). Source monitoring. *Psychological Bulletin, 114*, 3–28.

Lie, E., & Newcombe, N. (1999). Elementary school children's explicit and implicit memory for faces of preschool classmates. *Developmental Psychology, 35*, 102–112.

Newcombe, N., & Fox, N. (1994). Infantile amnesia: Through a glass darkly. *Child Development, 65*, 31–40.

Ottinger-Alberts, W., & Newcombe, N. (1999, April). *Retrieval effort, source monitoring, and childhood amnesia: A new look at an old problem.* Paper presented at the annual meeting of the Society for Research in Child Development, Albuquerque, NM.