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Early Childhood Memories Are not Repressed: Either They Were Never Formed or Were Quickly Forgotten

Mark L. Howe

Department of Psychology, School of Health and Psychological Sciences, City, University of London

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Abstract

Early childhood events are rarely remembered in adulthood. In fact, memory for these early experiences declines during childhood itself. This holds regardless of whether these memories of autobiographical experiences are traumatic or mundane, everyday experiences. Indeed, what people tend to remember from their childhoods involves relatively innocuous experiences, ones often devoid of emotion. In this article, I provide an overview of the types of memories adults recall from their childhoods and the ages at which these memories are believed to have been formed. Along the way, I provide a brief exegesis of the neurobiological and cognitive underpinnings of early memory development. I will show that changes and growth in neural interconnectivity as well as the development of various cognitive structures (e.g., the inception of the cognitive self) help propel the emergence of a mature autobiographical memory system, one that can and does serve as a reconstructive base for remembering events that occur in later childhood and adulthood. During the course of this review, I detail the nature of early memories, their fragility, and the adaptive consequences of forgetting and supplanting these memories with newer, more age-appropriate experiences throughout childhood.

Keywords: Infantile amnesia; Childhood amnesia; Repression; Forgetting; Trauma memory

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Correspondence should be sent to Mark L. Howe, Department of Psychology, School of Health and Psychological Sciences, City, University of London, Northampton Square, London EC1V 0HB, UK. E-mail: drmarkl.howe@gmail.com

The question addressed in this article is whether experiences from our early childhood can be remembered or reconstructed with any degree of accuracy. A number of writers have opined that regardless of age, each of us carries with us "a permanent record of our past" (Furlow, 2001, p. 25). Furlow also suggests that "Even if it's sometimes hard to recall experiences, they are permanently inscribed somewhere amid the billions of neurons in your brain" (p. 25). One's inability to consciously remember these early life experiences is, therefore, not a matter of storage failure but is likely due to the effects of repression—that is, memories become inaccessible to conscious inspection through an automatic and unconscious process that prevents the active retrieval of these memories. The idea of repression has its roots in psychoanalytic theory, where (traumatic) early memories were so psychologically overwhelming that an automatic defense mechanism prevented them from reaching consciousness (e.g., see Ellenberger, 1970).

This notion that storage is permanent for early life experiences (including being born [e.g., Chamberlain, 1988] and perhaps even for experiences that occurred in utero [e.g., Janov, 2000]), even if we cannot remember them, is not new. In fact, it dates back to some of the earliest known thinkers and philosophers (e.g., Aristotle, ca. 345 B.C./2001; Plato, 360 B.C./2004). Early in the 20th century, Thorndike (1905, pp. 330–331) opined, "Each mental acquisition really leaves its mark … Nothing good or evil is ever lost … Every event of a man's life in written indelibly in the brain's archives." Similar views were also expressed by other writers of the time, notably Freud (1916–1917/1964) and Rank (1924/1994).

Of course, these ideas are not backed by the scientific fact (e.g., see Spanos, 1996). Indeed, such ideas are based on assumptions that have not been proven. Specifically, the foundation for these ideas assumes that early experiences are (1) encoded and stored in the first place and (2) that these experiences remain in storage *unchanged* for considerable periods of time (years and decades). As we will see in this article, neither of these assumptions is tenable, especially for explicit autobiographical memories.

Throughout early childhood, there are a number of important cognitive and neurobiological developments that take place prior to the onset of a mature autobiographical memory system, changes that make it possible to remember aspects of experiences for prolonged intervals. Of course, this memory system is, at any age, reconstructive. That is, remembering is a process that does not involve the exact reproduction of events as they happened. Rather, remembering involves reconstructing events from the memory fragments that remain in such a manner that the narrative forms a cohesive story of how the event must have unfolded, one that is consistent with our worldview (e.g., Conway & Howe, 2022; Howe, 2011). Indeed, from the very beginning when we encode an event, we filter what gets encoded and stored through the lens of our worldview. This means that not everything that is available during an experience gets into memory—only those elements that we attend to and are deemed "important" in our worldview get encoded. Similarly, at retrieval, we extract what memory fragments remain from that experience and reconstruct the remembered experience according to our worldview. Of course, even though memory is reconstructive, what we reconstruct can be a relatively realistic representation of that earlier experience, especially if our worldview uses accurate schemas to fill in the pieces that are no longer in memory (e.g., Zacks, Bezdek, & Cunningham, 2022). This is particularly true when older children and adults rehearse those memories, even ones for traumatic experiences (e.g., Wu et al., in press), although rehearsal itself can lead to memory modification (see later discussion of reconsolidation).

1. Early memory development

So, how does this mature memory system develop? The neural systems needed to encode, store, and retrieve information is present, at least in rudimentary form, prior to birth, enabling infants to remember an impressive amount of information very early in life (Bauer, 2015; Courage & Howe, 2022; Cuevas & Davinson, 2022). Equally clear is the fact that infant memory is relatively immature and does not typically retain this information over extended periods of time (Bauer, 2015; Cuevas & Sheya, 2018; Rovee-Collier & Cuevas, 2009). Indeed, research with humans and nonhuman animals reveals that forgetting occurs more rapidly in younger than older members of the species (Kim, McNally, & Richardson, 2006; Richardson & Hayne, 2007; Tang, McNally, & Richardson, 2007; Yap, Stapinski, & Richardson, 2005). This phenomenon is referred to as infantile amnesia (for reviews, see Courage & Howe, 2022; Howe, 2011, 2014, 2015). This rapid forgetting of early memories is due in part to immature consolidation processes in the infant brain and, at least in humans, to cognitive immaturity (e.g., Bauer, 2015; Howe, 2015).

As development proceeds, encoding processes operate more efficiently and quickly, storage and consolidation of encoded information becomes more stable, and retention of this information extends to longer and longer intervals (e.g., Howe, 2011, 2015). Equally important, rates of forgetting also decline with age throughout childhood (see Bauer, 2015). However, increased susceptibility to forgetting extends into the preschool years (Rubin, 2000). Together, what research on early memory has shown is that although we can and do encode and store information about these early experiences, much of this information is forgotten or overwritten by newer, perhaps more germane experiences. Indeed, adults rarely recall experiences from birth to about 24 months of age (the period of infantile amnesia) or even up to the age of 5–7 years (the period of childhood amnesia) (Rubin, 2000). In fact, research has clearly demonstrated that the average age of adults' earliest memories is approximately $3\frac{1}{2}$ years (e.g., Akhtar, Justice, Morrison, & Conway, 2018a; Bauer, Tasdemir-Ozdes, & Larkina, 2014; Tustin & Hayne, 2010), with the number of memories increasing from $3\frac{1}{2}$ to 7 years of age (Bauer, 2015).

Prior to the age of 18–24 months, experiences are simply represented in terms of the experience itself, whereas after this time, memory takes on an autobiographical flavor—that is, these become experiences that happened to me. A cornerstone in this development is the advent of the cognitive self (e.g., see Howe, 2014; Howe & Courage, 1993, 1997). This newly developing knowledge structure (the cognitive self) serves to integrate or bind memory for experiences to the developing self-consciousness, making these memories inherently more durable (Prebble, Addis, & Tippett, 2013; Ross, Hutchison, & Cunningham, 2019; Sui & Humphreys, 2015). Interestingly, the timing of the onset of this cognitive self coincides with adults' earliest memories (Akhtar et al., 2018a; Jack & Hayne, 2010; Tustin & Hayne, 2010; Wang & Peterson, 2014).

Of course, it is not just the development of the cognitive self that serves as the necessary, although not sufficient, condition that leads to the emergence of autobiographical memory. Indeed, like memory more generally, there are other neurobiological, linguistic, and social processes that spur the development of a mature autobiographical memory system. For example, neurobiologically, changes in structural and functional connectivity in the medial temporal lobe and the prefrontal cortex (PFC) are associated with increases in the speed of processing and the longevity of memory traces (e.g., Bauer et al., 2006; for an overview, see Howe, 2013). As well, increased language skills during childhood help children provide more detailed and coherent narratives about the events they experience, something that can also improve memorability. These increased narrative skills in tandem with improving social skills involved in communicating about one's memories provide an opportunity for rehearsal of memories, something that can also improve one's memory of an experience. Together, these factors contribute to the increased longevity of childhood memories.

2. Remembering early experiences

The critical question is how and why do previously explicit and consciously accessible memories in childhood become difficult if not impossible to retrieve later in development? As some would have us believe, it is because they are repressed in later childhood and adulthood. But why would this be the case especially as all early memories (both stressful and seemingly neutral) are "lost" at similar rates (e.g., see Howe, 2011). Indeed, recollection, if any, of early experiences tends to be disjointed and fragmentary (Bruce et al., 2005, 2007). Coherent narratives for these experiences are rarely, if ever, seen (Simcock & Hayne, 2002). In fact, Simcock and Hayne found that children who experienced an interesting and novel event before the age of 3 years showed nonverbal signs that a memory had been formed for the event. However, 6 months and 1 year later, these same children failed to exhibit an enduring autobiographical memory of this event. This is despite the fact that they had acquired the language necessary to translate the previously nonverbal memory into a verbal one.

Some people believe that they can remember experiences from early childhood, even as young as 2 months of age. These false beliefs, or fictional (first) memories (Akhtar et al., 2018a), are just that—false. Consider the following "memory" (Akhtar et al., 2018b):

> I remember a certain part of the past when I was only 2 months old.
>
> I can see myself positioned outside my parents dark green Morris
>
> Minor (with dark wood trims looking about 4 meters facing the back
>
> of the car). The car is on the left hand side of a road, weather is bright,
>
> colours are vivid. Tall grass either side of the road. I think the back doors
>
> are shut. I can see no one. When mentioned to my parents, they thought
>
> it was impossible at the age I was at the time.

This person's parents were probably right. How could a 2-month-old know what a Morris Minor is, what 4 meters looks like, or what left and right are? Although this person believes they remember this event, it is certainly not possible, at least not with the descriptors provided in the current narrative. Moreover, if this was simply the translation of a fragment memory into this person's current knowledge structure, it beggars belief that elements that could not have been encoded at the time (type of car, measurements in meters, and left vs. right) would have been preserved in the original memory for labeling when an adult. Indeed, such rich representations are not common in early memory, generally not arising until later in childhood (e.g., see Wells, Morrison, & Conway, 2014).

Interestingly, earliest memories do not conform to a specific type—that is, these fragmentary memories are often devoid of emotion and do not refer to significant (e.g., the birth of a sibling) or traumatic events (e.g., the death of a relative) (Bruce et al., 2005). Indeed, oftentimes events that occur early in life are not even stored by children in the first place. What may appear important to remember by adult standards (e.g., the death of a relative) may not be something that young children even pay attention to let alone encode (e.g., see Usher & Neisser, 1993). When early experiences are attended to and encoded, often what is subsequently recollected are memories that contain decontextualized sensory experiences or behaviors and actions (Bruce et al., 2005, 2007). For example, in one study, an individual recalled "I remember playing in the kitchen sink with a toy army man, not really sure how I reached the sink, but I remember there was music!" (Bruce et al., 2005, p. 272). Of course, the veracity of such memories is difficult to verify as there is no measure of this person's memory of the event at the time it was experienced and there is no independent confirmation that any such event occurred when this person was very young.

In fact, many early memories, even traumatic ones, are considered to be implicit and, unlike explicit memories, are not subject to conscious inspection in the first place. Although such memories remain inaccessible to a conscious, explicit memory system, they may still shape behaviors later in life (e.g., Alberini & Travaglia, 2017). Indeed, rodent studies have shown that contextual fear memories formed during the infantile amnesia period can be reinstated later in life (e.g., Guskjolen et al., 2018; Travaglia, Bissaz, Sweet, Blitzer, & Alberini, 2016). This raises the prospect that some implicit memories encoded during infancy could remain somewhat intact for a period of time, at least in rodents (for a review, see Li, Callaghan, & Richardson, 2014). Thus, in some instances of implicit memory, the issue of infantile amnesia may not be so much one of storage failure, but one of retrieval inaccessibility (see Alberini & Travaglia, 2017). However, although some implicit memories may be reinstated later in development, it is not clear how long this reinstatement lasts (Li et al., 2014), with up to 3 months since encoding perhaps being the outside limit.

Is there any evidence that findings from rodents extend to humans? Studies on pain early in life demonstrate that there may be physiological carry-over effects to subsequent painful ones. However, these reactions do not appear to persist into later childhood and adulthood, nor do they enter into our explicit memory system. For example, in one study, male infants who were circumcised with or without local anesthetic were followed to see whether implicit memory for the experience was reflected in later behavior (Taddio, Katz, Ilersich, & Koren, 1997). As expected, the researchers found that children who were not given the anesthetic cried significantly more than those who were given the anesthetic. Moreover, these children also exhibited greater behavioral and physiological distress to an immunization injection some 4–6 months post circumcision. This, as well as follow-up research (Taddio, Shah, Gilbert-MacLeod, & Katz, 2002), suggests that implicit memory (i.e., the memory that is not subject to conscious scrutiny) for painful experiences can affect physiological reactions to subsequent painful experiences. However, what is not clear is whether these reactions (1) persisted after 6 months or (2) were later verbalized and available for conscious inspection. Thus, the duration of implicit memories during infancy for rodents and humans remains an empirical issue. Moreover, for humans, given the findings of Simcock and Hayne (2002), it seems unlikely that such an event survived in autobiographical memory and it is equally unlikely that this implicit memory was later translated into words.

Of course, we have no evidence that such experiences were repressed, just as we have no evidence that they were encoded in, or that they were subsequently transformed into, declarative/autobiographical memories. For such an extreme retrieval mechanism to have kicked in, we would need evidence that this experience was consciously accessible to begin with (which we do not) and later could not be consciously accessed no matter how many retrieval cues were presented (which we do not). Indeed, there are no studies that show that a once accessible and documented childhood explicit/declarative memory becomes inaccessible and then accessible again. On the other hand, we do have considerable evidence that early childhood memories of events that never happened can be implanted in older children and adults (for recent reviews, see Otgaar, Houben, & Howe, 2019; Scoboria et al., 2017). In fact, it turns out that it is easier to implant false autobiographical memories in adults for childhood events that occurred during the period of childhood amnesia than it is to implant those same memories for events after the period of childhood amnesia (e.g., Strange, Wade, & Hayne, 2008). This may be because during periods of time where there is a paucity of memories (infantile and childhood amnesia), there is an inability to "fact check" whether those events did in fact occur.

The other, more tenable hypothesis, is that early memories can be overwritten by subsequent experiences. Essentially, older memories that may no longer be sustainable or useful at later stages of development become supplanted or altered by newer experiences that are more useful. In this sense, early memories are modified at the very least and perhaps even erased if they are no longer germane to one's current self. Perhaps, this is why early memories are inherently more labile than ones stored by a more mature memory system. Consistent with this idea, Bauer and colleagues (2014a, 2014b) have provided evidence that rates of forgetting are higher early in childhood as opposed to later in childhood (and adulthood). Indeed, infantile amnesia begins in childhood itself, with memories formed around the age of 3 years being forgotten sometimes as early as age 5 or 6 years. Thus, although memories are formed early in life, they are more frequently lost from storage even during childhood itself. Indeed, this accelerated rate of forgetting for early childhood experiences that was observed in these studies extended all the way to 7 years of age (also see Bauer & Larkina, 2014a, 2014b; Morris, Baker-Ward, & Bauer, 2010).

3. Forgetting as adaptive

The idea that forgetting is an adaptive process has gained considerable currency recently (e.g., see Nørby, 2015; Ryan & Frankland, 2022). A central tenet here is that "… information loss prevents overfitting to perceptual situations that are too specific. In other words, degrading stored information contained in a memory allows organisms to behave more flexibly and promotes better memory-guided decision-making" (Ryan & Frankland, 2022, p. 179). Forgetting then, in childhood and adulthood, is something that occurs in an adaptive memory system, one that is geared to promote the survival of the remembering organism (also see Howe & Otgaar, 2013).

A related mechanism that, although not necessarily leading to the complete erasure of information but simply its modification, is reconsolidation. Like consolidation, reconsolidation involves initial trace volatility of engrams in memory followed by the stabilizing of the engram, in this case, following the retrieval of a previously stored memory trace. During the period of instability, additional information can be added to the original memory trace, information that subsequently becomes part of the newly restored engram. Through this process, the original trace is updated with new information, making that representation more pertinent to functioning in the organisms current environment.

Concerning the forgetting of early childhood experiences, one model suggests that the ongoing maturation of the hippocampal complex may make infantile memories inaccessible to later retrieval attempts (Alberini & Travaglia, 2017). The idea here is that there are critical periods in memory-related neural development in which the young organism is learning to learn and remember. Although memory traces may be laid down early in this development, forgetting of these traces might occur due to the maturation of the hippocampal memory system in response to these infantile experiences, making memories of these early experiences inaccessible to retrieval attempts in this more mature memory system.

Another process that exacerbates forgetting is hippocampal neurogenesis (e.g., see Akers et al., 2014). In infancy as well as adulthood, new neurons are generated in the hippocampus (specifically, the subgranular zone of the dentate gyrus), neurons that integrate into hippocampal circuits permitting new learning. This integration not only aids in the storage of new memories, but can also affect memories that are already stored. That is, as these new neurons integrate into the hippocampus, they establish new synaptic connections that either compliment those that already exist or may even replace those existing ones. Thus, high levels of hippocampal neurogenesis can lead to higher levels of forgetting of information already stored in memory. Because hippocampal neurogenesis rates tend to be high during infancy (see Akers et al., 2014), rates of forgetting should be high then too. The fact that these high rates of neurogenesis are seen across many species during infancy, and these same species evince high rates of infantile amnesia, neurogenesis may be partly responsible for increased forgetting of early life events (Akers et al., 2014; Josselyn & Frankland, 2012; also see Howe, 2011). Importantly, because neurogenesis reconfigures hippocampal circuits, memories originally served by these circuits have been fundamentally altered and cannot be reinstated as they no longer exist in their original form (Akers et al., 2014). As development proceeds, neurogenesis rates decline, making it easier (neurobiologically, at least) to retain hippocampally dependent (declarative/autobiographical) memories over longer and longer periods of retention. Thus, given the need to update early memories in light of new experiences, as well as the prodigious rates of neurogenesis early in life, both of these factors contribute to the increased forgetting, not repression, of early childhood experiences.

4. Conclusion

What this review has demonstrated is that there is little or no scientific research supporting the idea that rapid forgetting of early childhood memories is the result of memory repression. In fact, sometimes the events that we as adults consider to be important are not even encoded by young children in the first place. Indeed, herein lies the methodological conundrum—we must first establish that stable, early memories are formed and retained in childhood. We must then establish that there is a period in which those memories have been repressed and cannot be remembered despite numerous cuing and retrieval attempts. Finally, we must then see that those memories do come back to mind and correspond to the memories that we originally observed in early childhood. To date, no such evidence has been produced, making the repression explanation an unlikely theoretical candidate accounting for the ubiquitous finding of rapid forgetting across multiple species of early life experiences.

What we do find evidence of is rapid forgetting due to an immature memory system. Early memories are not particularly stable and are not well consolidated, problems which lead to rapid forgetting of information that was encoded. Early memories tend to be forgotten more rapidly than later ones because the neural structures (e.g., maturation of the dentate gyrus) and connectivity (e.g., with the PFC) necessary for mature declarative/autobiographical memory take time to develop and mature. Also, high rates of neurogenesis exist early in life, leading to the rapid modification of memory traces, changes that fundamentally alter the original trace leading in some cases to the erasure of the original information stored in those traces. This forgetting can be seen as adaptive inasmuch as earlier information has outlived its usefulness and memory traces representing currently relevant information are more germane to an organism's survival.

In addition to neurobiological development, cognitive developmental processes (e.g., the emergence of the cognitive self, language), at least in humans, also take time to emerge. The development of these processes enhances memory stabilization and binding of information to emerging self-consciousness. Effectively, what this does is transform memories of experiences that simply happened into memories of experiences that happened to me. This combined growth in neural structures and processes, along with the development of self-consciousness, leads to a mature autobiographical memory system, one that improves memory stability.

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