Memory Retention in Infancy and Toddlerhood

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Abstract

Memory is difficult to assess in infants and toddlers due to their lack of language and therefore inability to share memory. Through experimentation, such as the mobile experiment, infants and toddlers have shown to retain implicit memory, such as recognizing familiarity, assessed through habituation, and learned behavior, assessed through operant conditioning. The retention of this memory varies based on the ages of the infant; however, the more reactivations or reminders for the memory the child is given, the longer the memory can be retrieved. These findings on implicit memory also lead to understanding the infant and toddler’s context dependency and ability to generalize a memory. Finally, this paper will explore infantile amnesia, where older children and adults cannot remember earlier than the age of three or four.
Memory and Retention in Infancy and Toddlerhood

Just as the body is developing and changing throughout life, so is cognitive processing. The brain develops throughout early life becoming a fully functioning adult. One aspect of this cognitive processing is memory. There is a large difference between adult memory retention and that of an infant or toddler. However, infants and toddlers have more memory capacity than previously thought. Infants and toddlers can remember implicitly, or without conscious awareness, well. They can also be conditioned with limitations. Particularly in younger infants, the conditioning is highly contextual and slowly becomes more generalized with age. Retention is also limited by length of time. Infants also appear to lack explicit memory, including episodic or autobiographical memory. This leads to a phenomenon called infantile amnesia, where older children and adult cannot remember an event that occurred younger than three years old. Infants and toddlers have almost adult-like memory abilities with implicit memory; however, with explicit memory infants and toddlers do not have the ability to retain.

Habituation

Two of the easiest ways to judge infants’ memories is through habituation and operant conditioning. Habituation has shown that infants learn and retain a wide variety of information (Berk, 2014, p. 163). Infants will show either a familiarity preference or a novelty preference with these objects and events. If the child sees two stimuli directly after learning one of them, the child will immediately stare at the unfamiliar stimuli, which is showing preference to it. This recovery of the new stimuli is a novelty preference, because the child recovered the memory that he or she remembers the stimuli, but showed a preference towards the new one (Berk, 2014, p. 135). Familiarity preference, on the
other hand, is when the infant sees two stimuli after a delay of learning one of them, and shows preference for the familiar stimuli (Berk, 2014, p. 135). These preferences show with habituation infants can remember stimuli and retain memory of their environment.

**Operant Conditioning**

Operant conditioning demonstrates how infants and toddlers are capable of learning behaviors and retaining that behavior; this is demonstrated in the mobile test (Berk, 2014; Hitchcock & Rovee-Collier, 1996). The infants studied in this experiment were three months old. The experiment done was to tie a ribbon attached from a mobile to the child's ankle. When the child kicked, the mobile shook. The child learned by kicking that they could make the mobile move, which demonstrated positive reinforcement. Once the behavior was learned, Hitchcock and Rovee-Collier (1996) instated a forgetting period (6 to 20 days after training), a reactivation period where they would remind the child of the reward (mobile moving), and finally observed whether the child would kick (P. 15). The infants showed the behavior and therefore remember learning like adults; however, they do so for shorter lengths of time unless the memory is reactivated. When infants forget an operant response, it only takes a brief prompt for the infant to reinstate and extend that memory dramatically (Berk, 2014, p. 163). On their own, the duration maximum for infants to remember tasks increases linearly (Rovee-Collier & Cuevas, 2006, p. 124). A two-month-old infant could retain learning for one to two days, while a 13-week-old child could retain learning for about 18 months (Rovee-Collier & Cuevas, 2006, p. 124). This operant condition shows how infants can remember implicitly and retain that memory for some time, but the length of that retention depends upon the age of the infant and the number of reactivations.
While infants and toddlers can retain learned behaviors, they do have limits on how well they remember these behaviors. One example is contextual cues. The Hitchcock and Rovee-Collier experiment was changing the context in which the infants were not able to retain the learning as the remembering was in a different context. However, Hitchock and Rovee-Collier (1996) found that learning did return once it was generalized or able to be seen in multiple contexts and eventually become neutral or not context dependent. Hitchcock and Rovee-Collier explained that the more retrievals made the more generalized the memory was. For infants, their memory is highly dependent upon context. When they learn a behavior in one context, they will only perform the behavior in that context until they learn it again in a new one. This is also true with extinction, the forgetting of a learned behavior. Extinction can only occur in the same context that the learning first occurred (Rovee-Collier & Cuevas, 2006, p. 127). With this, the original learning is permanent (Rovee-Collier & Cuevas, 2006, p. 127). By reactivating the memory in different contexts, infants and toddlers can generalize the learning and make it neutral (Hitchcock & Rovee-Collier, 1996). These generalized memories happen before language development, which is crucial to much of memory retention, which will be discussed later. Because of this, the generalized memories demonstrated that this is a fundamental cognitive process that is not limited by age (Hitchcock et al., 1996, p. 398). Despite having a contextual limit, learning the nature of generalizing learning demonstrates that this implicit memory ability is present in infants and is not limited by age or language, although it is partly limited in the length of said learning and retention.

The aspects of memory mentioned so far, habituation and operant conditioning, are concerning recognition, which is “noticing when a stimulus is identical or similar to one
previously experienced” (Berk, 2014, p. 164). For infants, this is much easier of a task as the stimulus will be present. Berk (2014) demonstrated that what is more difficult for this age is present (p. 164). By the second half of the first year, it improved with age, as one-year-old’s can recall for up to three months, and one-and-a-half-year old’s for up to a year (pp. 164–165). Recognition comes easier to this age; however, recall does make an appearance continues to develop early.

With implicit memory, infants and toddlers show almost adult capabilities. However, the ability to remember explicitly is significantly limited. Older children and adult can rarely remember events happening before three or four years, a phenomenon called infantile amnesia. It is normally autobiographical memory. According to Berk (2014), one-time events from both recent and distant pasts (p. 164) to why infants cannot retain explicit, episodic memories. Berk demonstrated that one theory was simply that infants only had implicit memory and explicit memory developed later (p. 164). Another is based on language. Older children and adults use language for encoding memory, means, such as actions and behaviors, to encode why infants can learn behaviors but not retain event required, the ability for episodic memory would increase. One theory, by Rovee-Collier and K. Cuevas, depends upon contextual cues in which:

A cue is defined as that aspect of a situation which the experimenter manipulates, and the context is defined as the relatively invariant aspects of the setting in which the response occurs that do not affect the characteristics or demands of the task. (121)
Infants’ memories are highly context dependent, which means to reactivate a memory the memory needs to be reinstated in the same context. Because remembering an event requires a person to know the context, time and place, of the event an infant would be unable to recall the event in a new context (Rovee-Collier & Cuevas, 2006). Rovee-Collier and Cuevas (2006) showed that a limit exists on how long after an event a forgotten memory can be reactivated. Therefore, because of the lack of recall ability as well as context dependency, infant amnesia occurs. Despite the restrictions, the infant memory shows that humans are designed with a fantastic mind, “fearfully and wonderfully made,” which has great abilities early on and becomes greater through development (English Standard Version, 2020, Psalms 139:14).

Conclusion

Infants and toddlers have more advanced memory ability than previously thought. However, this memory ability is hindered by the need to specific context dependency and reactivations of memory. Infants can learn behaviors and retain it for a significant amount of time and with the reactivations can retain memory even longer. Although they cannot show it, there is the potential of infants having explicit memory. However, the ability to remember events in hindered by lack of language, need for context, and length of time leading to infantile amnesia. Despite the restrictions, the infant memory shows that humans are designed with a fantastic mind, which has great abilities early on and becomes greater through development.


“A reference generally has four elements: author, date, title, and source...considering these four elements and answering these four questions will help you create a reference for any type of work, even if you do not see a specific example that matches it” (283).