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# Development of episodic and autobiographical memory: The importance of remembering forgetting

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ABSTRACT

Some memories of the events of our lives have a long shelf-life – they remain accessible to recollection even after long delays. Yet many other of our experiences are forgotten, sometimes very soon after they take place. In spite of the prevalence of forgetting, theories of the development of episodic and autobiographical memory largely ignore it as a potential source of variance in explanation of age-related variability in long-term recall. They focus instead on what may be viewed as positive developmental changes, that is, changes that result in improvements in the quality of memory representations that are formed. The purpose of this review is to highlight the role of forgetting as an important variable in understanding the development of episodic and autobiographical memory. Forgetting processes are implicated as a source of variability in long-term recall due to the protracted course of development of the neural substrate responsible for transformation of fleeting experiences into memory traces that can be integrated into long-term stores and retrieved at later points in time. It is logical to assume that while the substrate is developing, neural processing is relatively inefficient and ineffective, resulting in loss of information from memory (i.e., forgetting). For this reason, focus on developmental increases in the quality of representations of past events and experiences will tell only a part of the story of how memory develops. A more complete account is afforded when we also consider changes in forgetting.


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Forgetting is fundamental. Most of the time, we take it for granted that much of what we once remembered eventually (if not sooner) will be forgotten. We even plan for forgetting – creating notes and electronic reminders of things that we do not want to forget, but know that we otherwise would. Yet in spite of the prevalence of forgetting, theories of the development of memory largely ignore it as a potential source of variance in explanation of the course of change in long-term memory for past events – so-called *episodic* or *autobiographical* memory. Instead, focus is on what may be viewed as positive developmental changes, that is, changes that result in improvements in the quality of memory representations that are formed. The purpose of this review is to remove forgetting from the shadows and bring it into the spotlight of attention. The major argument of the review is that focus on developmental increases in the quality of representations of past events and experiences will tell only a part of the story of how memory develops. A more complete account is afforded when we also consider changes in forgetting (see Bauer, 2015, for a review).

## Complementary processes in development of memory

There is no doubt that over the course of childhood, memory for past events and experiences gets better. The early history of the developmental study of memory is replete with examples of age-related improvements in task performance (Bauer & Fivush, 2014). The trend is apparent whether one considers incidental memories, such as those formed over the course of everyday life, or deliberate and strategic remembering (see Bauer, 2013, for a review). The changes typically are viewed in terms of positive developments in the quality of the representations of past events that are formed, in terms of improvements in component abilities, or both. For example, we attribute better retention over time to more veridical encoding (e.g., Ornstein, Baker-Ward, & Naus, 1988), to more nuanced differentiation of the details of one event or experience relative to another (e.g., Bauer & Lukowski, 2010; Riggins, 2014), to greater precision locating events in time (Friedman, 2014) and place (Lourenco & Frick, 2014), to more robust and autonomous retrieval processes (e.g., Roebers, 2014), and to increases in autonoetic awareness (Tulving, 2005; Wheeler, 2000), to name a few. All of these changes contribute to the formation of memory representations that are of higher quality, through addition of more, better elaborated, and more tightly integrated features (Bauer, 2015). The result is a higher quality memory trace and more robust remembering.

Critically, increases in the quality of the representations of past events and experiences are only one side of the mnemonic coin. The other side of the coin – the complement to positive change – is negative change in the representation, change that results in forgetting. Forgetting has been recognized as a force in memory since the beginning of scientific study of the faculty. Famously, Ebbinghaus (1885) carefully tested and documented the course of forgetting of lists of nonsense syllables over time, revealing highly replicable retention (and forgetting) functions. Yet forgetting has been largely ignored in developmental theories. With notable exceptions (e.g., Brainerd, Reyna, Howe, & Kingma, 1990), most developmental scientists do not feature forgetting processes in theories of "what develops" in memory for specific events or experiences. That is, they do not attend to developmental changes in the rate at which memory traces are forgotten. The argument developed in this review (see also Bauer, 2015) is that focus on positive change alone fails to account for why the development of memory takes the forms that it does. The argument applies to episodic memory in general, and to autobiographical memory – memory for personally relevant past events – and explanation of the phenomenon of childhood amnesia, in particular. Briefly, to explain the shape of the distribution of episodic and autobiographical memories in childhood and beyond, we must consider that over the course of development, there are increases in the quality of memory traces and there are decreases in the vulnerability of mnemonic traces to forgetting.

It is noteworthy that consideration of complementary processes in shaping the course of development is not unique to memory. An excellent example of consideration of complementary processes is in brain development. Throughout prenatal and early postnatal development, there are increases in neurons, dendrites and axons, synapses, myelin, glial, and other "positive" events that form the brain (e.g., Gilmore et al., 2011; Seress & Ábrahám, 2008). Equally importantly, there are "regressive" events as well. The best-known example is the number of synapses: the adult complement of synapses is reached only after an initial period of over-production, followed by pruning (Huttenlocher, 1979;