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# The episodic memory and inhibition accounts of age-related increases in false memories: A consistency check☆

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**Abstract**

Theory suggests that age-related increase of associatively based false memories is caused by decline in episodic memory performance and inhibitory functioning. A total of 146 participants, aged 20–80, completed tasks designed to assess processing speed, inhibition, episodic memory performance, and false memory. Structural equation modeling was used to provide a consistency check between theory and empirical data. Results revealed approximately continuous age-related increases in false memories as measured with three independent paradigms and confirmed that the measures could be represented by a latent factor. The influence of inhibition was entirely mediated by episodic memory performance and individual differences in episodic memory performance could account for the age-related increase in false memories. These findings are consistent with the episodic memory accounts and an account postulating that the influence of inhibition is mediated by episodic memory.


*Keywords:* False memory; Inhibition; Episodic memory; Processing speed; Cognitive aging

A growing body of evidence indicates that older individuals, as compared to younger adults, not only show lower levels of episodic memory functioning in terms of the amount of veridical memories retrieved, but also that older adults are more prone to memory distortions and erroneous memories of information not previously presented (see Schacter, Koutstaal, & Norman, 1997 for an overview). In a demonstration of this finding, Norman and Schacter (1997) tested young and old adults with a version of the Deese/Roediger–McDermott paradigm (DRM; Deese, 1959; Roediger & McDermott, 1995). In this paradigm, false memories are induced by the presentation of semantic associates (e.g., thread, pin, eye, and sewing) to a critical non-presented word (needle). The participants in Norman and Schacter's (1997) study claimed to remember specific details surrounding the encoding of the critical non-presented words, mostly of semantic/associative nature. In addition, older individuals falsely recalled more critical words than younger adults did. Although age differences in absolute frequencies of false memories are not consistently found with the DRM paradigm (e.g., Kensinger & Schacter, 1999), the finding of age differences generalizes to other similar paradigms relying on associatively structured materials to induce false memories (e.g., Koutstaal & Schacter, 1997; Koutstaal, Schacter, Galluccio, &

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Stofer, 1999; Rankin & Kausler, 1979). For example, using a categorized pictures paradigm, Koutstaal and Schacter (1997) reported that older adults showed markedly higher false recognition of items that were categorically related to presented pictures.

The accounts for the age differences in these associatively based false memories emanate from two comprehensive explanatory frameworks: Age differences in episodic memory functioning (e.g., Benjamin, 2001; Schacter, Israel, & Racine, 1999; Tun, Wingfield, Rosen, & Blanchard, 1998) and age differences in attentional and inhibitory control (Balota et al., 1999; Balota, Dolan, & Duchek, 2000; Watson, Balota, & Sergent-Marshall, 2001). In this respect, the accounts resemble models of the functional origin of confabulation, which account for confabulation with a combination of episodic memory deficits and executive dysfunction (e.g., Kopelman, 1999; Moscovitch & Melo, 1997) or solely with some aspect of executive dysfunction, such as suppressing, inhibiting, and monitoring currently irrelevant associations (e.g., Schnider, 2001). In addition, neuropsychological evidence suggests that abnormally high levels of false memories are caused by memory deficits accompanied with strategic monitoring deficits (e.g., Melo, Winocur, & Moscovitch, 1999).

One line of explanation for the age differences, subsumed under the episodic memory account, is rooted in the fuzzy-trace theory (e.g., Reyna & Brainerd, 1995). The notion is that there are developmental changes in a dynamic balance of verbatim processes and gist-based processes (i.e., processes based on the meaning or theme, rather than on surface details). Specifically, older adults might be relatively more reliant on gist-based retrieval, giving rise to more false memories of information sharing the "gist" with the presented materials (Kensinger & Schacter, 1999; Koutstaal & Schacter, 1997; Tun et al., 1998). This shift towards gist-based processes might occur as a compensation for age decrements in verbatim memory (Wingfield, Tun, & Rosen, 1995), thus suggesting an indirect causal role for age decrements in verbatim memory in producing age differences in false memory.

A similar line of dual-process explanation is grounded in the distinction between recollection and familiarity (see Yonelinas, 2002 for review). The general notion is that non-studied information will only be accepted as a memory when it has a sufficiently high degree of familiarity and recollection is sufficiently low to justify exclusive reliance on familiarity-based processes—a situation more common in an elderly population with impairments in recollection (Bartlett, Strater, & Fulton, 1991; Benjamin, 2001; Dywan & Jacoby, 1990; Jacoby, 1999). In a similar vein, Schacter and colleagues (e.g., Koutstaal et al., 1999; Schacter et al., 1999) have capitalized on the notion that age-related increase in schematic encoding coupled with reductions in distinctive encoding might lead to less detailed and distinct recollection (e.g., Mäntylä, 1993). Schacter and colleagues suggest that, in turn, the less distinct veridical recollections might cause older adults to respond in a generally more lenient manner, demanding a less vivid recollection of what they accept as a memory.

To summarize, the episodic memory account suggests that the age differences in false memories are tied to age differences in episodic memory performance. To explicitly demonstrate this notion, consider studying the two words *orange* and *banana* only; that is, consider the example when recollection/verbatim retrieval of the presented information is perfect as an extreme example of the memory advantage for younger adults over older adults. Although the word *apple* shares the "gist" with the presented information and probably would give rise to a feeling of familiarity, it is very unlikely that anyone would claim to remember it, perhaps because the gist/familiarity would be overridden, rejected, or excluded by the trust in the perfect verbatim memory/recollection (cf. Brainerd & Reyna, 2002; Hintzman & Curran, 1994; Jacoby, 1999; Rotello & Heit, 2000). In fact, under such circumstances false recognition of related words can be reduced to levels lower than false recognition of unrelated words (Brainerd, Reyna, & Kneer, 1995).

The inhibition account, on the other hand, highlights age differences in the ability to inhibit associatively based information (Balota et al., 1999, 2000; Watson et al., 2001). For example, Balota et al. (1999) suggested that an attentional and inhibitory control system might be the key construct in explaining age differences in the frequency of false memories. This account is in accordance with aspects of the interference literature (e.g., Anderson & Spellman, 1995). Specifically, there is ample evidence that retrieval processes may impair later recall of related information (e.g., Anderson, Bjork, & Bjork, 1994; Anderson & Spellman, 1995; Bauml, 1998)—a phenomenon referred to as retrieval-induced forgetting. This finding has been taken as support for the notion that inhibitory processes are involved in the discrimination of target information from similar competing information in memory (Anderson & Spellman, 1995; Dagenbach, Carr, & Barnhardt, 1990). In the wake of findings suggesting that elderly adults are impaired in inhibitory processes (e.g., Hasher, Stoltzfus, Zacks, & Rypma, 1991; Spieler, Balota, & Faust, 1996), the inhibition account suggests that inhibition might dampen the associatively based familiarity/gist to a lesser extent in elderly adults, giving rise to elevated levels of false memories (Balota et al., 1999, 2000; Watson et al., 2001).

The inhibition view gains further impetus from the suggestion that the prefrontal cortex is critically involved in producing the observed age differences in inhibition (Arbuckle & Gold, 1993; Dempster, 1992). In this vein, there are several lines of evidence indicating disproportional age-related structural (e.g., Haug & Eggers, 1991) and functional (e.g., Gur, Gur, Orbist,